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Confronting the Global Plastics Problem Threatening the Marine Environment – A Framework and Elements of an International Legal Response

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ABSTRACT

At present, international law does not contain any one instrument that would have been designed to target the global plastics problem as a whole. Existing efforts remain fragmented and fail to establish a coherent legal regime, yet a globally recognized need to construct a coordinated and comprehensive international legal response exists. The problem and related regulatory challenges are tremendously complex and multifaceted. The aim of this dissertation is to understand the science and root causes behind the problem and the role of international law and States in contributing to solutions.

Unlike earlier legal research, this study approaches the global plastics problem threatening the marine environment as a continuum of three sub-problems comprising extensive plastics wastes generation, plastics leakage to the oceans, and accumulating marine plastics pollution (MPP). It argues that each sub-problem has their distinctive features that require their own set of legal measures. This approach unfolds a problem-based doctrinal and interdisciplinary assessment of international law. While respecting the intricacies of the problem, the study offers a three-fold framework to examine the global plastics problem and elements of international law. An international legal response to the global plastics problem arises from a mix of diverse measures coming together.

A problem-based analysis highlights that most of the existing applicable international law targets the sub-problem of plastics leakage, whereas the other two sub-problems of accumulating MPP and extensive plastics wastes generation are not covered with adequate international rules. The international community has to develop new, more specific legal measures to tackle the issue of land-based-plastics leakage successfully, as has happened with ocean-based sources of plastics leakage. Regarding plastics wastes generation, international law has yet to embrace its potential role in advancing circular economy practices to increase use of plastics wastes as resources. The findings indicate that a new binding international agreement would bring added value to target land-based plastics leakage and plastics wastes generation. They also note the impracticability of remedying damage from MPP with existing rules or even a new liability mechanism as part of a possible new agreement. The study thus promotes the establishment of a new global fund to combat MPP. To the extent possible, any new mechanisms or rules to reduce MPP or to prevent plastics leakage should be linked to serve a circular economy of plastics to protect to the oceans for the benefit of the current and future generations.

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TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

ARSIWA	Draft Articles on Responsibility of States for Internationally Wrongful Acts
ALDFG	abandoned, lost or otherwise discarded fishing gear
BAT	best available technology
BEP	best environmental practice
CBD	Convention on Biological Diversity
CBDR	principle of common but differentiated responsibilities
CE	circular economy
CICOS	International Congo-Ubangui-Sangha Commission
CMS	Convention on the Conservation of Migratory Species of Wild Animals
EDCs	chemicals with endocrine disrupting properties
EEZ	Exclusive Economic Zone
EIA	environmental impact assessment
EMF	Ellen MacArthur Foundation
EPR	extended producer responsibility
ESA	European Space Agency
FAO	Food and Agriculture Organization of the United Nations
GACERE	Global Alliance on Circular Economy and Resource Efficiency
GAIRAS	generally accepted international rules and standards
GATT	General Agreement on Tariffs and Trade
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GHS	Globally Harmonized System of Classification and Labelling of Chemicals

GPA	Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities
GPML	Global Partnership on Marine Litter
HS	Harmonized Commodity Description and Coding System
ICJ	International Court of Justice
ICARM	Integrated Coastal Area and River Basin Management
ILC	International Law Commission
IEL	international environmental law
IMO	International Maritime Organization
IMSAS	Mandatory State Audit Scheme
IOMC	Interorganization Programme for the Sound Management of Chemicals
IRP	International Resource Panel
ISO	International Standardization Organization
ITLOS	International Tribunal for the Law of the Sea
ISWM	Integrated Solid Waste Management
IWRM	Integrated Water Resources Management
LCA	life cycle assessment
LOSC	United Nations Convention on the Law of the Sea
MPP	marine plastics pollution
NBA	Niger Basin Authority
NBI	Nile Basin Initiative
NOWPAP	Northwest Pacific Action Plan
OECD	Organization for Economic Co-operation and Development

OSPAR	Oslo/Paris Convention (for the Protection of the Marine Environment of the North-East Atlantic)
PCA	Permanent Court of Arbitration
PCIJ	Permanent Court of International Justice
PE	polyethylene
PET	polyethylene terephthalate
POPs	persistent organic pollutants
PP	polypropylene
PP&A	polyester, polyamide and acrylic
PPM	process or production method
PPP	polluter pays principle
PRF	port reception facility
PS	polystyrene
PUR	polyurethane
PVC	polyvinyl chloride
RBO	river basin organization
RSO	regional seas organization
RSP	Regional Seas Programme
SACEP	South-Asia Co-operative Environment Programme
SDGs	Sustainable Development Goals
UN	United Nations
UNEA	United Nations Environment Assembly
UNECE	Convention on the Protection and Use of Transboundary Watercourses and International Lakes
UNEP/UN Environment	United Nations Environment Programme

UNGA	United Nations General Assembly
UNIDO	United Nations Industrial Development Organization
UNSCEGHS	Social Council's Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals
UNWC	Convention on the Law of Non-Navigational Uses of International Watercourses
VCLT	Vienna Convention on the Law of Treaties
VRP	value retention process
WCO	World Customs Organization
WTO	World Trade Organization
ZAMCOM	Zambezi Watercourse Commission

PART I – SETTING THE SCENE

CHAPTER 1 – INTRODUCTION

1.1 Introduction: Topic, Scope, Aims, Research Questions and Structure

On the 28th January 2017, a Cuvier's beaked whale became stranded on the beach of Sotra, an island near Norway's southwestern coast. The whale had repeatedly stranded itself off the water, and finally the local authorities had to euthanize it. A group of researchers from Bergen University then began to determine the cause of death. What they discovered was devastating: the whale's stomach was filled with large quantities of small plastics, sweet wrappers, plastic bread bags, and 30 plastic bags with labels in Danish and English. According to one of the researchers, the whale had been in severe pain for a long time.[1] The destiny of this whale paints a picture of the distress marine plastics pollution

[1] This event was widely in the news. See, e.g., L Chow, 'Whale Found with 30+ Plastic Bags in Its Stomach' (EcoWatch, 6 February 2017) http://www.ecowatch.com/whale-dead-plastic-bags-2242936742.html; K Evans, 'Whale That Had to Be Euthanized Found with 30 Plastic Bags in Its Stomach' (IFL Science!, 3 February 2017) http://www.iflscience.com/plants-and-animals/whale-that-had-to-be-euthanized-found-with-30-plastic-bags-in-its-stomach/; 'Whale Found off the West Coast of Norway with 30 Plastics Bags in Its Stomach' (The Nordic Page Norway) http://www.tnp.no/norway/panorama/5450-norwegian-whale-found-off-the-west-coast-with-30-plastic-bags-in-its-stomach; Photo from a news article: K Bru, 'Plasthvalen Rørte en Hel Verden' (Bergens Avisen, 21 January 2018) https://www.ba.no/plasthvalen/forurensning/miljovern/plasthvalen-rorte-en-hel-verden/s/5-8-726208

(MPP)[2] is causing to the marine environment[3] and accurately depicts the transboundary and global nature of the plastics problem, regulation of which at the international level is the topic of this study. The aim is to understand the science and root causes behind the problem and the role of international law and States in contributing to solutions. The underlying premise of this study is that international law has a pivotal role due to the global nature of the problem.

MPP is "one of the fastest growing threats to the world's oceans health."[4] Of all pollutant substances, "[p]lastics are the most abundant material collected in studies of marine debris floating on the ocean surface and collected in beach surveys and beach cleanups, and they are commonly observed on the seafloor."[5] Land-based sources of marine pollution remain one of the last issues yet to be addressed with binding rules under international environmental law (IEL), despite the 1982 United Nations Convention on the Law of the Sea (LOSC) calling for their establishment.[6] At present, international law does not contain any one specific instrument that would have been designed to target the global plastics problem as a whole, though many existing rules and norms can be applied to it. Due to these shortcomings, existing efforts remain fragmented and uncoordinated, and fail to establish a coherent legal regime.[7] However, recently, awareness of the global plastics problem has reached an unprecedented level and created momentum to take further action also at the international level.[8]

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[2] The term 'marine plastics pollution' ('MPP') is used in this study to refer to any substances that are made of plastic and have leaked into the marine environment, intentionally or unintentionally, and have become pollutants. MPP can be categorized further by size into macro-, meso-, primary and secondary microplastics, and nanoplastics. The exact sizes for plastic particles in these categorizations are not settled scientifically. Generally, macroplastics particles have to be over 5mm-2,5cm in size, and mesoplastics particles sizes vary between 5mm-2,5cm. Microplastic particle sizes vary between 1 µm-5mm, and they can be further categorized based on origin. Primary microplastics refer to microplastics that are intentionally produced and added into products, whereas secondary microplastics are a result from meso- or macroplastics fragmenting in the environment. Nanoplastics particle sizes vary between 1nm-1 µm. (NB Hartmann et al., 'Are We Speaking the Same Language? Recommendations for a Definition and Categorization Framework for Plastic Debris' (2019) 53 Environmental Science & Technology. 1039-1040)

[3] 'Marine environment' refers to the natural environment located in any of the maritime zones within and beyond national jurisdiction.

[4] CK Pham et al., 'Marine Litter Distribution and Density in European Seas, from the Shelves to Deep Basins' (2014) 9 PLoS ONE 4. 1; See also, J Wang et al., 'Chapter 25. Marine Debris' (United Nations, United Nations Division for Ocean Affairs and the Law of the Sea, 2016) First Global Integrated Marine Assessment. 1; The total number of marine species with documented records of ingestion is 233 species. (S Kühn et al., 'Deletorius Effetcs of Litter on Marine Life' in M Bergmann et al. (eds) *Marine Anthropogenic Litter* (Springer 2015) 85.)

[5] KL Law, 'Plastics in the Marine Environment' (2017) 9 Annual Review of Marine Science. 207; KL Law et al., 'Plastic Accumulation in the North Atlantic Subtropical Gyre' (2010) 329 Science 5996. 1185-1188; M Thiel et al., 'Anthropogenic Marine Debris in the Coastal Environment: a Multi-Year-Comparison between Coastal Waters and Local Shores' (2013) 71 Marine Pollution Bulletin 1-2. 307; International Coastal Cleanup and Ocean Conservancy, 'Turning the Tide on Trash: 2014 Report' (2014) 14; F Galgani et al., 'Litter on the Sea Floor Along European Coasts' (2000) 40 Marine Pollution Bulletin 6. 516, 526.

[6] Art 207, United Nations Convention on the Law of the Sea (Adopted 10 December 1982, entered into force 16 November 1994) 1833 UNTS 397 ('LOSC').

[7] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 10.

[8] See eg, UNEA 2/11 'Marine Plastic Litter and Microplastics' (23-27 May 2016) UN Doc UNEP/EA.2/Res.11; UNEA Res 3/7 'Marine Litter and Microplastics' (4-6 December 2017) UN Doc UNEP/EA.3/Res.7; UNEA Res 4/6 'Marine

Momentum has even been growing around the possibility of a new international binding agreement to target the problem.[9] Evidently, a globally recognized need to construct a coordinated and comprehensive international legal response exists, yet views on what this response should build on and include vary. No consensus between States has so far been reached.[10] Therefore, the main research question of this study asks:

> How should States respond under international law to the global plastics problem threatening the marine environment?

Few comprehensive studies on the topic have been undertaken.[11] Unlike earlier legal research, this study approaches the global plastics problem threatening the marine environment as a continuum of three sub-problems comprising extensive plastics wastes generation,[12] plastics leakage to the oceans,[13] and accumulating marine plastics pollution (MPP). Global plastics production and consumption –

Plastic Litter and Microplastics' (11-15 March 2019) UN Doc UNEP/EA.4/Res.6; UNEA Res 4/9 'Addressing Single-use Plastic Products Production' (11-15 March 2019) UN Doc UNEP/EA.4/Res.9; UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 151; Ocean Conservancy and McKinsey Center for Business and Environment, 'Stemming the Tide: Land-Based Strategies for a Plastic-Free Ocean' (2015) 6.

[9] See eg, Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics, 'Chair's Summary for the Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics' (13 November 2020) 7; Nordic Council of Ministers for the Environment and Climate, 'The Nordic Ministerial Declaration on the Need for a New Global Agreement to Prevent Marine Plastic Litter' (28 October 2020) <https://www.norden.org/en/declaration/nordic-ministerial-declaration-need-new-global-agreement-prevent-marine-plastic-litter>; The Fortieth Regular Meeting of the Conference of Heads of Government of the Caribbean Community (CARICOM), 'St Johns Declaration' (Adopted 5 July 2019) <https://www.marketscreener.com/news/latest/CARICOM-Caribbean-Community-COMMUNIQUE-ISSUED-AT-THE-CONCLUSION-OF-THE-FORTIETH-REGULAR-MEETING-OF--28862544/>; African Ministerial Conference on the Environment (AMCEN), 'Report of the Ministerial Segment' (14-15 November 2019) UN Doc AMCEN/17/9. 8, para VIII.; EC, 'A New Circular Economy Action Plan For a Cleaner and More Competitive Europe' (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM(2020) 98 Final. 18; CIEL, EIA and GAIA, 'Convention on Plastic Pollution: Towards a New Global Agreement to Address Plastic Pollution' (2020); WWF, Ellen MacArthur Foundation and Boston Consulting Group, 'Business Case for a UN Treaty on Plastic Pollution' (2020)

[10] Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics, 'Chair's Summary for the Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics' (13 November 2020) 7.

[11] Most importantly, see, A Stöfen-O'Brien, *The International and European Legal Regime Regulating Marine Litter in the EU* (Nomos Verlagsgesellschaft 2015); K Raubenheimer, 'Towards an Improved Framework to Prevent Marine Plastic Debris, (Doctor of Philosophy Thesis, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong 2016); UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5; K Raubenheimer and N Urho, 'Possible Elements of a New Global Agreement to Prevent Plastic Pollution' (Nordic Council of Ministers 2020); UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016)

[12] The problem of extensive plastics wastes generation stems from the linear 'take-make-dispose' pattern of production and consumption of plastics.

[13] 'Plastics leakage' entails situations in which plastics wastes are leaking, or in danger of leaking, to the oceans or items containing plastics are lost, or in danger of being lost, in the marine environment during use. It refers to 'plastics' and 'plastics wastes' in the plural to highlight the variety of different types of plastics. The word 'leakage' denotes to any intentional (eg, littering) or unintentional activities involving plastics (eg, plastic waste blown to the ocean by wind from an unsanitary landfill), which result in plastics pollution in the oceans. Plastics leakage can happen in all parts of the oceans, as well as from land to oceans or from rivers to oceans.

and consequently waste generation – is expected to grow exponentially in the future, approximately 8 million metric tons more leak into the marine environment yearly, and the oceans already contain over 150 million tons of plastics.[14] These three sub-problems form a continuum because the sheer amount of plastics production and wastes generation is a contributing factor to plastics leakage to the marine environment which in turn results in MPP. The international community thus has to not only confront the current situation with plastics wastes leaking to the oceans, but also consider the accumulation of plastic pollution in the environment during past decades, as well as worsening trajectories of plastics wastes generation in the future. This dissertation argues that each of these three sub-problems comes with distinctive features that require their own set of international legal responses. A mix of these measures then have the potential to address the global plastics problem. The three sub-research questions reflect this problem-based approach:

a) To prevent transboundary and global harm from plastics leakage to the marine environment, what does international law currently require of States, and how should these existing international legal measures be further developed and complemented?

b) When faced with transboundary and global harm caused by marine plastics pollution (MPP), what are the international legal remedies States have at their disposal, and how could the current remedies be further developed and complemented?

c) To reduce extensive plastics wastes generation, how do international law and international technical standards promote a global circular economy (CE) of plastics, and how could these efforts be further developed and complemented?

This approach unfolds a three-fold problem-based doctrinal and interdisciplinary assessment of international law that allows inclusion of new areas of research, such as applying international responsibility and liability rules to MPP, or developing international law to strengthen the global CE markets for plastics. The dissertation contributes to the field of IEL by developing an adjustable framework to structure the scientific and legal content relating to the global plastics problem and by filling in gaps in the current literature on international legal protection of the oceans from the global plastics problem.

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[14] Ocean Conservancy and McKinsey Center for Business and Environment, 'Stemming the Tide: Land-Based Strategies for a Plastic-Free Ocean' (2015) 14; J Jambeck et al., 'Plastic Waste Inputs from Land into the Ocean' (2015) 347 Science 6223. 768; UN Environment, 'Mapping of Global Plastics Value Chain and Plastics Losses to the Environment (with a Particular Focus on Marine Environment) (2018) 12, 52; World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, 'The New Plastics Economy – Rethinking the Future of Plastics' (2016) 17; GRID-Arendal, 'Global Plastic Production and Future Trends' (2018) <http://www.grida.no/resources/6923>

The international community has already established a common value basis to provide direction for international legal action in the form of a wide range of principles of IEL. Though international law provides a strong general legal foundation to minimize land-based plastics leakage to the oceans in the form of due diligence obligations, the international community has to develop new, more specific legal measures to tackle the issue more successfully (as has happened with ocean-based sources of plastics leakage). Regarding plastics wastes generation, international law has yet to embrace its potential role in advancing CE practices to increase the use of plastics wastes as resources. This study stresses the need for new measures and the added value of a new binding international agreement in targeting land-based plastics leakage and plastics wastes generation. It also analyzes the challenges of remedying damage from MPP through existing rules and discusses establishing a new global fund to address MPP more efficiently.

A problem-based analysis highlights that most of the existing, applicable international law instruments target plastics leakage, whereas accumulating MPP and extensive plastics wastes generation are not covered by appropriate international rules. The current legal situation combined with trajectories of growing plastics production and wastes generation clearly indicate that States should dedicate efforts to developing CE practices that reduce long-term plastics wastes generation. To the extent possible, also new arrangements or rules on cleanup efforts to reduce accumulated MPP or plastics leakage prevention should be linked to serve a CE of plastics to eliminate plastics leakage to oceans. A well-rounded international legal response requires a mix of diverse components to come together from a problem-based angle. Even a new binding agreement is not panacea for such a complex issue as the global plastics problem.[15]

Each main part of the dissertation (II, III and IV) discusses one sub-research question and reflects the same set of themes in relation to the question: a description of the sub-problem; the underlying legal foundation of an international legal response originating from principles of international law; strengths and weaknesses of the existing and applicable instruments of international law and how they could be improved; recommendations for complementing measures that do not depend on a new binding agreement; and recommendations of what should be taken into account if new treaty negotiations should begin. In the conclusions (V) the structure follows a thematic approach instead of a sub-problem-specific approach. This allows highlighting the interrelations between the main parts

[15] T Graff Hugo, 'The Case for a Treaty on Marine Plastics Pollution' (Norwegian Academy of International Law 2018) 17.

around sub-problems and providing an integrated legal evaluation around each theme to reflect upon the main research question.

1.2 A Short History of the Developments Concerning Plastic Materials, the Science of Marine Plastics Pollution and International Policies

Today the world simultaneously embraces and confronts thousands of different types of plastics. Plastic is a summary term for a man-made synthetic polymer, which is a large molecule "consisting of many equal or similar subunits bonded together". [16] These main building blocks of plastics, monomers and polymers, can vary in their raw materials and chemical compositions.[17] However, currently up to 99% of plastics are produced from fossil fuel-based raw materials.[18] Plastics also contain a "significant amount of chemical additives in order to modify and enhance their properties".[19] Speaking of the material in the plural, that is, plastics or plastics wastes or marine plastics pollution, is essential to capture this extremely wide array of different compositions of plastic materials. Plastics can be categorized into two groups based on their ability to melt when heated: thermoplastics and thermosets. [20] Thermoplastics can be molded repeatedly, and all the most commonly used plastic types belong to this group. Thermosets can only be shaped once, and stay solid after that.[21] These properties of the material have significant implications for their end-of-life treatment possibilities. Plastics do not biodegrade in the marine environment. Biodegradable plastics wastes can be composted, but this usually requires specific industrial settings.[22]

The road toward commercial plastics production began as early as the last decade of the 19th century. The first commercially successful man-made polymer was celluloid, which was developed in 1890s as a substitute material to replace ivory in billiard balls.[23] The next breakthrough was Bakelite, which was invented in 1907 and was the first purely synthetic polymer. However, though celluloid and Bakelite

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[16] R Geyer, 'A Brief History of Plastics' in M Streit-Bianchi et al. (eds) *Mare Plasticum – The Plastics Sea: Combatting Plastic Pollution through Science and Art* (Springer 2020) 31, 32.
[17] UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 26.
[18] CIEL, 'Fossils, Plastics & Petrochemical Feedstocks' (CIEL 2017) Fueling Plastics – Series. 1.
[19] R Geyer, 'A Brief History of Plastics' in M Streit-Bianchi et al. (eds) *Mare Plasticum – The Plastics Sea: Combatting Plastic Pollution through Science and Art* (Springer 2020) 32.
[20] *Ibid.*
[21] GM Scheutz et al., 'Adaptable Crosslinks in Polymeric Materials: Resolving the Intersection of Thermoplastics and Thermosets' (2019) 141 Journal of the American Chemical Society. 16181; UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 26.
[22] UNEP, 'Biodegradable Plastics and Marine Litter: Misconceptions, Concerns and Impacts on Marine Environments' (2015) 10, 31.
[23] S Freinkel, Plastic: A Toxic Love Story (Houghton Mifflin Harcourt Publishing Company 2011)

marked the dawn of the plastic age, their production volumes were modest.[24] The major turning point in accelerating the global plastics problem was in the aftermath of the Second World War:

> During the Second World War, plastic production started to increase due to growing shortages of other materials and plastic's ability to be used instead. After the end of the war, plastic producers started to look for new markets for their newly created production capacity. The unprecedented economic growth of the postwar decades, together with the emergence of the modern consumer society, has led to a rapid and sustained growth of global plastic production. Entire new product categories were invented, such as single-use packaging, which increasingly displaced more traditional reusable packaging.[25]

Plastics created the conditions for global trade and consumerism, which have resulted in plastics infiltrating "so many aspects of our daily lives that its presence is easy to take for granted and also hard to fathom".[26] Plastics have found their application in virtually all types of products due to their low cost and technical versatility.[27] The dependence on plastics has reached a level where it would be difficult if not impossible to do without them. From everyday goods, such as food packaging or hygiene items, to vital services, such as medical equipment or pipelines for supplying water, the role of plastics in human life is much deeper than merely adding convenience.[28] However, now "the utility of plastic in contemporary society is at a crossroads, where the perceived benefit of single-use, throw-away products and packaging is outweighed by the true cost of persistent waste and fragmented microplastics in terrestrial and marine ecosystems."[29]

Concurrently with the developments in global plastics production and consumption, the scientific community became aware of the threat of MPP to animals in the 1950s.[30] The concern arose from anecdotal reports of turtles and sea birds ingesting plastics, as well as plastics becoming the preferred material for fishing gear and thus becoming an entanglement threat to marine animals.[31] Alongside the increasing marine animals' research, by the 1970s the inquiries broadened into experiments to more broadly determine "the nature, origins, and consequences of oceanic petroleum pollution".[32]

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[24] R Geyer, 'A Brief History of Plastics' in M Streit-Bianchi et al. (eds) *Mare Plasticum – The Plastics Sea: Combatting Plastic Pollution through Science and Art* (Springer 2020) 32.
[25] *Ibid.* 33-34.
[26] H Davis, 'Life & Death in the Anthropocene: A Short History of Plastics' in H Davis and E Turpin (eds) *Art in the Anthropocene: Encounters Among Aesthetics, Politics, Environments and Epistemologies* (Open Humanities Press 2015) 349.
[27] R Geyer, 'A Brief History of Plastics' in M Streit-Bianchi et al. (eds) *Mare Plasticum – The Plastics Sea: Combatting Plastic Pollution through Science and Art* (Springer 2020) 35.
[28] S George, 'Plastics We Cannot Live Without' in TM Letcher (ed) *Plastic Waste and Recycling: Environmental Impact, Societal Issues, Prevention and Solutions* (Academic Press 2020) 452-453.
[29] M Eriksen, 'The Plastisphere – The Making of a Plasticized World' (2014) 27 Tulane Environmental Law Journal. 153.
[30] CIEL, 'Plastic Industry Awareness of the Ocean Plastics Problem' (CIEL 2017) Fueling Plastics – Series. 1.
[31] Ibid. 1-2; See eg, SE Cornelius, 'Marine Turtle Mortalities along the Pacific Coast of Costa Rica' (1975) 1 Copeia; PC Harper and JA Fowler, 'Plastic Pellets in New Zealand Storm-Killed Prions (Pachyptila spp.) 1958-1977' (1987) 34 Notornis 1; SI Rothstein, 'Plastic Particle Pollution of the Surface of the Atlantic Ocean: Evidence from a Seabird' (1973) 75 Condor.
[32] CIEL, 'Plastic Industry Awareness of the Ocean Plastics Problem' (CIEL 2017) Fueling Plastics – Series. 2.

Two workshops organized in 1973 by the National Academy of Sciences presented studies of the ocean surface that revealed the presence of significant amounts of plastics debris, and though researchers acknowledged that "there were not 'widespread significant alterations in the marine environment' at the time of writing, there could be significant effects if pollutants accumulated, and more research would needed to be done."[33] It is also noteworthy that major actors in the petroleum industry and plastics manufactures participated in these workshops, which "indicates that the petrochemical industry knew, or should have known, of the presence of plastic in such ocean surveys no later than 1973."[34]

Furthermore, "in addition to the growing awareness of plastics litter at the sea surface and stranded on beaches, the mid-1970s also saw the first records of plastics on the seabed."[35] From the 1980s on researchers also became increasingly aware of how MPP can facilitate "opportunities for organisms that live on objects floating at the sea surface" to settle into new environments.[36] However, the major turning point in recognizing MPP as a global environmental issue occurred only in the beginning of the 2000s, when research revealed the ubiquity of microplastics in the oceans and discovered the North Pacific Garbage Patch.[37] Particularly the discovery of the North Pacific Garbage Patch in 1997 created wide awareness and the global plastics problem has received significant mass media attention since then.[38]

Following these discoveries and growing global awareness, the issue of the global plastics problem threatening the marine environment was officially placed on the international agenda by a Resolution of United Nations General Assembly (UNGA) adopted in 2005. The Resolution:

> [u]rges States to integrate the issue of marine debris into national strategies dealing with waste management in the coastal zone, ports and maritime industries, including recycling, reuse, reduction and disposal, and to encourage the development of appropriate economic incentives to address this issue, including the development of cost recovery systems that provide an incentive to use port reception facilities and discourage ships from discharging marine debris at sea, and encourages States to cooperate regionally and subregionally to develop and implement joint prevention and recovery programmes for marine debris.[39]

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[33] Ibid. 2-3; See also, National Academy of Sciences Ocean Affairs Board, 'Background Papers for a Workshop on Inputs, Fates and Effects of Petroleum in the Marine Environment' (National Academies Press 1973)
[34] CIEL, 'Plastic Industry Awareness of the Ocean Plastics Problem' (CIEL 2017) Fueling Plastics – Series. 2.
[35] PG Ryan, 'A Brief History of Marine Litter Research' in M Bergmann et al. (eds) *Anthropogenic Marine Litter* (Springer 2015) 7.
[36] *Ibid.*
[37] *Ibid.* 18.
[38] See, J Kaiser, 'The Dirt on Ocean Garbage Patches' (2010) 328 Science 5985. 1056; J Males and P Van Aelst, 'Did the Blue Planet set the Agenda for Plastic Pollution? An Explorative Study on the Influence of a Documentary on the Public Media, and Political Agendas' (2021) 51 Environmental Communication 1. 51.
[39] UNGA Res 60/30 'Oceans and the Law of the Sea' (29 November 2005) UN Doc A/RES/60/30. 12, para 66.

Though dumping of plastics had already been banned by the 1972 Convention of the Prevention of Marine Pollution by Dumping of Waste and Other Matter ('London Convention'),[40] and marine litter generally had already been addressed in the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) in 1995, the scientific discoveries on the ubiquity of plastics in the marine environment kickstarted a process where the focus on particularly preventing marine plastics pollution increased. Following the UNGA Resolution, especially the International Maritime Organization (IMO) and United Nations Environment Programme (UNEP/UN Environment) have been active in developing their responses to ocean- and land-based plastics leakage to the oceans, respectively. For example, the IMO has been agile to amend the MARPOL Annex V and to develop complementing voluntary instruments targeting vessel-source plastics leakage.

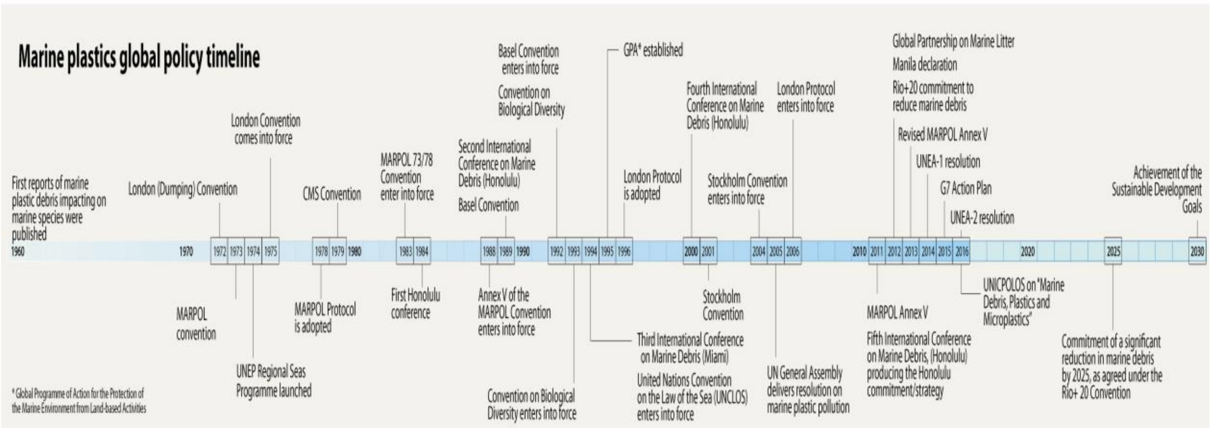

Fig. 1 Marine Plastics Global Policy Timeline.[41]

In addition to engaging with existing international and regional instruments to combat the global plastics problem, States have so far established further soft law instruments and public-private partnerships, as presented in the marine plastics global policy timeline above. Efforts to tackle the global plastics issue also contribute to achieving many of the Sustainable Development Goals (SDGs) in the 2030 Agenda for Sustainable Development.[42] In 2017, 'the United Nations Conference to Support the Implementation of Sustainable Development Goal 14: Conserve and sustainably use the

[40] See, Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Adopted 13 November 1972, entered into force 30 August 1975) 1046 UNTS 120 ('London Convention').

[41] GRID-Arendal, 'Marine Plastics Global Policy Timeline' (2018) https://www.grida.no/resources/6916; All these initiatives are not discussed in this dissertation due to methodological choices and delimitations, and on the other hand the timeline does not include all instruments subject to analysis in this research. However, the figure provides an overall view of many important turning points in policy- and law-making regarding the global plastics problem and depicts accurately the fragmented nature of these efforts.

[42] UNGA Res 70/1 'Transforming Our World: the 2030 Agenda for Sustainable Development' (25 September 2015) UN Doc A/RES/70/1.

oceans, seas and marine resources for sustainable development' addressed the issue of plastics particularly in the declaration "Our Ocean, Our Future: Call for Action" and urged all stakeholders to:

> *g*) Accelerate actions to prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris, plastics and microplastics;
>
> (*h*) Promote waste prevention and minimization; develop sustainable consumption and production patterns; adopt the 3Rs – reduce, reuse and recycle – including through incentivizing market-based solutions to reduce waste and its generation, improving mechanisms for environmentally sound waste management, disposal and recycling and developing alternatives such as reusable or recyclable products or products that are biodegradable under natural conditions;
>
> (*i*) Implement long-term and robust strategies to reduce the use of plastics and microplastics, in particular plastic bags and single-use plastics, including by partnering with stakeholders at relevant levels to address their production, marketing and use[43]

Following the Declaration, later in 2017 the third United Nations Environment Assembly (UNEA-3) outlined a general policy goal in Resolution 3/7: "long-term elimination of discharge of litter and microplastics to the oceans and of avoiding detriment to marine ecosystems and the human activities dependent on them from marine litter and microplastics".[44] UNEA-3 also established and gave a mandate to an Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics ('the Expert Group') to:

i. explore all barriers to combating marine litter and microplastics, including challenges related to resources in developing countries;
ii. identify the range of national, regional and international response options, including actions and innovative approaches, and voluntary and legally binding governance strategies and approaches;
iii. identify environmental, social and economic costs and benefits of different response options;
iv. examine the feasibility and effectiveness of different response options;
v. identify potential options for continued work for consideration by the United Nations Environment Assembly[45]

The mandate was extended by the Fourth United Nations Environment Assembly (UNEA-4) to:

a) Take stock of existing activities and action by governments, regional and global instruments, international organizations, the private sector, non-governmental organizations and other relevant contributors to reduce marine plastic litter and microplastics with the aim of the long-term elimination of discharge into the oceans;
b) Identify technical and financial resources or mechanisms for supporting countries in addressing marine plastic litter and microplastics;
c) Encourage partnerships that undertake activities such as the development of source inventories, the improvement of waste management, awareness-raising and the promotion of innovation in relation to the prevention of marine litter, including plastic litter and microplastics;

[43] United Nations Conference to Support the Implementation of Sustainable Development Goal 14: Conserve and Sustainably Use the Oceans, Seas and Marine Resources for Sustainable Development, 'Our Ocean, Our Future: Call for Action' (Adopted 6 July 2017) UN Doc A/RES/72/312. 4, para 13(1)(g)-(h).
[44] UNEA Res 3/7 'Marine Litter and Microplastics' (4-6 December 2017) UN Doc UNEP/EA.3/Res.7. 2, para 1.
[45] UNEA Res 3/7 'Marine Litter and Microplastics' (4-6 December 2017) UN Doc UNEP/EA.3/Res.7. 3-4, para 10.

d) Analyse the effectiveness of existing and potential response options and activities with regard to marine litter and microplastics at all levels to determine the contribution that they make to solving the global problem[46]

The Expert Group had four meetings and concluded its mandate in November 2020. It supports two main courses of action which it considers not to be mutually exclusive; "strengthening existing instruments and adopting a voluntary global agreement on marine plastic" and the "development of a new global architecture with a multi-layered governance approach, including the possibility to add a new legally binding instrument to the existing framework".[47] The conclusion the Expert Group called for:

a) setting a global common vision
b) developing and implementing national action plans addressing both downstream and upstream activities
c) enhancing regional and international cooperation
d) accumulating and sharing scientific knowledge
e) facilitating multi-stakeholder engagement
f) strengthening existing instruments
g) a new global instrument
h) enhanced coordination among instruments[.][48]

Some Expert Group participants recommended starting negotiations for a new global agreement, and similar calls are coming from some governments, non-governmental organizations (NGOs) and other coalitions.[49]

The coronavirus disease (COVID-19) that became a global pandemic in 2020 – and is still ongoing – has complicated efforts to tackle the plastics problem, as well as worsened the problem by resulting in vast amounts of plastics wastes, particularly medical waste, but also house-hold waste.[50] Also due

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[46] UNEA Res 4/6 'Marine Plastic Litter and Microplastics' (11-15 March 2019) UN Doc UNEP/EA.4/Res.6. 4, para 7.
[47] Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics, 'Chair's Summary for the Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics' (13 November 2020) 1.
[48] *Ibid.* 6-7.
[49] See eg, Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics, 'Chair's Summary for the Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics' (13 November 2020) 7; Nordic Council of Ministers for the Environment and Climate, 'The Nordic Ministerial Declaration on the Need for a New Global Agreement to Prevent Marine Plastic Litter' (28 October 2020) <https://www.norden.org/en/declaration/nordic-ministerial-declaration-need-new-global-agreement-prevent-marine-plastic-litter>; The Fortieth Regular Meeting of the Conference of Heads of Government of the Caribbean Community (CARICOM), 'St Johns Declaration' (Adopted 5 July 2019) <https://www.marketscreener.com/news/latest/CARICOM-Caribbean-Community-COMMUNIQUE-ISSUED-AT-THE-CONCLUSION-OF-THE-FORTIETH-REGULAR-MEETING-OF--28862544/>; African Ministerial Conference on the Environment (AMCEN), 'Report of the Ministerial Segment' (14-15 November 2019) UN Doc AMCEN/17/9. 8, para VIII.; EC, 'A New Circular Economy Action Plan for a Cleaner and More Competitive Europe' (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM(2020) 98 Final. 18; CIEL, EIA and GAIA, 'Convention on Plastic Pollution: Towards a New Global Agreement to Address Plastic Pollution' (2020); WWF, Ellen MacArthur Foundation and Boston Consulting Group, 'Business Case for a UN Treaty on Plastic Pollution' (2020)
[50] J Pinto da Costa, 'The 2019 Global Pandemic and Plastic Pollution Measures: Playing Catch Up' (2021) 774 Science of the Total Environment. 2, 4.

to the pandemic, the UNEA-5 was divided into two parts. The first part of the UNEA-5 took place virtually in February 2021, but did not address the global plastics problem specifically despite many delegates stressing the importance of the issue. The next opportunity for the international community to initiate a treaty negotiation process will be in 2022 at the second part of the UNEA-5.[51]

1.3 Literature Review

International legal protection of the marine environment from the global plastics problem is a relatively new topic in the field of international marine environmental law and there are few scholarly authorities. Illustrative of this fact is that despite plastics comprising the majority of all land-based marine pollution none of the major textbooks on international environmental law yet discuss the issue of plastics in particular.[52] Since the global plastics problem has become part of the international environmental agenda, publications have steadily been increasing, which also signifies that the topic is a moving target for research.

One of the challenges in terms of discussing legal measures in the literature is the absence of a clear global policy agenda on the objectives relating to tackling the global plastics problem. This signifies that possible objectives and targets for regulation need to be derived from other sources and/or developed. Though the Agenda 2030 for Sustainable Development and the SDGs provide some guidance, they are too general to offer any concrete objectives or targets specifically for the global plastics problem threatening the marine environment. For example, SDG14.1 states: "[b]y 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution", and the relevant indicator is index of floating marine debris density.[53] Based on these parameters, and without a baseline for floating marine debris density, it is not possible to effectively measure progress holistically. Furthermore, though the UNEA

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[51] IISD Reporting Services, 'Summary of the 5th Meeting of the UN Environment Assembly: 22-23 February 2021' (2021) 16 Earth Negotiations Bulletin 156. https://enb.iisd.org/sites/default/files/2021-02/enb16156e_0.pdf

[52] See eg, P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009); D Bodansky, *The Art and Craft of International Environmental Law* (Harvard University Press 2010); M Fitzmaurice et al. (eds) *Research Handbook on International Environmental Law* (Edward Elgar Publishing 2010); U Beyerlin and T Marauhn, *International Environmental Law* (Hart Publishing 2011); P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018); R Rayfuse (ed) *Research Handbook on International Marine Environmental Law* (Edward Elgar Publishing Limited 2015); A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017); J Harrison, *Saving the Oceans Through Law: The International Legal Framework for the Protection of the Marine Environment* (Oxford University Press 2017); D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008); However, Hey explicitly mentions the global plastics problem on several occasions in E Hey, *Advanced Introduction to International Environmental Law* (Edward Elgar Publishing 2016) 27, 64, 96.

[53] UNGA Res 70/1 'Transforming Our World: the 2030 Agenda for Sustainable Development' (25 September 2015) UN Doc A/RES/70/1. 23.

Resolutions have outlined a way forward toward CE practices, they do not communicate clearly measurable objectives or targets.[54]

Applied environmental sciences provide more concrete suggestions for possible objects and targets. Borrelle et al. have published the first estimations of required global targets. The overall reduction target is 8 Mt by 2030, which is reckoned to achieve a curbing of the problem.[55] The estimates are based on either individual or combined efforts from increasing proportion of managed waste, recovery of plastics pollution from the environment, and reduction of plastics wastes generation:[56]

> If additional actions were to solely focus on reduction, then plastic waste generation would need to be reduced by 85% across all income levels. If additional actions were to solely focus on waste management, then every country would have to make exceptional efforts to properly manage ≥99% of its plastic waste. If additional actions were to solely focus on recovery, then 85% of annual global emissions would have to be recovered from the environment by 2030."[57]

If all three strategies are used simultaneously, the target for proportion of managed waste for high income (HI) States and upper-middle income (UMI) States would be 99%, for lower-middle income (LMI) States 80%, and for low-income (LI) States 60%.[58] The target for recovering plastics emissions from aquatic environments would be 40% for all countries and the target for plastic waste generation reduction would be "40% in HI countries, 35% in UMI and LMI countries, and 25% in LI countries compared with the BAU [business-as-usual] trajectory."[59] Complementing Borrelle et al., most recent literature provides recommendations for specific objectives in the context of a new treaty.[60] Consequently, due to the lack of commonly agreed global policy objectives, this study builds on these above-mentioned efforts to delineate goals to target the global plastics problem and the three main sub-problems constituting it.

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[54] See, UNEA Res 2/8 'Sustainable Consumption and Production' (23-27 May 2016) UN Doc UNEP/EA.2/Res.8; UNEA 2/11 'Marine Plastic Litter and Microplastics' (23-27 May 2016) UN Doc UNEP/EA.2/Res.11; UNEA Res 3/7 'Marine Litter and Microplastics' (4-6 December 2017) UN Doc UNEP/EA.3/Res.7; UNEA Res. 4/1 'Innovative Pathways to Achieve Sustainable Consumption' (11-15 March 2019) UN Doc UNEP/EA.4/Res.1; UNEA Res 4/4 'Addressing Environmental Challenges through Sustainable Business Practices' (11-15 March 2019) UN Doc UNEP/EA.4/Res.4; UNEA Res 4/6 'Marine Plastic Litter and Microplastics' (11-15 March 2019) UN Doc UNEP/EA.4/Res.6; UNEA Res 4/7 'Environmentally Sound Management of Waste' (11-15 March 2019) UN Doc UNEP/EA.4/Res.7; UNEA Res. 4/8 'Sound Management of Chemicals and Waste' (11-15 March 2019) UN Doc UNEP/EA.4/Res.8; UNEA Res 4/9 'Addressing Single-use Plastic Products Production' (11-15 March 2019) UN Doc UNEP/EA.4/Res.9

[55] SB Borrelle et al., 'Predicted Growth in Plastic Waste Exceeds the Efforts to Mitigate Plastic Pollution' (2020) 369 Science 6510. 1515.

[56] *Ibid.* 1515-1516.

[57] *Ibid.* 1516.

[58] *Ibid.* 1515-1516. Borrelle et al. use socioeconomic statuses that are based on World Bank definitions: The World Bank, 'Data Catalog: Population Estimates and Projections' (2019) https://datacatalog.worldbank.org/dataset/population-estimates-and-projections

[59] *Ibid.* 1516.

[60] K Raubenheimer and N Urho, 'Possible Elements of a New Global Agreement to Prevent Plastic Pollution' (Nordic Council of Ministers 2020) 43.

How one understands the complexity and constituents of the global plastics problem greatly affects how one envisions legal solutions. Yet a common feature of literature is that it first provides general information of the global plastics problem and then moves on to analyze legal instruments and principles, without explicitly aligning and applying the legal measures to the scientific facts originally presented. One good exception to this is Karen Raubenheimer's dissertation, where she highlights the importance of "deconstruct[ing] the multifaceted problem of marine plastic debris into workable components" to avoid "broad and sweeping responses that are difficult to measure and enforce in practical applications.""[61] While this study agrees with Raubenheimer's premise, it reconstructs the constituents of the global plastics problem differently from Raubenheimer, who used three commonly polluted items as a starting point in her research.[62]

A common starting point in international legal scholarship on the topic has been to map and analyze the instruments applicable to the problem. In early literature, the mapping merely entailed the LOSC, the London Convention and Protocol, MARPOL Annex V, and regional agreements.[63] In 1987, in one of the first articles on international legal protection of the marine environment from the global plastics problem, Lentz interpreted and applied the LOSC in an evolutionary manner: "Although the LOS Convention does not specifically acknowledge the plastics problem, it does provide encouragement for states to develop domestic laws and to address marine pollution problems internationally."[64] Aleke Stöfen-O'Brien wrote the first book addressing the issue of marine litter from the viewpoint of international and EU law. The book delved further into (evolutionary) interpretation of the LOSC in relation to marine litter and provided an in-depth doctrinal analysis of the application of the London Convention and Protocol, MARPOL Annex V, GPA, and EU law (as it stood in 2015) to the issue of marine litter, as well as the application of prevention, polluter pays and precautionary principles.[65]

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[61] K Raubenheimer, 'Towards an Improved Framework to Prevent Marine Plastic Debris, (Doctor of Philosophy Thesis, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong 2016) 48.
[62] *Ibid.*
[63] SA Lentz, 'Plastics in the Marine Environment: Legal Approaches for International Action' (1987) 18 Marine Pollution Bulletin 6B; MJ Bean, 'Legal Strategies for Reducing Persistent Plastics in the Marine Environment' (1987) 18 Marine Pollution Bulletin; BS Manheim, 'Annex V of the MARPOL Convention: Will It Stop Marine Plastic Pollution? (1988) 71 The Georgetown International Environmental Law Review 1; PE Hagen, 'The International Community Confronts Plastics Pollution from Ships: MARPOL Annex V and the Problem that Won't Go Away' (1990) 5 American University International Law Review 2; DC Baur and S Iudicello, 'Stemming the Tide of Marine Debris Pollution: Putting Domestic and International Authorities to Work' (1990) 17 Ecology Law Quarterly 1; CJ Joyner and S Frew, 'Plastic Pollution in the Marine Environment´ (1991) 22 Ocean Development and International Law 1.
[64] SA Lentz, 'Plastics in the Marine Environment: Legal Approaches for International Action' (1987) 18 Marine Pollution Bulletin 6B. 361.
[65] A Stöfen-O'Brien, *The International and European Legal Regime Regulating Marine Litter in the EU* (Nomos Verlagsgesellschaft 2015)

Scholars mapping international law applicable to the global plastics problem have gradually taken broader approaches and included more instruments in the mix. Presumably scientific advancements and discoveries relating to the problem have enabled legal researchers and other experts to update their understanding of relevant measures to combat the issue. Broadening the scope of mapping relevant instruments, major contributors in developing an understanding of the existing international legal framework targeting the global plastics problem are a UNEP report 'Marine Plastic Debris and Microplastics – Global Lessons and Research to Inspire Action and Guide Policy Change'[66] and Raubenheimer's dissertation on how the current international and regional framework should be improved to prevent marine plastic debris.[67] While the UNEP report remained mainly descriptive, Raubenheimer's dissertation provided more normative recommendations. Raubenheimer has since become one of the leading scholarly authorities in the field of international policy and law related to the global plastics problem.[68] Raubenheimer, McIlgorm and Oral are co-authors of the most comprehensive mapping and assessment of international legal protection of the marine environment from the global plastics problem to date: a UN Environment report entitled 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' ('Governance Report'). It mapped and analyzed international, regional and sub-regional instruments, grouped them thematically under pollution, biodiversity and species, or chemicals and waste (based on the primary objective of the management), and evaluated whether the instrument in question provided the necessary legal structure to address marine plastics litter and microplastics.[69] In addition to these major undertakings, a set of academic papers have presented their views of appropriate regulatory mixes to confront the problem.[70]

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[66] UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 5-24.
[67] K Raubenheimer, 'Towards an Improved Framework to Prevent Marine Plastic Debris, (Doctor of Philosophy Thesis, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong 2016)
[68] See eg, K Raubenheimer and A McIlgorm, 'Is the Montreal Protocol a Model That Can Help Solve the Global Marine Plastic Debris Problem?' (2017) 81 Marine Policy; K Raubenheimer and A McIlgorm, 'Can the Basel and Stockholm Conventions Provide a Global Framework to Reduce the Impact of Marine Plastic Litter?' (2018) 96 Marine Policy; K Raubenheimer and A McIlgorm, 'Can a Global Fund Help Solve the Global Marine Plastic Debris Problem?' (2018) 5 Journal of Ocean and Coastal Economics' 1; K Raubenheimer et al., 'Towards an Improved International Framework to Govern the Lifecycle of Plastics' (2018) 27 Review of European, Comparative & International Environmental Law 3; K Raubenheimer and N Urho, 'Rethinking Global Governance of Plastics -The Role of Industry' (2020) 113 Marine Policy.
[69] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 24-25.
[70] See eg, A Trouwborst, 'Managing Marine Litter: Exploring the Evolving Role of International and European Law in Confronting a Persistent Environmental Problem' (2011) 27 Merkourios 73; M Gold et al., 'Stemming the Tide of Plastic Marine Litter: A Global Action Agenda' (2014) 27 Tulane Environmental Law Journal 2; P Dauvergne, 'Why is the Global Governance of Plastic Failing the Oceans? (2018) 51 Global Environmental Change; EA Kirk and N Popattanachai 'Marine Plastics: Fragmentation, Effectiveness and Legitimacy in International Lawmaking' (2018) 27 Review of

Though a few comprehensive reviews and other literature have already mapped and analyzed international law relevant to the global plastics problem, this study is the first to do this from the viewpoint that it comprises the issues of plastics leakage, MPP and extensive wastes generation as a continuum of sub-problems. Moreover, the literature still has gaps that remain unexplored. These include limited analysis of the due diligence of States in relation to preventing plastics leakage and reducing plastics wastes generation, and any in-depth discussion of the absence of a liability and compensation mechanism for MPP.[71] This study aspires to fill these gaps and discusses the challenges relating the due diligence obligations and applying the law of State responsibility and international liability principles to transboundary and global harm caused by MPP.

Furthermore, this study maps and analyzes international law from a CE perspective. Views on the general direction of developing the law share the understanding that upstream activities should be better addressed to govern the whole lifecycle of plastics and the literature refers to the CE as means to do this.[72] Yet it rarely critically evaluates the limitations of the CE in this context. A more extensive analysis of the interface between the CE and the law and their interlinkages is lacking at the international level, both generally and in terms of global plastics problem. The most detailed suggestions on how to address upstream activities with CE practices build around a possible new treaty on plastics,[73] but broader mapping and evaluation of international law from the viewpoint of how it currently promotes a CE of plastics is missing, particularly from a global perspective. Although plastics in their various forms are internationally traded through complex value chains, the literature has not yet addressed whether and how international law can enable or hinder a global CE of plastics. This research fills some of these gaps. While it draws from literature on how a new treaty should address the CE, it also investigates other means international law could use to promote global CE practices for plastics. For example, the literature recognizes that international technical standards have

European, Comparative and International Environmental Law 3; L Cortat Simonetti Goncalves and M Faure, 'International Law Instruments to Address the Plastic Soup' (2019) 43 William Mary Environmental Law and Policy Review 3.

[71] Duvic-Paoli's brief assessment of the application of prevention principle provides an excellent stepping stone to due diligence considerations: L-A Duvic-Paoli, 'Fighting Plastics with Environmental Principles? The Relevance of the Prevention Principle in the Global Governance of Plastics' (2020) 114 American Journal of International Law Unbound. Symposium on Global Plastic Pollution; Maljean-Dubois and Mayer provide an excellent but very brief analysis on international responsibility and liability with regard to MPP: S Maljean-Dubois and B Mayer, 'Liability and Compensation for Marine Plastic Pollution: Conceptual Issues and Possible Ways Forward' (2020) Symposium on Global Plastic Pollution. 114 American Journal of International Law; Also Cortat and Faure briefly discuss liability in relation to MPP: L Cortat Simonetti Goncalves and M Faure, 'International Law Instruments to Address the Plastic Soup' (2019) 43 William Mary Environmental Law and Policy Review 3. 941.

[72] See eg, K Raubenheimer et al., 'Towards an Improved International Framework to Govern the Lifecycle of Plastics' (2018) 27 Review of European, Comparative & International Environmental Law 3.

[73] To date Raubenheimer and Urho's report is the most detailed recommendation for a new global agreement: K Raubenheimer and N Urho, 'Possible Elements of a New Global Agreement to Prevent Plastic Pollution' (Nordic Council of Ministers 2020)

a role to play in promoting CE practices.[74] However, practical implications are discussed to limited extent and therefore this study adds to the literature by examining the role of ISO standards in relation to international law and a global CE of plastics. This study also aspires to develop the application of the extended producer responsibility (EPR) in a more global context, following in the footsteps of Raubenheimer, Urho and Monroe, who have initiated a discussion of this issue.[75]

It is well established in the literature that any future efforts should have a basis in existing instruments and strive to improve them as much as possible, as well as instituting a coordination mechanism among all relevant institutions governing these instruments.[76] Despite coordination having been identified as one of the key issues in the current fragmented approach to tackling the problem, more concrete suggestions on improving coordination have been lacking. This study contributes to filling this gap by providing some specific suggestions regarding existing and new institutions and mechanisms – namely cooperation between regional seas organizations and river basin organisations and a new fund to deal with MPP. Coordination between existing mechanisms and regimes is also essential to any future negotiations around a new binding agreement, and the study includes suggestions also in this regard.

The latest development in the literature is the considerable attention given to the possibility of a new international agreement on plastics. Many of the solutions currently under discussion rely on a new binding agreement.[77] Despite the current momentum and calls for a new treaty by many governments and coalitions, UNEAs have not managed to gather enough political will from governments to

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[74] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 128.

[75] K Raubenheimer and N Urho, 'Rethinking Global Governance of Plastics -The Role of Industry' (2020) 113 Marine Policy; L Monroe, 'Tailoring Product Stewardship and Extended Producer Responsibility to Prevent Marine Plastic Pollution' (2014) 27 Tulane Environmental Law Journal 2.

[76] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 13; Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics, 'Chair's Summary for the Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics' (13 November 2020) 7.

[77] See, N Simon and ML Schulte, 'Stopping Global Plastic Pollution: The Case for an International Convention' (adelphi 2017) 43 Heinrich Böll Stiftung Publication Series Ecology; T Graff Hugo, 'The Case for a Treaty on Marine Plastics Pollution' (Norwegian Academy of International Law 2018); N Simon et al., 'No More Plastics in the Ocean: Gaps in Global Plastic Governance and Options for a Legally Binding Agreement to Eliminate Marine Plastic Pollution' (adelphi 2018) Discussion Paper; K Raubenheimer et al., 'Towards an Improved International Framework to Govern the Lifecycle of Plastics' (2018) 27 Review of European, Comparative & International Environmental Law 3; I Tessnow-von Wysocki, 'International Cooperation for the Protection of Global Public Goods: Towards a Global Plastics Treaty' (Freie Universität Berlin 2019) 2 University Alliance for Sustainability Working Paper Series; R Bodle and S Sina, 'A Treaty on Plastic Waste' (ecologic 2019) Discussion Paper; K Raubenheimer and N Urho, 'Possible Elements of a New Global Agreement to Prevent Plastic Pollution' (Nordic Council of Ministers 2020); CIEL, EIA and GAIA, 'Convention on Plastic Pollution: Towards a New Global Agreement to Address Plastic Pollution' (2020); EA Kirk, 'The Montreal Protocol or the Paris Agreement as a Model for a Plastics Treaty?' (2020) Symposium on Global Plastic Pollution. 114 American Journal of International Law.

provide a mandate for a new treaty negotiation process.[78] Furthermore, initiating such negotiations requires that the international community is first clear on the scope and the main elements to include in a new treaty, as well as the relationship of such a treaty with the current international legal efforts:[79]

> Deliberation of the value of a new international legally binding instrument must first consider, at a minimum, four additional questions regarding: (i) the scope and parameters of the agreement; (ii) the elements to include in the agreement; (iii) where the authority for this agreement should come from; and (iv) the relationship of the agreement with other instruments. Until the international community discusses and evaluates these questions in detail, it would be premature to offer an opinion on the value of such an agreement.[80]

This study has adopted an approach where it first evaluates to how far it is possible to address the sub-problems with existing measures, and only after this discusses complementary measures and whether a new binding agreement would or would not bring added value to an international legal response.

In summary, the literature on international legal protection of the marine environment from the global plastics problem is still relatively young and not many legal researchers have engaged with the topic yet. Consequently, there is room for both commenting on, and building on, earlier analyses of international law in relation to the global plastics problem, and scope for developing ideas about coordination and a possible new treaty, as well as filling in research gaps that have barely been discussed so far.

1.4 Significance

This research makes two contributions. First, this study offers a simple three-fold framework to comprehend both the constituent elements of the global plastics problem and the existing and potential corresponding international law measures. This does not signify that the problem or solutions are simplified or simple. Rather, the framework provides a platform for organizing the complexity of the problem and responses. Based on the framework, it is possible to create problem-based legal response mixes, which together can address the global plastics problem as a whole. Moreover, the three-fold framework is not exhaustive but can be further developed and complemented with other research – for example to include lower levels of regulation (regional, sub-regional, national) or create more specific categories for the sub-problems (for instance, leakage of

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[78] WWF, 'World Leaders Fail to Address Plastic Crisis, Says WWF' (16 March 2019) https://wwf.panda.org/wwf_news/?344671/World-leaders-fail-to-address-plastic-crisis-says-WWF; IISD Reporting Services, 'Summary of the Third Session of the United Nations Environment Assembly: 4-6 December 2017' (9 December 2017) 16 Earth Negotiations Bulletin 143. http://enb.iisd.org/unep/oecpr3-unea3/

[79] K Raubenheimer et al., 'Towards an Improved International Framework to Govern the Lifecycle of Plastics' (2018) 27 Review of European, Comparative & International Environmental Law 3. 216.

[80] *Ibid.*

primary microplastics or extensive plastics packaging wastes generation). The framework thus offers a tool that can assist policymakers from State-level or any other individuals interested in the global plastics problem and international law to grasp the scientific and legal content in a structured manner and not be overwhelmed by the complexity and number of relevant instruments.

The second contribution relates to the substantive content this study adds to the literature. This research fills gaps in the literature relating to understanding the content of States' due diligence obligations in relation to the global plastics problem, the application of State responsibility and international liability to MPP, and the analysis of the relationship between international law, international technical standards and a global CE of plastics. From a problem-based angle, the study provides recommendations on how to improve the current international legal framework, what complementary and coordination measures would be beneficial, and discusses what added value a possible new binding agreement on plastics would bring.

The complexity of the science and root causes of the global plastics problem are difficult fathom and consequently challenging to regulate. At the international level, States must be able to grasp the latest relevant scientific understanding of the issues and develop a mix of corresponding objectives and legal measures to provide common direction for all States. This research aspires to be a resource that makes these challenges more attainable and diversifies academic discussions on the topic. It does not create a comprehensive policy but it builds towards minimizing plastics leakage, reducing existing MPP and reducing plastics wastes generation by offering a framework and a set of international legal elements and normative recommendations that can be useful while the international community works toward a comprehensive international policy regarding solutions to the global plastics problem.

CHAPTER 2 – METHODOLOGY

2.1 The Layers of the Methodology

Methodological rigor stems from "the reflexive relationship between methodology and the research questions we ask" and "a commitment to the value of methodology…is a commitment to developing methodologies that are 'best suited' to the type of questions asked".[81] The main research question and the sub-research questions dictated that the methodology needed to be able to provide a variety of legal and interdisciplinary tools that could help clarify the nature and context of the chosen problems, the problem-solving content of international law, as well as illuminating a range of options which could develop the content of international law to better address the problems at hand.

In the absence of a readily available formula to answer the research questions, this research required developing a tailor-made methodology to describe the overall approach.[82] Developing such an approach was necessary to deal with the complexity and interdisciplinary nature of regulating the plastics problem globally. A tailor-made methodology here refers to a combination of methodologic elements and methods that together provide the tools to delimit and analyze regulation of the global plastics problem. The methodologic elements and methods are called "layers" in this chapter. This describes how the methodology was compiled, with each layer building on the previous one, as well as suggesting the interactive nature of the different layers. The table below provides an overview of the structure of the methodology and research design.

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[81] E Fisher et al., 'Maturity and Methodology: Starting a Debate about Environmental Law Scholarship' (2009) 21 Journal of Environmental Law 2. 227.
[82] R Cryer et al., *Research Methodologies in EU and International Law* (Hart Publishing 2011) 6.

The main research question	How should States respond under international law (IL) to the global plastics problem threatening the marine environment?		
The sub-research questions	To prevent transboundary and global harm from plastics leakage to the marine environment, what does international law currently require of States, and how should these existing international legal measures be further developed and complemented?	When faced with transboundary and global harm caused by marine plastics pollution (MPP), what are the international legal remedies States have at their disposal, and how could the current remedies be further developed and complemented?	To reduce extensive plastics wastes generation, how do international law and international technical standards promote a global circular economy (CE) of plastics, and how could these efforts be further developed and complemented?
The sub-problem	plastics leakage to the marine environment from land- and ocean-based sources	accumulating plastics pollution in the marine environment	extensive plastics wastes generation
Activity type	downstream activities	downstream activities	upstream activities
The waste hierarchy elements	recovery, landfill	failure of complying with all waste hierarchy elements	prevention (of waste generation/reduce), reuse, recycle
Sources of IL: International legal foundation	no-harm rule, prevention principle, CBDR, general obligations of Part XII of the LOSC (=due diligence)	Principle 22 (Stockholm Declaration), Principle 13 (Rio Declaration), no harm-rule, PPP, law of State responsibility and international liability principles	evolving due diligence concept, BEP, precautionary principle, intergenerational equity principle
Sources of IL: IL applicable to the sub-problems	LOSC, MARPOL Convention and MARPOL Annex V, London Convention and Protocol, UNWC, UNECE Water Convention, Espoo Convention and Protocol, GPA, GPML, Honolulu Strategy, RSOs instruments, RBOs instruments	ARSIWA, Draft Principles on Allocation of Loss, GFATM instruments	Stockholm Convention, Basel Convention, Fish Stocks Agreement, HS Convention and Nomenclature MARPOL Annex V Guidelines, IMO Action Plan to Address Marine Plastic Litter from Ships, London Convention/Protocol Recommendation, GPA, Honolulu Strategy, CDB COP13 Decision XIII/10, UNEA Resolutions
Subsidiary and other sources	judicial decisions, literature	judicial decisions, literature	ISO-standards, GHS, EPR, judicial decisions, literature
Methods	review of interdisciplinary literature on the sub-problem, doctrinal legal research	review of interdisciplinary literature on the sub-problem, doctrinal legal research	review of interdisciplinary literature on the sub-problem and the CE, doctrinal legal research
Context	linear economy	linear economy	circular economy
Contribution	Recommendation for a framework and elements of an international legal response to the global plastics problem threatening the marine environment		

Fig. 2 The Methodology Table

2.2 The Three Sub-Problems and Related Legal Issues

2.2.1 Introduction

The starting point of the methodology was to identify and choose the problems and related legal issues it sets out to target. Though the common global concern toward the topic stems from increasing evidence of plastics pollution already in the oceans, the problem and its causes are more multifaceted and complex than that. Moreover, the problems are not legal *per se,* which means that the legal issues relating to the topic can be framed in many different ways and thus needed to be explicitly chosen. This process of choosing the physical world problems to target and identifying the legal issues that relate to these problems was inherently an interactive one. Therefore, the combination of studying physical world problems from a legal perspective required that each approach shaped and delimited the other. On the one hand, not everything about the problems with plastics and plastics pollution is relevant for legal research. On the other hand, legal measures can only partly contribute to solving physical world problems that are not legal problems *per se*.

An international focus was chosen due to the global and transboundary nature of the problem and to delimit the scope. Even at an international level, a multitude of instruments apply to the problem and it was not possible within the scope to also examine all regional instruments.[83] International focus also affected the choice to take a State perspective to the problem. States remain the primary authors and subjects of international law and exercise legislative and enforcement jurisdiction over other entities in their territory, including companies involved in plastic value chains. States are also the entities with competence to negotiate and enter into new treaties.[84] Other major stakeholders, such as producers, are addressed through the lenses of States.

From an international law viewpoint it was important to choose those aspects of physical world problems that have global characteristics and to spot trends that affect the whole international community. The material properties of plastics and how they degrade in the marine environment, the ability of ocean currents and transboundary rivers to spread plastics pollution, and the interconnectivity of oceans and international watercourses as spaces, provided reasons for selecting the marine environment and international watercourses as the environmental compartments this

[83] Some regional aspects are considered in Chapter 5 to tackle transboundary riverine plastics leakage to oceans because it was directly related to the possibilities provided under an international voluntary initiative, the Global Partnership on Marine Litter. However, due to this general limitation to focus on international level, some important regional instruments are not discussed in this thesis. These include *inter alia* an initiative by the G7 States in 2015, Global Plastics Charter, and an initiative by G20 States in 2017, Implementation Framework for Actions on Marine Plastic Litter.

[84] See eg, U Beyerlin and T Marauhn, *International Environmental Law* (Hart Publishing 2011) 247-248.

study focuses on. This, in turn, delimited the legal approach to those elements of international law that directly or indirectly contribute to marine environmental protection from plastics.

However, international legal protection of the marine environment from the global plastics problem is still a very broad delimitation. To break up this delimitation into smaller and more specific units of research, a conceptual framework to approach environmental problems created by Nicolas de Sadeleer was used as a source of inspiration. De Sadeleer asserts that human thinking has experienced an epistemological break during the twentieth century in relation to the environmental degradation. The interventions of policy-makers to tackle environmental degradation, which "took place in stages, reflecting three successive models of thought," are a reflection of this epistemological break.[85] These three models of thought represent de Sadeleer's approaches to environmental risk, and are called the curative, the preventive and the anticipatory models.[86]

The curative model perceives nature as "an inexhaustible resource reservoir".[87] Any damage to nature can be indemnified, replaced, repaid or compensated. In this model, liability and the polluter pays principle are the central concepts.[88] The curative model "is merely an *a posteriori* response to a social problem".[89] The preventive model perceives that "nature is not perpetually renewed, inexhaustible fount of riches imagined by the nineteenth century liberalism". The preventive model is based on the idea that problems should be prevented from occurring, or at least prevented from spreading, and that prevention is usually cheaper than repair.[90] The anticipatory model is based on the perception that environmental damage has become unpredictable for science and is planetary in scope; it is now global, collective and inescapable. Therefore, an anticipatory model to perceived threats is required and justified, and "uncertainty should no longer delay the adoption of measures intended to anticipate environmental degradation".[91] It dictates that uncertainty should become a central element of decision-making process, and today's choices must reflect an uncertain future.[92]

These models of thought provide a three-fold approach which takes into account historically evolved views and strategies about how environmental degradation is seen and dealt with, different timelines to approach environmental problems, the costs of environmental protection, and the role of science in risk assessments. It also shows how different principles of international environmental law are

[85] N de Sadeleer, *Environmental Principles – From Slogans to Legal Rules* (Oxford University Press 2002) 14-15.
[86] *Ibid.* 15-19.
[87] *Ibid.* 15.
[88] *Ibid.*
[89] *Ibid.* 16.
[90] *Ibid.*
[91] *Ibid.* 18.
[92] *Ibid.* 19.

endorsed within the models. This framework and elements provide useful criteria and logic to divide the large topic of international legal protection of the marine environment from plastics into three specific approaches, which take into account the interaction between physical world problems with plastics and the international legal issues relating to them.

2.2.2 The First Sub-Problem: Plastics Leakage to the Marine Environment

The first approach under international legal protection of the marine environment from plastics concerns international legal measures of pollution prevention of plastics leakage to the marine environment. This approach was inspired by de Sadeleer's preventive model where the prevention principle guides action toward preventing and mitigating environmental pollution and harm. These measures are based on solid scientific knowledge of plastics leakage and negative impacts of MPP in the marine environment, and reasoned to be more cost-effective than cleaning up the oceans afterwards. The time dimension aspect of pollution control remains short-sighted as it does not seek to address the root causes of pollution but merely prevent items and substances from entering the environment and polluting it.

The UN Environment uses a similar logic to categorize different initiatives relating to the global plastics problem:

> …an initiative is identified as… Addressing marine plastic "entering the ocean" if its primary focus is on managing plastic end-of-life flows so that they do not end up in the oceans. This includes anti-littering measures and waste management initiatives (such as sound disposal practices)[93]

In the UN Environment terminology 'marine plastic "entering the ocean"' corresponds to what this study calls "plastics leakage to the marine environment". When UN Environment refers to "managing plastic end-of-life flows", this research uses the terminology "to address downstream activities."[94] The legal issues tied to this sub-problem concern international law relating to existing plastics and plastics wastes that aim to control their leakage points and prevent global and transboundary harm – namely application of international marine pollution prevention rules.

2.2.3 The Second Sub-Problem: Marine Plastics Pollution

The second approach concerns international legal remedies regarding MPP already in the marine environment. This approach is inspired by de Sadeleer's curative model where the polluter pays

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[93] UN Environment, 'Addressing Marine Plastics: A Systemic Approach – Stocktaking Report' (2018) 40.

[94] This dissertation defines downstream activities as activities that relate to preventing plastics wastes leakage to the environment, or remedying or mitigating marine plastics pollution. Upstream activities are defined as activities that relate to reducing waste generation or improving the lifecycle of plastics. See, section 2.3.5.1 'Downstream and Upstream Activities'.

principle and liability guide action to repair or compensate for environmental damage. Action is thus based on evidence from harm from MPP that has already occurred, arguably the least effective and most costly response option.

Using the UN Environment categorization for the three different initiative types relating to the global plastics problem:

> an initiative is identified as… Addressing marine plastic "in the ocean" if its primary focus is on cleaning up and/or mitigating the impacts of plastic already in the oceans, or researching the impacts, quantities, residing locations etc. of plastic in the oceans[95]

In the UN Environment terminology 'marine plastic "in the ocean"' corresponds to what this dissertation calls "plastics pollution in the marine environment" or "marine plastics pollution /MPP". When the UN Environment refers to "cleaning up and/or mitigating the impacts of plastic already in the ocean", this dissertation uses the terminology "to address downstream activities". The legal issues relevant for this sub-problem relate to the applicability of legal remedies that international law provides as regards States – namely, rules of State responsibility and international liability principles.

2.2.4 The Third Sub-Problem: Extensive Plastics Wastes Generation

The third approach concerns promoting a global CE of plastics to reduce extensive plastics wastes generation and increase use of plastics wastes as resources. This approach is inspired by de Sadeleers's anticipatory model where the precautionary principle seeks to guide action to prevent unpredictable global environmental harm. In the absence of scientific certainty, measures need to rely on precautionary risk assessments. Within this approach, it is possible to take the most long-sighted measures that have potential to address the root causes of the global plastics problem.

In terms of the UN Environment categorization of different initiatives to address the global plastics problem, Part VI is interchangeable with:

> …an initiative…identified as: Addressing plastic "production and use" indicates initiatives focusing upstream in the plastic value chain that aim to reduce and/or eliminate plastic end-of-life flows through changes in consumer behavior and developing new products, materials and business models.[96]

The term "plastic 'production and use'" corresponds to what this dissertation refers to as "extensive plastics wastes generation and not using plastics wastes as resources". The difference in terminology is due to the problem-based approach in this research. "Plastic production" is problematic when the outcome is vast amounts of single-use plastics or plastics products that are unsuitable for CE

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[95] UN Environment, 'Addressing Marine Plastics: A Systemic Approach – Stocktaking Report' (2018) 40.
[96] *Ibid.*

purposes. This creates the issue of extensive plastics wastes generation after use, not the production *per se*. Moreover, "plastic use" is problematic when the plastics products or product parts are not designed to maintain their value over time through CE practices, or their value as potential secondary materials is not recognized after plastics become wastes. Again, the issue is not the use of plastics *per se*, but not maintaining the plastics materials in use for as long as possible or valuing them as a resource after they have become wastes.

2.2.5 Value of the Sub-Problems

The dissertation takes a broad approach to the global plastics problem by addressing it through the three different sub-problems. Put together, the three sub-problems form a continuum that comprehensively targets the global plastics problem from production to accumulation of marine plastics pollution. Constructing the legal issues and analysis around these three approaches thus provided an opportunity to comprehensively map and analyze a whole width of international law applicable to the global plastics problem. Moreover, when existing international law is mapped and systematized based on these approaches, the mapping shows the overall stress of current efforts and reveals which parts of the sub-problems are currently covered and which lack legal measures.

The value of this approach lies also in pinpointing two-way causal relationships between physical world problems and related legal issues. The research seeks to be transparent in its presentation and choice of the problems it targets, and to align them with legal measures that have the potential to help solve each specific sub-problem of the global plastics problem.

The three-fold problem-based approach is further supported by Borrelle et al.'s study that calculated how much States should improve their waste management, recovery and waste generation reduction efforts to curb the amount of plastics ending up in the environment by 2030.[97] Their study indicates that a three-fold hybrid approach in all these areas provides a more realistic and balanced outcome compared with what would be required if States focused on only one of these areas alone.

[97] SB Borrelle et al., 'Predicted Growth in Plastic Waste Exceeds the Efforts to Mitigate Plastic Pollution' (2020) 369 Science 6510.

2.3 Construction of the Legal Analysis

2.3.1 Theoretical Framing

Legal theory "is necessary to tell us where to look for the 'producers' of law in the first place."[98] It studies what law is and what the origins of law are, that is, the ontological and epistemological positions of law.[99] In both the domestic and international setting, legal theory has an intimate relationship with the question of the sources of law. The theoretical significance of the centrality of the sources originates from its effects on understanding the nature, legality, normativity and legitimacy of law.[100] However, international legal theorists "have long agreed to disagree about sources of international law"[101] and a rich tradition on the topic within the field of international legal theory means that "[l]egal theorizing means making stark choices and provoking incommensurability: clarity comes at the price of fragmentation."[102] Consequently, also anchoring a specific piece of legal research in a certain legal theoretical tradition may unavoidably exclude other traditions.

The theoretical framing of this dissertation draws from interactional law:

> Law begins in shared understandings coupled with sustained efforts to link those understandings to criteria of legality. To engender fidelity, legal norms must continue to meet the criteria of legality. Ultimately, then, law is created, maintained or destroyed through day-to-day interactions in communities of legal practice. Legal obligation cannot be reduced to existence of formal rules; it is made real in the continuing practice of communities that reason with and communicate through norms.[103]

The interactional account of international law is a legal theory developed by Brunnée and Toope which aims at providing an alternative theoretical framework for international law that can explain the contemporary practice of international law-making and application, the strengths and weaknesses of international law and the idea of legal obligation in international society.[104] Their theory is based on Lon Fuller's legal theory and constructivist international relations theory, from which Brunnée

[98] J Kammerhofer, 'International Legal Positivism' in A Orford and F Hoffmann (eds) *The Oxford Handbook of the Theory of International Law* (Oxford University Press 2016) 414.
[99] E Engle, 'Ontology, Epistemology, Axiology: Bases for a Comprehensive Theory of Law' (2008) 8 Appalachian Journal of Law 1. 105.
[100] S Besson and J d'Aspremont, 'The Sources of International Law: An Introduction' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017) 1, 3.
[101] *Ibid.* 3.
[102] J Kammerhofer, 'International Legal Positivism' in A Orford and F Hoffmann (eds) *The Oxford Handbook of the Theory of International Law* (Oxford University Press 2016) 426.
[103] J Brunnée and SJ Toope, *Legitimacy and Legality in International Law: An Interactional Account* (Cambridge University Press 2010) 356-357.
[104] *Ibid.* 5.

and Toope combine components that culminate in three fundamental and interrelated elements; shared understandings, criteria of legality and the practice of legality.[105]

Shared understandings refer to legal norms arising from social norms.[106] These shared understandings can emerge from different forums,[107] of which the role of epistemic communities is of particular relevance here:

> [C]onsensus within epistemic communities that operate in the context of international environmental regimes can significantly shift policy debates about the need for, or costs of, collective action. Collective background understandings regarding the environmental problem at hand can also facilitate the emergence of internationally shared norms or reinforce the work of norm entrepreneurs.[108]

In the context of the global plastics problem and the role of international law, epistemic communities of scientists from different fields have played a major role in developing shared knowledge of the problem and its solutions. They have done so in two main ways. First, disseminating scientific knowledge of the scope and impacts of MPP has increasingly brought these issues into public debates and onto the international agenda, a process facilitated by mass media attention. Their work has culminated in the acceptance that the global plastics problem threatening the (marine) environment is a common concern of humankind.[109] Second, experts from the fields of policy and law, based on the work of environmental scientists, have worked on creating shared knowledge in constructing understanding of what can at present be considered the current international legal framework for combatting the global plastics problem. Though variations of what this framework incorporates exist, all of them are essentially based on a shared understanding of the need to address the problem with international law, as well as the notion that while none of the instruments were originally designed to address this specific problem they can be argued to have their application in this context. However, the lack of shared understandings beyond these general points helps to explain why substantial progress in addressing the problem with international law has so far not occurred at the international level.

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[105] J Brunnée, 'Sources of International Environmental Law: Interactional Law' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017) 963-964; J Brunnée and SJ Toope, Legitimacy and Legality in International Law: An Interactional Account (Cambridge University Press 2010) 6-7; For background see, L Fuller, *The Morality of Law* (Yale University Press 1969) and E Adler and V Pouliot, *International Practices* (Cambridge University Press 2011)

[106] J Brunnée, 'Sources of International Environmental Law: Interactional Law' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2018) 964.

[107] J Brunnée and SJ Toope, *Legitimacy and Legality in International Law: An Interactional Account* (Cambridge University Press 2010) 57.

[108] *Ibid.* 60.

[109] UN Environment, and Sidhu and Desai have advocated that MPP should be considered as a 'common concern of humankind'. See, UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) x, xii; BK Sidhu and BH Desai, 'Plastics Pollution: A New Common Concern of Humankind?' (2018) 48 Environmental Policy and Law 5. 254.

The criteria of legality refer to eight criteria that are based on Lon Fuller's internal morality of law:

> [1] Legal norms must be *general*, prohibiting, requiring, or permitting certain conduct. [2] They must also be *promulgated*, and therefore accessible to the public, enabling citizens to know what the law requires. [3] Law *should not be retroactive*, but prospective, enabling citizens to take the law into account in their decision-making. [4] Citizens must also be able to understand what is permitted, prohibited or required by law – the law must be *clear*: [5] law should *avoid contradiction* not requiring or permitting and prohibiting at the same time; [6] law must be *realistic* and not demand the impossible; [7] its requirements of citizens must remain relatively *constant*; [8] finally, there should be *congruence* between legal norms and the actions of officials operating under the law.[110]

If the eight criteria are met, it generates fidelity of law, that is, a view of legal obligation as an internalized commitment which makes it legitimate to those it addresses.[111] Thus the interactional theory of law explains that the creation of international legal legitimacy comprises three elements:

> First, States and other interactional actors must build up shared understandings of what they want to accomplish through law, and of specific candidate norms. Second, international actors must work to ensure that the specific criteria of legality are met. Third, shared understandings and rules that adhere to the criteria of legality must be reinforced through a continuing practice of legality…States and other actors at the international level…are active agents in the continuing enterprise of law-making, through elaboration of custom, treaty and soft law.[112]

Though interactional law provides an alternative, practice-based understanding of the sources of international law, it "takes seriously what international actors do, both as they continue to rely on 'sources' listed in Article 38 [of the ICJ Statute], and as they develop new ways of making international law".[113] The interactional theory of international law thus resonates particularly well with international environmental law. IEL is a subfield of international law, and its distinctive character stems from application of international law to environmental issues. This focus on problem-solving makes international environmental law a relatively pragmatic discipline which affects how sources of international law are approached within it.[114] Consequently, "whether a given approach is 'law' in the traditional sense may be secondary. What matters is which approach is best suited to achieving the desired results in a certain context."[115]

The interactional theory of international law thus provides an apt framing for this dissertation, as it enables investigating sources of international law that are relevant for solutions for the global plastics

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[110] J Brunnée and SJ Toope, *Legitimacy and Legality in International Law: An Interactional Account* (Cambridge University Press 2010) 26; Numbering and cursives are mine.
[111] *Ibid.* 27.
[112] *Ibid.* 55.
[113] J Brunnée, 'Sources of International Environmental Law: Interactional Law' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017) 963; Art 38, Statute of the International Court of Justice (Adopted 26 June 1945, entered into force 24 October 1945) 33 UNTS 933 ('ICJ Statute')
[114] J Brunnée, 'Sources of International Environmental Law: Interactional Law' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017) 961.
[115] *Ibid.* 961.

problem in a way that does not diminish the value of the traditional sources, while also making room for legitimizing non-traditional sources. This is particularly relevant in the context of land-based sources of plastics leakage which are currently mostly based on soft law. The next sections will further delve into which sources of international law are used and analyzed in this dissertation in the context of the plastics problem and the interactional theory, and how they are deployed.

2.3.2 Doctrinal Legal Research

The doctrinal legal research method is a combination of descriptive and normative research. Descriptive legal research "aims at giving an accurate description of the present state of positive law."[116] This description of positive law includes identifying, collecting and systematizing legal sources, interpreting texts, analyzing contradictions and gaps, and constructing a coherent legal doctrine.[117] The interactional theory of international law provides the theoretical framing for identifying the relevant sources and their status as legal norms. Doctrinal research also has a normative component. Normative legal research uses the descriptive part as groundwork, evaluating existing law and advocating law reforms.[118] The basis for recommendations generally stems from principles of law or from pragmatic arguments, such as "the existing rules no longer answer practical concerns."[119] This dissertation uses both of these components of doctrinal legal research. They can also be called *de lege lata* (of the existing law) and *de lege ferenda* (of the law to be proposed).[120]

Each research question requires that doctrinal legal research focuses on the content of international law particularly in relation to how it addresses the specific sub-problem (descriptive research) and how any shortcomings should be improved (normative research). Analysis of the content of law incorporates substantive and procedural obligations, coordination aspects between States and/or institutions, enforcement obligations, best practice and other relevant factors for addressing the problem. Mapping and identifying the relevant sources of international law that apply to the sub-problems themselves requires, at least in part, interpretation as not all relevant instruments refer explicitly to plastics or plastics pollution in their wording. The normative research is guided by

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116 S Taekema, 'Relative Autonomy: A Characterisation of the Discipline of Law' in B van Klink and S Taekema (eds) *Law and Method: On Interdisciplinary Research into Law* (Mohr Siebeck 2011) 35.
117 S Taekema and W van der Burg, 'Introduction: The Incorporation Problem in Interdisciplinary Legal Research' (2015) 8 Erasmus Law Review 2. 39.
118 S Taekema, 'Relative Autonomy: A Characterisation of the Discipline of Law' in B van Klink and S Taekema (eds) *Law and Method: On Interdisciplinary Research into Law* (Mohr Siebeck 2011) 35, 36.
119 *Ibid.* 36.
120 AX Fellmeth and M Horwitz, *Guide to Latin in International Law* (Oxford University Press 2009)

addressing the features of the problem descriptions, and operationalizing the principles that form the legal foundation for each main approach and their overall objectives.

Due to a wide range of sources of international law, the dissertation is limited to analyzing the interaction between the three sub-problems and the applicable content of law. Even more detailed analysis of these interactions could be provided by evaluating the actual effectiveness of the measures in question and how they have contributed to mitigating the problem they target. However, such empirical research on State practice and environmental impacts globally would have been beyond the scope of one dissertation. Consequently, this delimitation signifies that the evaluation of how international law addresses or could better address the problems remains a subjective and hypothetical analysis.

2.3.3 SOURCES OF INTERNATIONAL LAW

The review of the sources of international law used in this study combines the traditional approach to identify sources with interactional theory. The ICJ Statute provides the classic starting point to identify sources of international law:[121]

> 1. The Court, whose function is to decide in accordance with international law such disputes as are submitted to it, shall apply:
>
> a. international conventions, whether general or particular, establishing rules expressly recognized by the contesting states;
>
> b. international custom, as evidence of a general practice accepted as law;
>
> c. the general principles of law recognized by civilized nations;
>
> d. subject to the provisions of Article 59, judicial decisions and the teachings of the most highly qualified publicists of the various nations, as subsidiary means for the determination of rules of law.[122]

In this traditional setting, (a) treaties, (b) customary law, and (c) general principles (c) are direct sources of international law, whereas (d) judicial decisions and teachings are subsidiary sources that are used to determine the relevant rules of international law.[123] Interactional law theory blurs these lines and "facilitates a nuanced assessment of the role and relative importance of the Article 38 'sources', and the rise of new international law-making processes."[124] Though the sources of international law are

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[121] H Thirlway, *The Sources of International Law* (2nd Edn, Oxford University Press 2019) 8;
[122] Art 38, Statute of the International Court of Justice (Adopted 26 June 1945, entered into force 24 October 1945) 33 UNTS 933 ('ICJ Statute')
[123] A Pellet and D Müller, 'Competence of the Court, Article 38' in A Zimmermann et al. (eds) *The Statute of the International Court of Justice: A Commentary* (3rd Edn, Oxford University Press 2019) 941.
[124] J Brunnée, 'Sources of International Environmental Law: Interactional Law' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017) 966.

generally discussed and considered in the order that Article 38 lists them, no official hierarchy between them exists.[125]

The next sections review the sources of international law used in this research in an unusual order. The order in which they are presented better reflects the research process, and the order is thus methodologically a more accurate description of how the relevant sources were identified. The literature review earlier demonstrated how understanding of what constitutes the relevant instruments and principles to combat the global plastics problem has evolved from the work of scholars and other experts from intergovernmental organizations. Furthermore, the problem-based approach relies on expertise from scientists from many different fields and this knowledge was instrumental in deciding which sources belong under the three main approaches. Therefore, the analysis begins with the category of "Work of Scholars and Other Relevant Experts". The next category is "Principles of International Law" due to their role in steering the direction of each main approach. The principles are particularly important due to the lack of a common, global policy agenda for the problem that would provide objectives for action. After these changes to the classic order of discussing the sources, follows an analysis of the categories of treaties and customary international law. Complementing the traditional source categories, the study also uses soft law and international technical standards, the nature of which as source categories is discussed last.

2.3.3.1 Work of Scholars and Other Relevant Experts

To reflect the process of doctrinal analysis of the sources of international law in this dissertation, the assessment here begins with work of scholars and other relevant experts, or in the language of Article 38, "the teachings of the most highly qualified publicists of the various nations, as subsidiary means for the determination of rules of law." Within the classic paradigm, the teachings of the most highly qualified publicists do not constitute a source of international law but can have value in ascertaining the law.[126] Yet, in ascertaining the relevant law in the context of the global plastics problem, scholars and experts have had a particularly crucial role. Due to a lack of a regime and instruments originally designed to target the global plastics problem, an understanding of what can be considered to form

[125] H Thirlway, *The Sources of International Law* (2nd Edn, Oxford University Press 2019) 152; A Pellet and D Müller, 'Competence of the Court, Article 38' in A Zimmermann et al. (eds) *The Statute of the International Court of Justice: A Commentary* (3rd Edn, Oxford University Press 2019) 932.
[126] J Brunnée, 'Sources of International Environmental Law: Interactional Law' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017) 975-976.

such an approach under current international law has arisen from the work of scholars and other respected experts.[127]

The complexity of the global plastic problem necessitates a combination of different instruments of international law, signifying that identification of relevant law is not a straightforward exercise. Depending on how one approaches a variety of issues under the umbrella of the global plastics problem, the identification of what constitutes the current international legal framework may vary. Therefore, constructions by scholars and other experts of what belongs under the current international legal framework targeting the global plastics problem have had a significant role in building shared understandings of the topic amongst States and other international actors. Furthermore, in addition to identifying the combination of relevant instruments, the work of scholars and other experts has greatly contributed to mutual understandings regarding interpretation and application of individual instruments to the problem.

Against the backdrop of interactional law theory, scholars and experts as non-State actors are accepted as valid contributors to the development of international law through "explaining, clarifying, reinforcing and advancing the concepts, rules, and approaches in the field" and consequently "exert[ing] influence through individual publications or through reports prepared by scholarly associations…or UN bodies".[128] Specifically for the topic at hand, the influence of the work of scholars and other relevant experts is important and evidently has so far played a larger role than merely providing subsidiary means to identify and interpret the relevant law. These views are based both on academic literature and reports and working papers from international organizations and other expert organizations.

2.3.3.2 Principles of International law

Principles of international environmental law (IEL), as well as general and other principles of international law, provide an important source of international law in the context of developing a legal response to the global plastics problem. Within the classic categorization of sources of

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[127] Most importantly, see, A Stöfen-O'Brien, *The International and European Legal Regime Regulating Marine Litter in the EU* (Nomos Verlagsgesellschaft 2015); K Raubenheimer, 'Towards an Improved Framework to Prevent Marine Plastic Debris, (Doctor of Philosophy Thesis, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong 2016); UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5.; K Raubenheimer and N Urho, 'Possible Elements of a New Global Agreement to Prevent Plastic Pollution' (Nordic Council of Ministers 2020); UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016)

[128] J Brunnée, 'Sources of International Environmental Law: Interactional Law' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017) 976-977.

international law, a principle of international law can become binding by being incorporated in a treaty text, by recognition as a principle of general international law, or by becoming a rule of customary international law.[129] Principles can also have a soft law status as emerging rules, guiding interpretative standards or aspirational norms.[130] Aside from incorporation of a principle in a treaty text within a specific regime, it is challenging to pinpoint the legal status of a principle and thus the evaluation of the status of principles relies in this dissertation on assessments in judicial decisions and literature.

From the interactional law viewpoint, principles of international law are particularly challenging for evaluating shared understandings, and the criteria and practice of legality. Brunnée argues that interactional law "helps explain why the concept of general principles plays a limited role as a 'source' of international law, including in international environmental law."[131] Due to the absence of general indicators on what constitutes a principle of general international law and limited and inconsistent practice, "it is difficult to identify the shared understandings and adherence to the requirements of legality that would support the conclusion that the category of 'general principle' as such constitutes a strong indicator of international legality."[132] With respect to principles of international environmental law, in particular, interactional law views them as having "impacts in guiding development of treaties" and providing means for more environmentally friendly interpretations.[133]

Moreover, no taxonomy of what constitutes "the general principles of law recognized by civilized nations", "customary principles of international law", "general principles of international environmental law", or "principles of international environmental law" exists, as well as no consensus of the nature of the relationship between these categories.[134] The debate includes a spectrum of opinions. Principles of general international law, such as the principle of co-operation,[135] or other well-founded principles of international law, such as "every internationally wrongful act of a State

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[129] E Hey, *Advanced Introduction to International Environmental Law* (Edward Elgar Publishing 2016) 54.
[130] L Paradell-Trius, 'Principles of International Law: An Overview' (2000) 9 Review of European, Comparative & International Environmental Law 2. 93.
[131] J Brunnée, 'Sources of International Environmental Law: Interactional Law' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017) 974.
[132] *Ibid.*
[133] *Ibid.* 980.
[134] R Rayfuse, 'Principles of International Environmental Law Applicable to Waste Management' in K Kummer Peiry et al. (eds) *Waste Management and the Green Economy: Law and Policy* (Edward Elgar Publishing 2016) 14; ILC, 'Fragmentation of International Law: Difficulties Arising from the Diversification and Expansion of International Law: Report of the Study Group of the International Law Commission' (Fifty-Eight Session 2006) UN Doc A/CN.4/L.682. 72-73, 255-256.
[135] Eg, ITLOS stated in the MOX Plant Case that "the duty to cooperate is a fundamental principle in the prevention of pollution of the marine environment under Part XII of the Convention and general international law." *The MOX Plant Case (Ireland v United Kingdom)* (Provisional Measures, Order of 3 December 2001) [2001] ITLOS Reports 2001. 110, para 82.

entails the international responsibility of that State",[136] can have their application in environmental cases without being principles of international environmental law *per se*. Though some principles, such as the no-harm rule[137] or the principle of prevention[138], have clear customary international law status, views on the status of other principles as customary international law, for example regarding the precautionary principle[139], remain ambiguous. Birnie et al. identify a set of general principles of international environmental law, including in this category the precautionary principle, the polluter pays principle, and the principle of common but differentiated responsibilities (CBDR).[140] Valverde Soto discusses as general principles of IEL sovereignty and responsibility, good neighborliness and cooperation, prevention, precaution, duty to compensate for harm, the CBDR and sustainable development. He simply states that "the significance of the generality of these principles [of international environmental law] is that they can be applied to the international community for the protection of the environment".[141]

In this dissertation the principles of international law, regardless of which of the above categories above they belong to, serve two main functions. First, principles function as communicators of common values and general commitments. Due to the absence of a State-consented, explicitly designed regime to target the global plastics problem, principles can shed light on shared understandings of the general direction for developing a legal response concerning each sub-problem. Principles of international law thus provide a general legal foundation for each main approach, which underlies the construction of a more specific legal analysis:

[136] P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 737; ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International law Commission (Vol II, Part Two) 32, paras 1, 2; See eg, *Phosphates in Morocco (Italy v France)* (Preliminary Objections) PCIJ Series A/B No 74. 22; *The Corfu Channel Case (UK v Albania)* (Merits) [1949] ICJ Reports 1949. 23; *Case Concerning the Difference between New Zealand and France Concerning the Interpretation or Application of Two Agreements, Concluded on 9 July 1986 between the Two States and Which Related to the Problems Arising from the Rainbow Warrior Affair (New Zealand v France)* [1990] XX UNRIAA. 251, para 75.
[137] *Trail Smelter Arbitration (United States v Canada)* (Award of 11 March 1941) III UNRIAA. 1965; *The Corfu Channel Case (UK v Albania)* (Merits) [1949] ICJ Rep 1949. 22; *Legality of the Threat or Use of Nuclear Weapons* (Advisory Opinion) [1996] ICJ Reports 1996. 241-242, paras 27, 29; *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)* (Judgment) [2010] ICJ Reports 2010. 68, para. 193; P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009) 137; and P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 206.
[138] *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)* (Judgment) [2010] ICJ Reports 2010. 45, para 101; L-A Duvic-Paoli, *The Prevention Principle in International Environmental Law* (Cambridge University Press 2018) 95.
[139] See eg, *Responsibilities and Obligations of States with respect to Activities in the Area* (Advisory Opinion) [2011] ITLOS Reports 2011. 47, para 135; U Beyerlin and T Marauhn, *International Environmental Law* (Hart Publishing 2011) 55-56.
[140] P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009) 27.
[141] M Valverde Soto, 'General Principles of International Environmental Law' (1996) 3 ILSA Journal of International and Comparative Law 1. 193.

> General principles of [international] law play a prominent role in law-creation….Their main characteristic is to be general, i.e., open to value-oriented arguments: principles are thus in the first place 'transformators' of extra-positive (moral, social, or other) needs into the legal system.[142]

> A principle also may provide the general orientation and direction to which positive law must conform, a rationale for the law.[143]

Each main part is thus grounded on principles identified as applicable to the sub-problem based on the problem framing, and they guide and justify the selection of more specific instruments of international law under each main part.

Furthermore, in establishing these underlying foundations for each approach, the analysis makes use of the notion of principles as "rules of indeterminate content," which means that they have a degree of abstraction so great it is not possible to deduce precise obligations from them with any degree of certainty.[144] In other words, "principles embody legal standards, but the standards they contain are more general than commitments and do not specify particular actions."[145] For the purposes of establishing an underlying and general legal foundation and direction for each main approach, this inherent generality of principles is a useful quality. For example, the first main approach to control plastics leakage to the oceans builds on the no-harm rule, the principle of prevention, the CBDR and general obligations concerning protection of the marine environment deriving from the LOSC. This combination communicates common values such as the objective of protecting the marine environment, accepting that States have differing capabilities to do this, and preventing transboundary harm to the environment. The combination of these principles also communicates that States already have general obligations to protect the global marine environment from transboundary pollution according to their capabilities. Establishing an underlying legal foundation thus provides a framework and basic direction for fleshing out this framework with further legal measures that could operationalize the general obligations.

The second function of principles of international law in this dissertation is to guide interpretation and fill gaps regarding substantive obligations:

> Another and very important role of principles is their role in providing guidance for courts and tribunals in the process of interpreting international rules and obligations, environmental or other, and in filling legal gaps.[146]

142 R Kolb, 'Principles as Sources of International Law (With Special Reference to Good Faith' (2006) LIII Netherlands International Law Review. 7.
143 AC Kiss and D Shelton, *Guide to International Environmental Law* (Martinus Nijhoff Publishers 2007) 89.
144 *Ibid.*
145 D Bodansky, 'The United Nations Framework Convention on Climate Change: A Commentary' (1993) 18 Yale Journal of International Law 2. 501.
146 L Paradell-Trius, 'Principles of International Law: An Overview' (2000) 9 Review of European, Comparative & International Environmental Law 2. 96.

Particularly with regards to addressing land-based sources of plastics leakage, due diligence obligations deriving from the no-harm rule and the general obligations of the LOSC can play a role in strengthening the legal protection of the oceans from plastics pollution. Interpretative guidance from principles of international (environmental) law is especially important in the context of the global plastics problem, as legal analysis requires applying existing sources to a new problem.

2.3.3.3 Treaties

In international settings, treaties help to crystallize and specify shared understandings and are important steps in interactional law-making.[147] Furthermore,

> [t]reaties can provide for robust legality, grounded in the basic rules and practices of treaty making and treaty application, framed by the Vienna Convention on the Law of the Treaties. It is no accident that these universally supported rules and practices reflect, to a large extent, the criteria of legality…As a general matter, therefore, treaties provide not only law-making processes, but also 'places' where binding legal rules can be found.[148]

International treaties are one of the dominant sources of international law in this study. The main purpose for studying treaties is to map which ones apply to the sub-problems, if so how, and whether they contain shortcomings which need to be addressed. Articles 31 and 32 of the Vienna Convention on the Law of Treaties ('VCLT') guide interpretation of the applicable treaties.[149]

For a few of the treaties, interpretation and application to the sub-problems is straightforward and in line with "good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose."[150] Specifically MARPOL (Annex V), the London Convention and Protocol, the Stockholm Convention, the Basel Convention, and the Nomenclature of the HS Convention directly apply to plastics or chemicals in plastics based on their wording and purpose.[151]

The VCLT allows also for evolutionary interpretation, in which case context and "any relevant rules of international law applicable in the relations between the parties" can be taken into account, as long as such an interpretation respects the intention of the parties and the object and purpose of the

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147 J Brunnée, 'Sources of International Environmental Law: Interactional Law' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017) 966.
148 *Ibid.* 966-967.
149 Vienna Convention on the Law of Treaties (Adopted 23 May 1969, entered into force 27 January 1980) 1155 UNTS 331 ('VCLT')
150 Article 31(1), VCLT.
151 Stockholm Convention on Persistent Organic Pollutants (Adopted 22 May 2001, entered into force 15 May 2004) 2256 UNTS 119 ('Stockholm Convention'); The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Adopted 22 March 1989, entered into force 5 May 1992) 1673 UNTS 57 ('Basel Convention'); International Convention on the Harmonized Commodity Description and Coding System (Adopted 14 June 1983, entered into force 1 January 1988) 1503 UNTS 3 ('HS Convention'); HS Nomenclature (2017 Edition)

treaty.[152] The ICJ has also confirmed that treaties should be "interpreted and applied within the framework of the entire legal system prevailing at the time of the interpretation."[153] This concerns concepts and terms that are "by definition evolutionary".[154] The ICJ first explicitly corroborated the role of "evolving provisions" in an environmental context in *the Case Concerning the Gabcikovo-Nagymaros Project*, where it stated that "newly developed norms of environmental law are relevant for the implementation of the Treaty".[155]

The protection of the environment as an object of evolutionary interpretation concerns *inter alia* "cases where legal obligations which were already environmental at the time of their conclusion … are now interpreted evolutively in the light of new legal or factual circumstances."[156] Protecting the marine environment from the global plastics problem resonates explicitly with such cases. As a relatively recently recognized environmental problem (new factual circumstances), it requires interpreting existing instruments evolutively. The general definitions of pollution in treaties relevant for marine environmental protection are a good example. Evolutionary interpretation allowed for including plastics pollution or activities involving plastics in the scope of treaties such as the LOSC, the UNWC, the UNECE, the Fish Stocks Agreement, the Espoo Convention and Protocol, as well as regional seas treaties and protocols and treaties on specific international watercourses.

Furthermore, in developing complementary measures to the current international legal framework and constructing the elements of a new binding agreement, the research also relies on analogous interpretation. Analogy is a technique that can be used in the development of international law to fill gaps in the relevant body of law.[157] This signifies that the research uses an existing regime and its elements, such as the Montreal Protocol, as a model and extracts applicable components that fit the needs of an international legal response to the global plastics problem threatening the environment.

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152 Article 31(3)(c), VCLT; P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009) 21.
153 *Legal Consequences for States of the Continued Presence of South Africa in Namibia (South West Africa) Nothwithstanding Security Council Resolution 276 (1970)* (Advisory Opinion) [1971] ICJ Reports 1971. 19, para 53.
154 P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009) 21; *Legal Consequences for States of the Continued Presence of South Africa in Namibia (South West Africa) Nothwithstanding Security Council Resolution 276 (1970)* (Advisory Opinion) [1971] ICJ Reports 1971. 19, para 53.
155 *Case Concerning the Gabcikovo-Nagymaros Project (Hungary v Slovakia)* (Judgment) [1997] ICJ Reports 1997. 64, para 112.
156 N Mileva and M Fortuna, 'Environmental Protection as an Object of and Tool for Evolutionary Interpretation' in G Abi-Saab et al. (eds) *Evolutionary Interpretation and International La*w (Hart Publishing 2019) 125.
157 S Sivakumaran, 'Techniques in International Law-Making: Extrapolation, Analogy, Form and the Emergence of an International Law of Disaster Relief' (2018) 28 The European Journal of International Law 4. 1117.

2.3.3.4 Customary International Law

Customary international law rules have an important "function of filling lacunae which often arise in situations where a certain question has been left unsolved by the treaty regulation."[158] The formation of a customary international law rule requires a combination of two elements; a general practice of States as an objective element and *opinio juris* as a subjective element.[159] From an interactional viewpoint,

> one would assume that customary international law cannot arise without widely shared, and practiced, understandings. In fact, however, the relevant understandings may be relatively thin among some States…while the inaction of other States counts as acquiescence. In turn, the requirements of legality do not as explicitly structure the rules of governing customary law-making…and yet, legality is coded into customary law. After all, it is not enough for States' conduct simply to align with a given norm. In interactional terms, that norm will emerge as customary law only when it is supported by robust practices of legality.[160]

Some of the principles of international environmental law, such as the no-harm rule and the prevention principle, form part of the relevant customary international law. Furthermore, to some extent treaties codify customary international law, such as Part XII of the LOSC. Also the rules of State responsibility are for the most part a codification of customary international law. In fact, Brunnée notes "what appears to be something of a renaissance of the no-harm rule in the practice of neighbouring States".[161] In a few recent environmental disputes the no-harm rule, the prevention principle, their relationship with procedural duties and the content of the due diligence standards have played prominent roles.[162] A similar "renaissance" is also apparent in this dissertation due to the absence of a binding agreement targeting the global plastics problem, which signifies that these same rules and principles of customary international environmental law remain important sources in current efforts to protect the marine environment from plastics leakage.

2.3.3.5 Judicial decisions

In the classic setting of sources of international law, judicial decisions from international courts and tribunals provide a subsidiary means to ascertain the law. Though there is no doctrine of precedent in international courts and tribunals, "these courts will not lightly disregard their own pronouncements, though they may finds ways to distance themselves from earlier decisions".[163] In

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158 U Beyerlin and T Marauhn, *International Environmental Law* (Hart Publishing 2011) 282.
159 *Ibid.*
160 J Brunnée, 'Sources of International Environmental Law: Interactional Law' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017) 969-970.
161 *Ibid.* 972.
162 *Ibid.*; *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)* (Judgment) [2010] ICJ Reports 2010; *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica* v. *Nicaragua) and Construction of a Road in Costa Rica along the San Juan River (Nicaragua* v. *Costa Rica)* (Judgment) [2015] ICJ Reports 2015.
163 P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009) 28.

reality, international courts and tribunals "provide authoritative evidence of what the law is" and contribute "to the progressive development of law".[164] Interactional law supports this view and recognizes that international courts and tribunals are important participants in international law-making, as "their procedural frameworks and judicial reasoning methods anchor them in a strong foundation of legality".[165] Regarding environmental disputes, international courts and tribunals have made important contributions particularly in clarifying customary international environmental law.[166]

So far, no disputes involving issues with plastics have been brought before international courts or tribunals. However, existing case law includes judgments and advisory opinions that are relevant to developing legal responses to all three sub-problems. Existing case law helps specifically in clarifying the content of international law regarding plastics leakage prevention measures and international legal remedies for existing MPP. In particular, case law is used to elaborate the content of due diligence obligations deriving from customary international law to protect the marine environment.

2.3.3.6 Soft Law

State practice, inside and outside international organizations, has increasingly "placed normative statements in non-binding political instruments such as declarations, resolutions, and programs of action, and has signaled that compliance is expected with the norms that these texts contain."[167] Such norms are generally categorized under soft law, and soft law instruments can differ significantly in their provenance, form and function.[168] The trend of the increasing use of soft law instruments has been particularly evident in environmental matters.[169] In the classic doctrine of sources, soft law is not a source of international law unless it has become binding by being endorsed in a treaty text, accepted as a general principle of international law or by emerging as a rule of customary international law. From an interactional law viewpoint, "'soft' law-making processes are 'sources' of law to the extent that they are grounded in shared understandings, meet the requirements of legality, and are supported by practices of legality."[170]

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[164] *Ibid.* 28-29.
[165] J Brunnée, 'Sources of International Environmental Law: Interactional Law' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017) 975.
[166] *Ibid.* 976.
[167] D Shelton, 'Soft Law' in D Armstrong (ed) *Routledge Handbook of International Law* (Taylor & Francis Group 2009) 68.
[168] U Beyerlin and T Marauhn, *International Environmental Law* (Hart Publishing 2011) 290.
[169] J Friedrich, *International Environmental "Soft Law": The Functions and Limits of Nonbinding Instruments in International Environmental Governance and Law* (Springer 2013) Beiträge zum ausländischen öffentlichen Recht und Völkerrecht 247. 1-2.
[170] J Brunnée, 'Sources of International Environmental Law: Interactional Law' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017) 981.

This dissertation makes use of a variety of sources that fall under the category of soft law. The principles of international environmental law which have not (yet) been recognized as customary international law nevertheless find their expressions in the 1972 Stockholm Declaration and/or the 1992 Rio Declaration, which are political declarations that contain "an impressive corpus of existing or emerging norms" of international environmental law.[171] The United Nations Environment Assembly has issued a multitude of Resolutions to encourage and direct efforts to target the global plastics problem, which are of non-legal character but can affect the further development of international law.[172] Decisions and Recommendations taken under MEAs can similarly impact further developments. Furthermore, guidance on controlling land-based sources of pollution has long relied on soft-law instruments, the most relevant for plastics being the GPA and the Honolulu Strategy. At the regional level States have developed non-binding action plans to specifically combat plastics leakage. In the context of plastics, also public-private partnerships have emerged with their respective programs, such as the GPML. Additionally, the IMO has issued multiple voluntary guidelines and an action plan relevant for preventing plastics leakage.

These main soft law instruments relevant for the global plastics problem vary in their contribution to generating shared understandings and to the practice of legality, though a common denominator for most them is a joint understanding of the need to respond to issues around marine litter, including plastics. Consequently, soft law is an instrumental part of the current international legal framework applicable to the global plastics problem and has kept the issue of land-based marine pollution, and in particular marine litter, on the international agenda.

2.3.3.7 INTERNATIONAL TECHNICAL STANDARDS

The International Standardization Organization (ISO) defines a standard as:

> [a] document, established by a consensus of subject matter experts and approved by a recognized body that provides guidance on the design, use or performance of materials, products, processes, services, systems or persons.[173]

In complex societies, technical standards provide the means to communicate broadly and uniformly necessary common technical information, which can be continuously developed and expanded as technology is applied in new ways.[174] International technical standards are developed by international bodies, and these processes can be intergovernmental or private industry efforts, or combinations of

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171 U Beyerlin and T Marauhn, *International Environmental Law* (Hart Publishing 2011) 292.
172 See, *Ibid.* 295.
173 ISO, 'Standards in Our World' https://www.iso.org/sites/ConsumersStandards/1_standards.html
174 K Krechmer, 'The Fundamental Nature of Standards: Technical Perspective' (2000) 38 IEEE Communications Magazine 6. 2. https://www.isology.com/pdf/fundtec.pdf

the two.[175] International technical standards are generally voluntary but can be used in technical regulations.[176] However, for the World Trade Organization (WTO) members, adherence to international technical standards is not completely voluntary as the Technical Barriers to Trade Agreement ('TBT Agreement') stipulates that the members have to use them as a basis for national regulations.[177]

International technical standards cannot be considered a traditional source of international law.[178] A discussion of the place of international technical standards in international law commenced after the creation of the WTO in 1995 and in response to the WTO delegating some of its regulatory authority to international standardization bodies. Particularly, the Agreement on Technical Barriers to Trade and the Agreement on the Application of Sanitary and Phytosanitary Measures have linked "international standards and public international law by defining the former as a benchmark for compliance with some of the provisions established in the agreements."[179] Moreover, during the past decades,

> the scope of international standards has been expanded to cover much more than what is covered by the WTO agreements. They have gone beyond safety, products and production methods (from the technical point of view), to also cover values such as sustainable fishery, social responsibility, the protection of the environment, labor rights, etc. International standards have become relevant not only for trade law but also for other branches of international law.[180]

In line with this development, the need for international technical standardization and technical regulations has been well-established in the literature regarding the global plastics problem, though it is still debated who should be developing the standards and what their content should be. However, it is recognized that trade aspects and the TBT Agreement should be complemented or otherwise taken into account in this process.[181]

International technical standards subject to analysis in this dissertation are those standards that have been developed, or are under development, under the auspices of the ISO, and which have been identified as relevant for the global CE of plastics. One of the reasons ISO standards were chosen

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[175] ISO, 'Standards in Our World' https://www.iso.org/sites/ConsumersStandards/1_standards.html
[176] See eg, B Fliess et al., 'The Use of International Standards in Technical Regulation' (OECD 2010) OECD Trade Policy Papers No 2. 14.
[177] A Barrios Villarreal, *International Standardization and the Agreement on Technical Barriers to Trade* (Cambridge University Press 2018) 64; Agreement on Technical Barriers to Trade (Adopted 15 April 1994, entered into force 1 January 1995) 1868 UNTS 120 ('TBT Agreement')
[178] A Barrios Villarreal, *International Standardization and the Agreement on Technical Barriers to Trade* (Cambridge University Press 2018) 61.
[179] *Ibid.* 58.
[180] *Ibid.*
[181] K Raubenheimer and N Urho, 'Possible Elements of a New Global Agreement to Prevent Plastic Pollution' (Nordic Council of Ministers 2020) 36-38.

was because the TBT Agreement makes references to specifically ISO standards, and therefore their status as relevant standards within the trade regime is unambiguous.[182] The other international technical standard subject to analysis is the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), which was developed under the auspices of the Interorganization Programme for the Sound Management of Chemicals (IOMC), and ceded to the new United Nations Economic and Social Council's Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals (UNSCEGHS) for promotion, implementation and management.[183]

The development and nature of international technical standards by the ISO and IOMC/UNGSCEGHS present interesting aspects from the viewpoint of interactional law. ISO standards are developed in a hybrid process based on shared understandings between States and non-State actors regarding how to solve practical technical issues or establish minimum quality requirements.[184] Within the ISO, shared understanding of the currently relevant standards for the CE and the need for further development of standards to promote CE practices are clearly communicated.[185] The GHS is a culmination of shared understandings of work that has spanned more than a decade and involved individuals from a multitude of States, international organizations and stakeholder organizations.[186] Though these international technical standards "are not properly prepared and adopted by States and they are not based on State consent", they are "norms recognized by the international community".[187]

Regarding the criteria of legality, international technical standards have the potential to pass the evaluation of interactional law. International technical standards are by design meant to be general (criteria 1), prospective (criteria 3), avoid contradiction (criteria 5), be realistic (criteria 6) and be relatively constant (criteria 7). International technical standards often use precise and clear language that can even denote obligation (criteria 4).[188] Though adopting international technical standards is

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182 Annex 1 and 3, the TBT Agreement.
183 Globally Harmonized System of Classification and Labelling Chemicals, Eight Revised Edition (2019) UN Doc ST/SG/AC.10/30/Rev.8. ('GHS') iii, 8.
184 A Barrios Villarreal, *International Standardization and the Agreement on Technical Barriers to Trade* (Cambridge University Press 2018) 60-61.
185 ISO, 'Technical Committees: ISO/TC 323 Circular Economy' https://www.iso.org/committee/7203984.html ; See also, Croner-i, 'New International Standards on Circular Economy Proposed' (7 August 2018) https://app.croneri.co.uk/whats-new/new-international-standards-circular-economy-proposed
186 Globally Harmonized System of Classification and Labelling Chemicals, Eight Revised Edition (2019) UN Doc ST/SG/AC.10/30/Rev.8. ('GHS') iii.
187 A Barrios Villarreal, *International Standardization and the Agreement on Technical Barriers to Trade* (Cambridge University Press 2018) 61-62.
188 *Ibid.* 64.

optional, "[a]dherence to international standards is not entirely voluntary for WTO Members. The TBT Agreement requires Members to use them as a basis for their national technical regulations and standards… Plus, the dispute settlement procedure in the WTO acts as a judicial means of enforcement" (criteria 8).[189] Regarding promulgation, the GHS for example is publicly available, but ISO standards are publicly available only if a fee is paid (criteria 2). Furthermore, the practice of legality may be achieved when wide adoption of adherence to an international technical standard can result in a general practice amongst States and private actors.[190]

Though Brunnée and Toope do not specifically discuss international technical standards within their theory, it can be argued that through the lenses of interactional account of international law, these standards have potential to be legitimate sources of international law. The value in doing so stems from "highlight[ing] the ways in which a growing range of other actors participate in international law-making processes and influence them to greater or lesser extent":[191]

> Locating international standards under international law is very important for the international standardizing system, international law and even for development policies. The international standardization system will become more inclusive, transparent and accountable mainly toward actors that are traditionally excluded from standardization activities such as developing countries, small and medium enterprises (SMEs), social interests and consumers. It will correspondingly help the international legal system to better address reality, have more control over the process through which international standards are developed and become more predictable.[192]

2.3.4 Systematization Tools to Organize Sources of International Law Concerning the Sub-Problems

The current international legal framework that is applicable to the global plastics problem incorporates a multitude of sources of international law and other sources. These sources concern different aspects of the problem, and therefore require systematization with regards to the three sub-problems. The systematization of sources of international law requires methodologic tools to assess which sources address 1) plastics leakage to the marine environment, 2) existing marine plastics pollution, and 3) extensive plastics wastes generation.

To categorize relevant sources under the three different approaches, division between downstream/upstream activities and the waste hierarchy are used as systematization tools. Systematizing sources of international law based on downstream/upstream activities and the waste

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[189] *Ibid.*
[190] *Ibid.* 60.
[191] J Brunnée, 'Sources of International Environmental Law: Interactional Law' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017) 982.
[192] A Barrios Villarreal, *International Standardization and the Agreement on Technical Barriers to Trade* (Cambridge University Press 2018) 77.

hierarchy does not mean that a specific source can only be situated under one sub-problem approach. One source can be placed under two or three categories. However, this signifies that the source is analyzed from different angles and for different purposes under each main approach. The value in systematizing sources of international law based on these methodologic tools lies in revealing the strengths and weaknesses of existing instruments with regards to which part of the global plastics problem they deal with.

2.3.4.1 Downstream and Upstream Activities

Literature on international legal protection of the marine environment from the global plastics problem distinguishes between prevention measures that target either downstream or upstream activities. However, the literature rarely defines the exact meaning of downstream and upstream activities.

The terms originate from economics and from understanding that "[e]very firm is a collection of activities that are performed to design, produce, market, deliver, and support its product".[193] A value chain consists of multiple steps, which can be categorized under upstream, midstream, or downstream activities, though these categorizations can be blurry. For example, in the oil and gas industry, upstream activities relate to exploration and production of raw materials, midstream activities to transportation and storage services, and downstream activities cover anything from post-production to point of sale.[194] However, the literature on international legal protection of the marine environment does not borrow these terms 'off the shelf' from economics, and therefore their meaning requires interpretation and clarification.

For example, the Governance Report provides following expressions relating to downstream and upstream activities:

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193 ME Porter, *Competitive Advantage: Creating and Sustaining Superior Performance* (The Free Press 1985) 33. 36. The terms 'value chain' and 'supply chain' both depict the process of how a product is produced from raw material until reaching a customer as a finished product. Whereas 'value chain' looks at this process from a business management perspective, 'supply chain' takes an operational management perspective. (Investopedia, 'Value Chain vs. Supply Chain: What's the difference? https://www.investopedia.com/ask/answers/043015/what-difference-between-value-chain-and-supply-chain.asp) In this dissertation, these terms are used interchangeably because from regulatory viewpoint, the interest lies in identifying different phases for possible intervention along the process of plastic production and consumption. Both terms essentially capture and describe the idea that plastics production and consumption is a process with multiple phases.

194 Investopedia, 'Upstream vs. Downstream Oil & Gas Operations: What's the Difference' https://www.investopedia.com/ask/answers/060215/what-difference-between-upstream-and-downstream-oil-and-gas-operations.asp

> …remedial action has historically treated marine plastic litter as a failure of solid waste management systems and must progress to a more systemic upstream approach to prevent debris entering watercourses and the marine environment.[195]
>
> There is increasing recognition that prevention upstream in the lifecycle of plastics is more cost-effective than mitigation and removal efforts downstream. [196]
>
> MARPOL Annex V provides for waste minimization but would not necessarily deal with all upstream activities. [197]

Moreover, on several occasions the Governance Report distinguishes between the "lifecycle of plastics" and "final disposal", and implies that waste generation reduction is part of upstream activities.[198]

These expressions indicate that those measures that aim at improving the lifecycle of plastics (eg, product design, reuse, recycling) or waste generation reduction, refer to upstream activities, whereas remedial and mitigation efforts (e.g., cleanups) and final disposal options refer to downstream activities. A similar logic in the usage of these two concepts is present in scholarly literature and other UN initiatives.[199] However, Raubenheimer and Urho have enriched these views by adding midstream activities to the mix. In their work, upstream activities refer to raw materials extraction and production, midstream activities denote manufacturing and consumption, and downstream activities include final disposal waste management options and recycling.[200] It can be concluded from the literature that no consensus on these definitions currently exists. Therefore, this dissertation defines downstream activities as activities that relate to preventing plastics wastes leakage to the environment or remedying or mitigating MPP. Upstream activities are defined as activities that relate to reducing waste generation or improving the lifecycle of plastics. These definitions resonate most with the existing literature.

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[195] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UN Doc UNEP/EA.3/INF/5. 98.
[196] *Ibid.* 149.
[197] *Ibid.* 77.
[198] *Ibid.* 11, 12, 19, 77, 90, 134, 147, 149.
[199] See eg, K Raubenheimer, 'Towards an Improved Framework to Prevent Marine Plastic Debris, (Doctor of Philosophy Thesis, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong 2016); K Raubenheimer and A McIlgorm, 'Can the Basel and Stockholm Conventions Provide a Global Framework to Reduce the Impact of Marine Plastic Litter?' (2018) 96 Marine Policy; Secretariat of the Convention on Biological Diversity and the Scientific and Technical Advisory Panel of the Global Environment Facility, 'Impacts of Marine Debris on Biodiversity: Current Status Potential Solutions' (2012) 67 Technical Series.
[200] K Raubenheimer and N Urho, 'Possible Elements of a New Global Agreement to Prevent Plastic Pollution' (Nordic Council of Ministers 2020) 15.

However, though this approach is useful to apply to sources and assign them to the two first main substantive parts or the third main substantive part, it does not help with systematizing sources between the two first main parts. Therefore, the waste hierarchy is used in addition.

2.3.4.2 The Waste Hierarchy

The waste hierarchy links to the objective of reducing the use of resources by improving the life-cycle of products and materials.[201] The waste hierarchy applies "as a priority order in waste prevention and management legislation and policy."[202]

Fig. 3 The waste hierarchy, as depicted in the Waste Framework Directive 2008/98/EC.[203]

It has five elements, which are prevention (of waste generation), reuse, recycling, recovery and disposal. Prevention is defined as "measures taken before a substance, material or product has become waste".[204] Reuse denotes "any operation by which products or components that are not waste are used again for the same purpose for which they conceived."[205] Recycling is "any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes."[206] Recovery is "any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function".[207] With plastics, recovery denotes recovering energy by incineration. Disposal is

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[201](6), (8), Council Directive 2008/98/EC of 19 November 2008 on Waste and Repealing Certain Directives [2008] OJ L 312.
[202] *Ibid.* Art 4(1).
[203] EC, 'Directive 2008/98/EC on Waste (Waste Framework Directive)' http://ec.europa.eu/environment/waste/framework/
[204] Art 3(12), Council Directive 2008/98/EC of 19 November 2008 on Waste and Repealing Certain Directives [2008] OJ L 312.
[205] *Ibid.* Art 3(13).
[206] *Ibid.* Art 3(17).
[207] *Ibid.* Art 3(15).

"any operation which is not recovery even where the operation has a secondary consequence".[208] With plastics, disposal refers to landfill (or loss to the environment).

The elements of prevention (of waste generation), re-use, and recycling aim to improve the life-cycle of plastics, and therefore they fall under upstream activities, whereas the elements of recovery and disposal fall under downstream activities. If wastes are not treated under any of the elements of the waste hierarchy, they can end up in the terrestrial, freshwater or marine environment.

To use the waste hierarchy as a systematization tool requires that the five elements, or lack of them, are linked to the three sub-problems. The first sub-problem, plastics leakage to the marine environment, links to the waste hierarchy elements of recovery and disposal. These elements do not promote further use of plastics wastes as materials of secondary production but are merely means to treat plastics wastes and prevent them from leaking to the environment by burning or landfilling them. Instruments of international law that focus on pollution prevention as downstream activities are thus linked to the first sub-problem addressing plastics leakage to the environment.

The second sub-problem, plastics pollution already in the marine environment, links to a situation where even the least favorable elements of the waste hierarchy have failed and plastics wastes have ended up in the oceans. In this approach, international law can address the harm plastics are causing in the marine environment through available legal remedies, such as rules of State responsibility. Failure to use the waste hierarchy in plastics wastes treatment thus links to existing MPP and to instruments of international law that relate to remedying the situation.

The third sub-problem, extensive plastics wastes generation and increasing use of plastics wastes as resources, links to the three most favorable elements of waste hierarchy, that is, prevention of wastes generation, reuse and recycling. These elements also form the 3R principle, which is a fundamental principle of CE. Incorporation of these elements by those instruments of international law that apply to plastics can be seen as the first steps toward targeting upstream activities and promoting a global CE of plastics which can address the production and consumption problems under the third sub-problem approach.

2.4 Interdisciplinary Research

Environmental law scholarship has been accused of methodological immaturity partly due to having "little analytical reflection on the nature of interdisciplinarity in the subject and the label

[208] *Ibid.* Art 3(19).

'interdisciplinarity' is often used to refer to very different aspects of environmental law scholarship".[209] Therefore, this section seeks to explicitly address how and why interdisciplinary research is a necessary layer of the methodology in several parts of the research.

Interdisciplinary research can be described as:

> … a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice.[210]

This definition demonstrates that in addition to grounding legal research in sources of international law, interdisciplinarity opens a door for legal research to draw on knowledge from other academic disciplines.[211] Particularly in (international) environmental law, methodological challenges often concern interdisciplinarity as it "is perceived as both a reality and methodological expectation of environmental law scholarship".[212] The global plastics problem is a good example of such a situation. It is an extremely complex and multifaceted environmental problem, which would be impossible to approach solely from an international environmental law angle without also understanding the root causes and impacts of the problem, or the role of law and its interfaces to solutions from other fields.

The interdisciplinarity of this dissertation is anchored in using other fields as auxiliary disciplines:

> The legal researcher defines a problem, which he cannot solve with legal methods only, so that there is a need for input from another discipline. Often there will be a reason for that problem, external to the legal framework, which is perceived as demanding a legal response. In this type of research, material derived from the other discipline serves as a necessary contribution to the legal arguments…However, the conclusions of such research are still legal conclusions.[213]

This quote aptly describes the role of other disciplines in answering the research questions. Though the problems and reasons behind these problems are external to the legal framework, they are nonetheless perceived to demand a legal response. Understanding the problems and constructing legal responses necessitates knowledge from other disciplines, but the conclusions remain essentially legal in nature.

Answering the research questions this dissertation poses required using interdisciplinary research for three main purposes; 1) to identify and describe the sub-problems, 2) to be able to interpret whether

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[209] E Fisher et al., 'Maturity and Methodology: Starting a Debate about Environmental Law Scholarship' (2009) 21 Journal of Environmental Law 2. 231-232.

[210] National Academy of Sciences et al., Facilitating Interdisciplinary Research (The National Academies Press 2005) 2.

[211] D Owen and C Noblet, 'Interdisciplinary Research and Environmental Law' (2014) 41 Ecology Law Quarterly 4. 892.

[212] E Fisher et al., 'Maturity and Methodology: Starting a Debate about Environmental Law Scholarship' (2009) 21 Journal of Environmental Law 2. 231.

[213] S Taekema and B van Klink, 'On the Border: Limits and Possibilities of Interdisciplinary Research' in B van Klink and S Taekema (eds) *Law and Method. On Interdisciplinary Research into Law* (Mohr Siebeck 2011) 11.

plastics and plastics pollution fit within the scope of existing sources of international law that do not mention these substances in their exact wording, and 3) to understand the role of law in promoting CE and to inform how the law should be developed particularly to integrate CE practices to address the third sub-problem.

Each construction of a sub-problem consists of similar elements, which are a definition of the problem, defining the problem space by building an understanding of the problem, and framing the problem in a manner that enables "a concerted effort to focus on one's understanding of the problem".[214] This approach to environmental problem solving was created by Bardwell, who draws on cognitive psychology and conflict management,[215] and it was chosen because it serves the needs of presenting the sub-problems. First, it recognizes that "how one defines a problem determines one's understanding of and approach to that problem".[216] The global plastics problem and the sub-problems extracted from it have been defined in a manner that enables combining physical world problems with plastics with corresponding international legal issues. Second, the approach provides for depicting a problem space under each definition and framing the problem in a way that provides structure for organizing the problem and strategies for managing the problem-solving.[217] Each description of a sub-problem thus presents those elements of the problem that are considered essential for addressing the related legal issue and resonate with relevant framings of the legal issue. However, a myriad of ways exist for depicting problems relating to plastics, and these problem definitions and descriptions are only one possible manner of doing this.

A more specific description of the first sub-problem is provided in subchapter 3.3, 'Framing the Problem: Plastics Leakage to the Marine Environment'. This description is based on an interdisciplinary review of literature from different fields which seek to understand the amounts of plastic and plastics wastes entering the oceans annually, their main sources and source categories, and pathways of plastics to the marine environment. These fields include applied environmental sciences, such as Earth-system science, ecology, biology, chemistry, oceanography and hydrogeology, and environmental engineering. To date these sciences have provided a solid knowledge basis to guide international efforts to prevent plastics leakage. The first sub-problem is framed as a waste

[214] LV Bardwell, 'Problem-Framing: A Perspective on Environmental Problem-Solving' (1991) 15 Environmental Management 5. 603, 605, 607.
[215] *Ibid.* 603.
[216] *Ibid.*
[217] *Ibid.* 605, 607.

management problem and as an environmental problem based on the review of interdisciplinary literature and the systematization criteria.

Subchapter 6.3, 'Framing the Problem: Plastics Pollution in the Marine Environment', describes the situation and impacts of already existing MPP. It is also based on an interdisciplinary review of literature that draws from different fields in the sphere of applied environmental sciences to understand ocean plastics mass balance, chemicals mass balance, accumulation, distribution and behavior of plastics pollution in the marine environment, and the environmental and human health impacts of MPP. These factors provide the scientific basis that is needed to evaluate application of international legal remedies to the problem. However, the level of scientific uncertainty regarding particularly chemical mass balance and environmental and human health impacts requires that this knowledge is evaluated in a precautionary manner. The second sub-problem is framed as an environmental and potentially a human health problem on the basis of the interdisciplinary review of literature and the systematization tools.

The third sub-problem is depicted in the subchapter 9.3, 'Framing the Problem: Extensive Plastics Wastes Generation'. Knowledge of differences between the linear and circular economy, international trade links to the CE, global plastics production trajectories, markets for virgin and secondary raw materials and products, disposal and recycling rates, raw materials, material properties, the most common polluting types and usage sectors, and the most influential producers, are essential to understand the problem space in this part. This knowledge is gathered through an interdisciplinary review of literature that draws from CE and international trade literature, material science, and a variety of relevant statistics. Based on this review and the systematization criteria, the problem is framed as an issue of a linear 'take-make-dispose' pattern of production and consumption of plastics.[218]

Interpretation of whether existing sources of international law can accommodate plastics pollution within their scope also required input from other disciplines. This was particularly important regarding the LOSC and whether its definitions of "pollution" and "toxic, harmful or noxious substances" also cover plastics. Another good example is the GHS, application of which required knowledge of the chemical components of plastics. Moreover, assessing whether international law incorporates elements of the CE of plastics also necessitated knowledge of the CE and its features.

[218] See eg, R Merli et al., 'How Do Scholars Approach the Circular Economy? A Systematic Literature Review' (2018) 178 Journal of Cleaner Production. 704.

Addressing in particular the sub-problem of extensive plastics wastes generation required ideas for development of law beyond what was possible based on an exclusively doctrinal analysis of international law. The field of knowledge that resonated most with these needs was the circular economy. The CE itself is an umbrella concept for multiple fields of study that have as a common goal the reduction of wastes and using them as resources. The CE thus provides ideas and goals that can contribute to the development of law in a direction that addresses the current problems with plastics production and consumption.

Research on the CE was done from two angles. First, it was necessary to describe the CE's theoretical underpinnings and to map how different fields of study approach the CE from their distinctive vantage points. This was done by answering the following questions in relation to each main field of study (economics, industrial processes, product-service systems and design) under the CE umbrella in Chapter 10:

1. How does the field of study link and contribute to the CE?
2. How does the field of study perceive the principles of the CE?
3. Does the field of study consider systemic change?
4. How does the field of study perceive the role of law in the CE?

The purpose of this analysis was to contribute to a common theoretical understanding of the CE and clarify its central visions, concepts, principles and norms. Chapter 10 also sought to understand how the CE has been criticized to understand its weaknesses and its limitations, as well as the role of international law in particular in promoting the CE. These discussions provided the necessary theoretical background for the second phase: the analysis, in Chapters 11 and 12, of international law and standardization as tools to promote the CE in practice on a global scale in the plastics sector. These chapters used the theoretical background as a source of inspiration and sought to identify opportunities to integrate CE practices in the field of international law.

2.5 Further Delimitations: Excluded Elements

Studying an inherently interdisciplinary and multifaceted topic from an international legal perspective required a myriad of delimitations to fit it within the scope of one dissertation. Though the tailor-made methodology assisted in delimiting the topic into a manageable form, further clarification is required regarding some of the excluded elements.

2.5.1 EXCLUDED INSTRUMENTS OF INTERNATIONAL LAW

The international community of States and other actors are currently facing a multitude of environmental problems, such as biodiversity loss, climate change and MPP. Ideally, when considering solutions States should apply systems thinking and acknowledge the indirect and direct interrelations and common root causes behind individual environmental issues. For example, efforts to prevent and mitigate MPP can indirectly assist in protecting biodiversity, as animals would ingest less MPP, it would entangle fewer animals, and MPP would not destroy habitats. Another example is climate change, and how efforts to transform the linear plastics production and consumption process into a circular one would reduce the reliance on virgin fossil fuels both as raw materials and as energy sources for production, and thus reduce the overall emissions of plastics production.

Though these interlinkages between major environmental issues should be increasingly acknowledged and provide interesting interfaces for international environmental law scholarship, this dissertation had to exclude from the analysis those instruments of international law that do not provide direct means to address the three sub-problems as per the methodology. Mainly, this delimitation concerned international biodiversity instruments, such as the Convention on Biological Diversity (CBD) and the Convention on the Conservation of Migratory Species of Wild Animals (CMS). In this study, MPP is considered to have negative impacts on biodiversity (as depicted in Chapter 6) but CDB and CMS do not address any elements of the waste hierarchy or failure to comply with them, and are therefore excluded from the legal analysis.

2.5.2 EXCLUSION OF ECONOMIC THEORIES AND HUMAN RIGHTS/SOCIAL JUSTICE ISSUES

> While some appraisals aim to take a multidisciplinary perspective on plastic pollution, they frequently remain uncritical towards the tenets of neoclassical economics.[219]

This research had to limit critique of neoclassical economics in the context of the global plastics problem as outside the scope due to time limitations regarding the PhD project and the author's lack of education in economics and economic theories, which was considered essential for the task. Such critique with respect to describing root causes and solutions of the global plastics problem would have been a valuable component, particularly in relation the third sub-problem of extensive plastics wastes generation and using plastics wastes as a resource, and promoting the CE.[220]

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[219] CW Gattringer, 'A Revisited Conceptualization of Plastic Pollution Accumulation in Marine Environments: Insights from a Social Ecological Economics Perspective' (2018) 96 Marine Policy. 222.

[220] Mah discusses this criticism in her article and calls for "challenging entrenched corporate and societal views about growth. See, A Mah, 'Future-Proofing Capitalism: The Paradox of the Circular Economy for Plastics' (2021) Global Environmental Politics. 18.

Economic theories that are frequently associated with the CE are ecological economics and environmental economics, both of which are briefly presented in Chapter 10. However, even environmental economics is considered to be a sub-field of neoclassical economics. Gattringer has argued that of these two, ecological economics provides a more suitable economic theory to address the underlying causes of MPP, as it is not a sub-branch of neoclassical economics but emerged from both economics and ecology and can thus better address the interdependencies between ecological, social and economic spheres.[221]

Yet although both ecological and environmental economics have been instrumental in developing the theoretical underpinnings of the CE, the CE has no single major economic theory behind it (despite its somewhat misleading name).[222] Moreover, it may even be that no such theory currently exists but needs to be developed:[223]

> Finally, while 'circular economy' contains the term 'economy', strangely enough, it is not necessarily a theory about economics – macro or micro – but mainly a theory for how to manage material flows. The concept enjoys little traction and understanding among the current theoretical economists, both orthodox and heterodox. This one may sound a bit academic – but, it is not as such. We need to ensure that the actual and perceived societal benefits of a new circular model are established in a more fundamental and sound manner than just traditional cost-benefit analysis, which is an insufficient tool to describe transformation at a systems level.[224]

For example, Raworth has called for rethinking economics by picturing a Doughnut diagram, where

> below the inner ring – the social foundation – lie critical human deprivations such as hunger and illiteracy. Beyond the outer ring – the ecological ceiling – lies critical planetary degradation such as climate change and biodiversity loss. Between those two rings is the Doughnut itself, the space in which we can meet the needs of all within the needs of the planet…The challenge now is to create economies – local to global – that help to bring all of humanity into the Doughnut's safe space.[225]

Developing an alternative economic theory to the prevailing neoclassical economics theory that underpins also the current global economy of plastics is a difficult task even for economists themselves. Therefore, this dissertation settles in acknowledging this debate and highlights its significance regarding solutions to the global plastics problem.

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221 CW Gattringer, 'A Revisited Conceptualization of Plastic Pollution Accumulation in Marine Environments: Insights from a Social Ecological Economics Perspective' (2018) 96 Marine Policy. 222.

222 C Velis, 'No Circular Economy If Current Systemic Failures Are Not Addressed' (2018) 36 Waste Management and Research 9. 759.

223 See, K Raworth, *Doughnout Economics: Seven Ways to Think Like a 21st Century Economist* (Penguin Random House Business 2011).

224 C Velis, 'No Circular Economy If Current Systemic Failures Are Not Addressed' (2018) 36 Waste Management and Research 9. 759.

225 K Raworth, *Doughnout Economics: Seven Ways to Think Like a 21st Century Economist* (Penguin Random House Business 2011) 10, 11, 25, 28.

Another problem area that had to be placed outside the scope was human rights and social justice issues in the context of the global plastics problem. Such issues seek to develop

> [u]nderstanding of the social and economic impacts of marine pollution to identify vulnerable groups facing limited access to ecosystem services, or threats to their health or livelihoods. This includes coastal communities dependent on fisheries who suffer economic losses and health impacts from damaged fishing gear and contaminated seafood products; and informal waste pickers exposed to health and safety risks whose livelihoods depend on access to valuable plastic waste resources.[226]

Research on human rights and social justice issues with MPP is still marginal and would have presented interesting and important viewpoints. However, given that the approach in this research is already broad, this was not feasible. Thus it suffices to note that this area requires more research and would diversify environmental law and the CE discussions on the topic.

The exclusion of both social aspects and economic theorizing in relation to the global plastics problem signifies that the approach taken is merely environmental. Due to these choices, this research only investigates one objective relevant to sustainable development; environmental protection. In the absence of the other two objectives – economic development and growth and social equity – it is not possible to present a balanced view of how sustainable development relates to constructing an international legal response to the global plastics problem.[227] Therefore the role of the sustainable development principle/concept in this study remains limited.

[226] UNEP and COBSEA, 'A Human Rights-Based Approach to Preventing Plastic Pollution' (2019) Issue Brief 1. 2.
[227] See, WCED, 'Our Common Future' (1987) UN Doc A/42/427. ('Brundtland Report'); See also, section 10.1.3 'The Relationship between Global Circular Economy of Plastics and Sustainable Development'

PART II – PLASTICS LEAKAGE TO THE MARINE ENVIRONMENT: INTERNATIONAL LEGAL MEASURES OF POLLUTION PREVENTION

CHAPTER 3 – SCIENTIFIC AND LEGAL FOUNDATION FOR PLASTICS LEAKAGE PREVENTION

3.1 INTRODUCTION

Is zero-leakage of plastics to the environment an achievable goal in the future? Such objective is not currently outlined in any policy document. However, science provides an approximate global reduction target for States to achieve zero-leakage.[228] Science is also clear that plastics leakage prevention efforts should focus on mismanaged plastics wastes in coastal communities and along major river systems, as well as enforcing prohibitions on discarding plastics from maritime activities.[229] Streamlining these signposts into a concerted global effort toward minimum leakage requires input from international law. To date, IEL has responded to some scientific discoveries in relation to plastics leakage. Dumping of plastics wastes has been prohibited since the entry into force of the London Convention, MARPOL Annex V was revised to better address plastics leakage from ships following the discovery of widespread MPP in the oceans and their accumulation in the gyres, and several soft law instruments provide guidance to address land-based marine litter. Consequently, States do not need to start from scratch but can build on and combine existing efforts to construct an international legal response to plastics leakage which focuses on filling the gaps and developing new measures that complement existing efforts. This Part II embarks on describing, analyzing and envisioning a streamlined response of international law that guides States towards preventing transboundary harm from plastics leakage in the oceans, contributing to minimum leakage of plastics to the environment.

3.2 UNRAVELLING THE FIRST SUB-RESEARCH QUESTION

> To prevent transboundary and global harm from plastics leakage to the marine environment, what does international law currently require of States, and how should these existing international legal measures be further developed and complemented?

The first sub-research question consists of three clauses, each of which will addressed in Part II. The first clause expresses the problem dealt with in Part II, 'transboundary and global harm from plastics leakage to the marine environment'. The sub-chapter 3.3, 'Framing the Problem: Plastics Leakage to

[228] JR Jambeck et al., 'Plastic Waste Inputs from Land into the Ocean' (2015) 347 Science 6223; SB Borrelle et al., 'Predicted Growth in Plastic Waste Exceeds the Efforts to Mitigate Plastic Pollution' (2020) 369 Science 6510.
[229] UN Environment, 'Addressing Marine Plastics: A Systemic Approach – Stocktaking Report' (2018) 22.

the Marine Environment', will provide a description of the problem that Part II targets. The purpose of describing the problem first is to provide a transparent evaluation of plastics leakage to the marine environment, which functions on two levels. First, it describes which elements of the global plastics problem Part II deals with. The global plastics problem has a myriad of causes, features and impacts and it is impossible to address all of them in one legal dissertation. Therefore, to place this study in a wider context of research aiming at finding solutions to plastics leakage, it is crucial to describe the elements of the problem this part focuses on. And second, it is also necessary to align which legal measures address or have the potential to address the described part of the problem. Though separately presented in their own chapters, the problem description and the chosen legal measures in Part II are the result of an interactive evaluation process: the acquired knowledge of the problem helped to evaluate which measures target it, and likewise the acquired knowledge of the international legal framework and further legal measures was useful when delimiting which parts of the problem belong to the problem description. Providing transparency and alignment between problems and legal measures are the underlying objectives of this dissertation and these themes are present in each of the three main parts.

The first clause also provides the objective of the sub-research question 'to prevent transboundary and global harm from plastics leakage to the marine environment'. After describing the problem at hand, the rest of Part II focuses on a multitude of ways to regulate prevention of plastics leakage, particularly to avoid transboundary and global harm in the marine environment.

The second clause of the sub-research question, 'what does international law currently require of States', is the focus of the sub-chapter 3.4, 'International Legal Basis to Prevent Plastics Leakage to the Marine Environment', and Chapter 4 – 'Mapping and Analysis of the Current International Legal Framework Applicable to the Plastics Leakage to the Marine Environment'. The sub-chapter 3.4 provides an analysis of the sources of international law that form the foundation and justification for plastics leakage prevention measures in Part II. The selected principles of international law provide the value basis and direction for the international preventive approach, as well as general guidance and interpretative support for the application of the more detailed instruments. Chapter 4 identifies and maps the current international legal framework applicable to the prevention of plastics leakage to the oceans and analyses how it could be improved.

The third clause of the sub-research question, 'and how should these existing international legal measures be further developed and complemented?' is the focus of Chapter 5 – 'Further Legal Measures to Prevent Plastics Leakage to the Marine Environment'. Chapter 5 moves beyond what Chapter 4 identifies as the current international legal framework, and discusses further legal measures to add to the current toolbox of the plastics leakage prevention approach on a global level. Chapter 5 analyses these further legal measures in two phases. First, it focuses on measures that could be adopted regionally in a more coordinated manner to complement and strengthen the current international prevention efforts. Second, Chapter 5 analyses what would be the added value of a new treaty on plastics with regards to preventing plastics leakage to the marine environment. Chapter 5 also gathers the main findings of Part II as preliminary conclusions, which will then be combined and further developed in Part V – Conclusions.

3.3 Framing the Problem: Plastics Leakage to the Marine Environment

In Part II, the problem definition is plastics leakage to the marine environment. The definition entails situations in which plastics wastes are leaking, or in danger of leaking, to the oceans or items containing plastics are lost, or in danger of being lost, in the marine environment during use. The problem definition refers to 'plastics' and 'plastics wastes' in the plural to highlight the variety of different types of plastics. The word 'leakage' denotes to any intentional (eg, littering) or unintentional activities involving plastics (eg, plastic waste blown to the ocean by wind from an unsanitary landfill), which result in plastics pollution in the oceans. 'Marine environment' refers to the natural environment located in any of the maritime zones within and beyond national jurisdiction. Plastics leakage can happen in all parts of the oceans, as well as from land to oceans or from rivers to oceans.

The risk of transboundary MPP within and beyond national jurisdiction makes plastics leakage to the marine environment a matter of global concern and international law.[230] MPP can cross national maritime boundaries and spread to areas beyond national jurisdiction due to the durability and buoyancy of plastics materials which enable them to travel far from their original source.[231] Furthermore, MPP may even threaten Earth-system processes globally. MPP already meets two of the three conditions for a chemical pollution planetary boundary due to being irreversible and globally ubiquitous. The only question that remains is whether the ecological consequences of MPP are

[230] Global concern is used here as a general characterization, and not as a synonym for the term 'common concern of humankind'. However, UN Environment, and Sidhu and Desai have advocated that MPP should be considered as a 'common concern of humankind'. See, UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) x, xii; BK Sidhu and BH Desai, 'Plastics Pollution: A New Common Concern of Humankind?' (2018) 48 Environmental Policy and Law 5. 254.
[231] PG Ryan et al., 'Monitoring the Abundance of Plastic Debris in the Marine Environment' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences. 1999.

established well enough that it would also meet the third condition, and thus affect the Earth System.[232]

Defining the problem as plastics leakage to the marine environment signifies that the problem is framed as a waste management problem and as an environmental problem – that is, the problem is approached from those contexts that are closest to the situations of plastics leaking to the oceans. Plastics leakage is partly a waste management issue, because waste management practices are traditionally the last possibility of intervention before waste leaks to nature and becomes an environmental problem. The final disposal options of plastic wastes, namely, incineration (12%) or landfill/environment (60%), currently constitute the main means to deal with plastics wastes globally.[233] Furthermore, mismanaged waste is the most likely reason for both macroplastics and secondary microplastics ending up in the oceans.[234] These realities reveal the enormous pressures that plastics wastes are putting on national waste management systems. The problem is also environmental because of the impacts of plastic pollution on nature and wildlife after the leakage. The negative impacts that plastics have in the environment provide the motivation and reason for prevention measures under international environmental law.[235]

Framing the problem as a waste management and environmental issue means that Part II deals with downstream activities: the focus is merely on prohibiting plastics ending up in the oceans. Knowledge of the volumes, sources, pathways and impacts on the environment are essential to evaluate and improve legal preventive measures targeting downstream activities that relate to littering, final disposal of plastics wastes (incineration, landfill) and mismanagement of plastics wastes.

The exact amount of plastics leakage to the oceans is unknown.[236] However, modeling studies provide estimates of plastics leakage volumes. Jambeck et al. estimate that plastics wastes inputs from land to

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232 P Villarrubia-Gómez et al., 'Marine Plastic Pollution as a Planetary Boundary Threat – The Drifting Piece in the Sustainability Puzzle' (2018) 96 Marine Policy. 213, 217; For an overview of the three conditions to determine a chemical pollution planetary boundary ("the chemical pollution has a disruptive effect on a vital Earth system process[,] the disruptive effect is not discovered until it is, or inevitably will become, a problem at the planetary scale[, and] the effects of the pollution in the environment cannot be readily reversed"), and M MacLeod et al., 'Identifying Chemicals That Are Planetary Boundaries Threats' (2014) 48 Environmental Science & Technology 19. 11057; See also, LM Persson et al., 'Confronting Unknown Planetary Threats from Chemical Pollution' (2013) 47 Environmental Sciences & Technology 22; The concept of planetary boundaries for establishing a safe space for humanity with respect to the Earth System was introduced by J Rockström et al., 'Planetary Boundaries: Exploring the Safe Operating Space for Humanity' (2009) 14 Ecology and Society 2.

233 R Geyer et al., 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances 7. 3.

234 UN Environment, 'Mapping of Global Plastics Value Chain and Plastics Losses to the Environment (with a Particular Focus on Marine Environment)' (2018) 52; J Boucher and D Friot, 'Primary Microplastics in the Oceans: a Global Evaluation of Sources' (IUCN 2017) 13.

235 These impacts of plastics are discussed in more detail in sub-chapter 6.3 'Framing the Problem: Plastics Pollution in the Marine Environment' in Part III.

236 UN Environment, 'Addressing Marine Plastics: A Systemic Approach – Stocktaking Report (2018) 22.

ocean are 4.8-12.7 million metric tons (Mt) yearly.[237] Ryberg at al. evaluate that the total losses to the environment amount to 8.28 Mt per year, an unknown fraction of which goes to the oceans.[238] Assuming that approximately 8 Mt more plastics end up in the ocean each year – and assuming the business-as-usual model continues – that would mean that, by weight, the oceans would have more plastic than fish in them by 2050.[239] Such comparison provides a scale against which to contemplate the severity of the problem. However, the detected amounts of plastics in the oceans and the estimated amounts of plastics entering the oceans have significant disparities, which may indicate "over-estimation of waste leaked to the ocean and a higher degree of accumulation of plastic on land."[240] It could also indicate that a significant fraction of plastics pollution sinks or beaches, or that plastics accumulation at the sea surface is underestimated.[241] The volume of plastics leakage to the oceans annually is nevertheless already substantial, and only projected to increase, though some disparities remain between detected and estimated numbers. It can be argued that the scientific basis for action under international law is thus well established by these estimations.

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[237] JR Jambeck et al., 'Plastic Waste Inputs from Land into the Ocean' (2015) 347 Science 6223. 768.

[238] UN Environment, 'Mapping of Global Plastics Value Chain and Plastics Losses to the Environment (with a Particular Focus on Marine Environment) (2018) 12, 52.; See Figure 3. Sources of Plastic Losses and the Environmental Compartments to Which the Plastics are Lost. (below)

[239] World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, 'The New Plastics Economy – Rethinking the Future of Plastics' (2016) 17.

[240] UN Environment, 'Addressing Marine Plastics: A Systemic Approach – Stocktaking Report' (2018) 26; See also, KL Law, 'Plastics in the Marine Environment' (2017) 9 Annual Review of Marine Science. 213.

[241] The Ocean Cleanup, 'Chasing Plastics: How to Close the Ocean Plastic Mass Balance' (2019) https://theoceancleanup.com/updates/chasing-plastics-how-to-close-the-ocean-plastic-mass-balance/

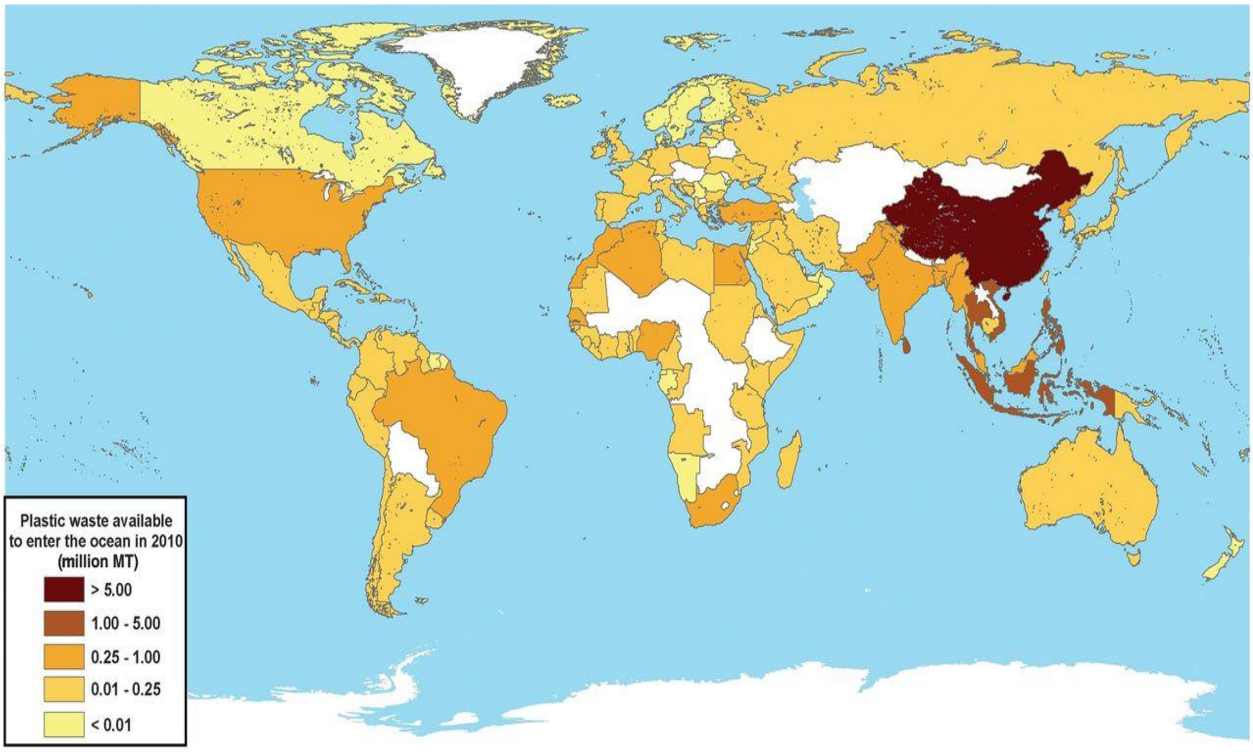

Fig. 4 Global map with each country shaded according to the estimated mass of mismanaged plastic waste [millions of metric tons (MT)] generated in 2010 by populations living within 50 km of the coast.[242]

Sources of plastics leakage vary greatly regionally, nationally and locally, and depend on various factors and transport routes present to deliver plastics into the ocean.[243] These variations can guide targeting particularly short-term preventive action to control plastics leakage in States and regions where the situation is the most severe, notably Asia. However, it should be noted that global waste trade has most likely affected these geographical variations. Developed States have for years traded their plastics wastes to developing States, which has increased pressures for waste management in these areas. Thus plastics leakage to the marine environment in developing States in the South may not have been originally generated in them. The chart below describes recent waste trade flows, which demonstrate clearly the direction of waste trade from developed States in the North to developing States in the South.

[242] JR Jambeck et al., 'Plastic Waste Inputs from Land into the Ocean' (2015) 347 Science 6223. 769.
[243] UN Environment, 'Addressing Marine Plastics: A Systemic Approach – Stocktaking Report' (2018) 22.

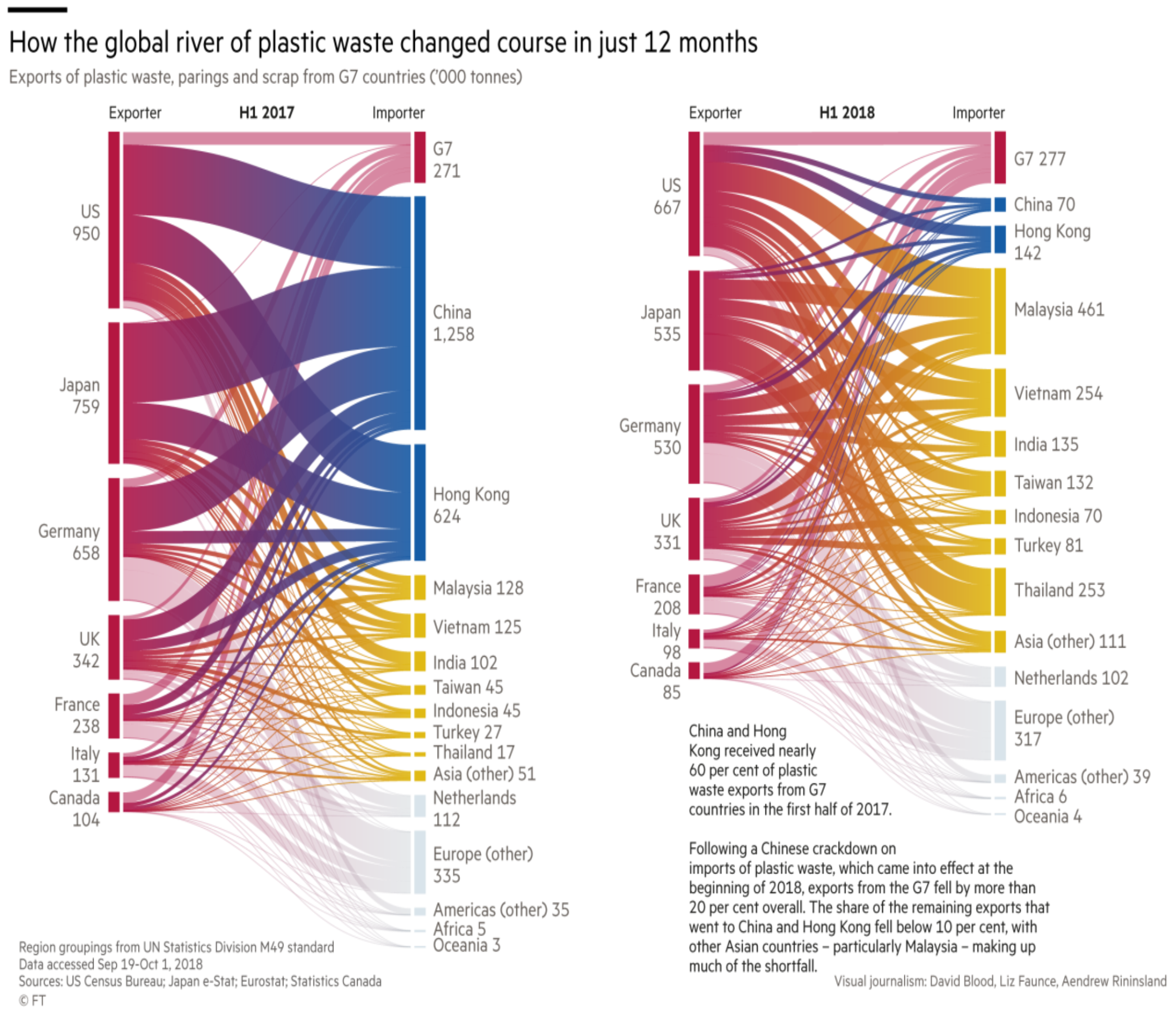

Fig. 5 How the global river of plastic waste changed course in just 12 months: exports of plastic waste, parings and scrap from G7 countries.[244]

Sources of plastics leakage can be categorized in multiple ways. MPP can be characterized merely as macro- or microplastics pollution based on its size, or plastics leakage can categorized to originate from land, vessels, dumping, rivers or atmosphere, based on its leakage point to the oceans.[245] Plastics leakage can be further subdivided into smaller categories, such as source sectors, product types, or polymer types. Ryberg et al. estimate that macroplastics form 64% of the losses and microplastics 36% globally.[246] The seven main source sectors of primary microplastics are tires, synthetic textiles, marine coatings, road markings, personal care products, plastic pellets and city dust.[247] Mismanaged

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[244] L Hook and J Reed, 'Why the World's Recycling System Stopped Working (Financial Times Magazine Environment, 25 October 2018) https://www.ft.com/content/360e2524-d71a-11e8-a854-33d6f82e62f8

[245] For example, the regulation in the LOSC is based on these leakage points as sources of marine pollution.

[246] UN Environment, 'Mapping of Global Plastics Value Chain and Plastics Losses to the Environment (with a Particular Focus on Marine Environment)' (2018) 52.

[247] J Boucher and D Friot, 'Primary Microplastics in the Oceans: a Global Evaluation of Sources' (IUCN 2017) 10, 12, 13.

waste accounts for 73.4% of the total macroplastics loss.[248] Secondary microplastics mostly originate from mismanaged waste.[249]

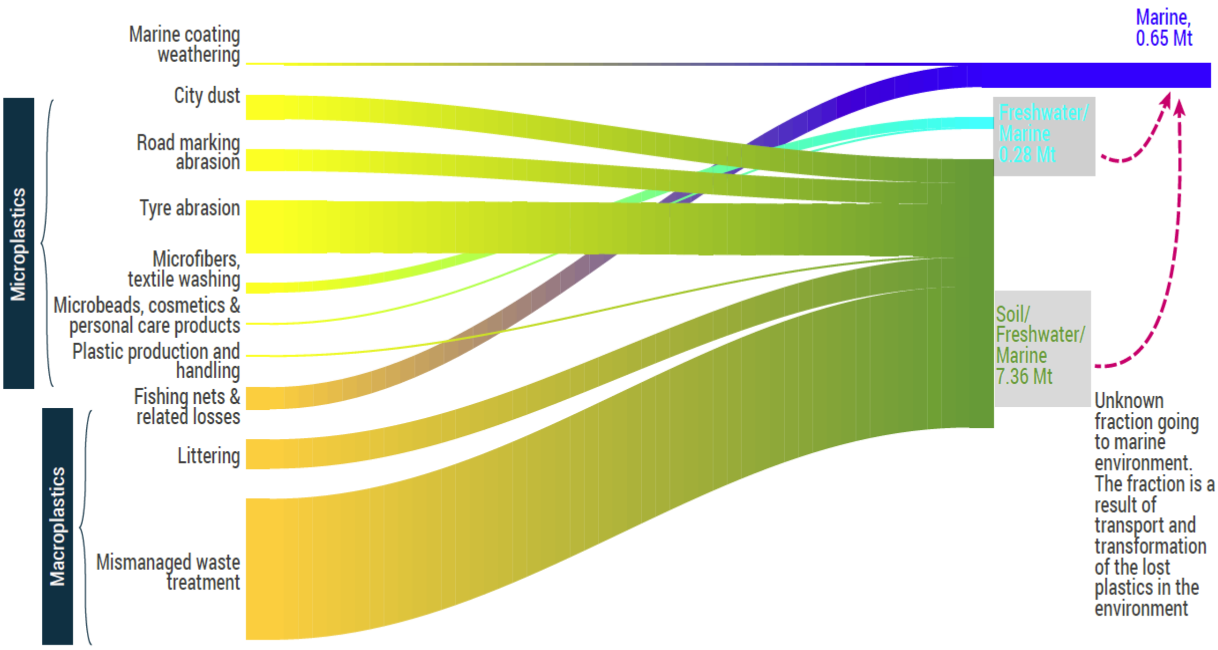

Fig. 6 Sources of plastic losses and the environmental compartments to which the plastics are lost.[250]

Though not fit-for purpose for assessing and explaining local plastics leakage variations, global models are nevertheless useful to obtain a broad overview.[251] The level of specificity regarding categorizations, and action based on it, depends on which geographical scope is selected. It is possible to be more specific on a local level than on a global one. As this study focuses mostly on a global level – and to some extent a regional level – the approach needs a level of generality and uses vessels, dumping, land and rivers as the main source categories for plastics leakage. In addition, the research is guided by the main divisions of between macro- and microplastics and their source sectors.

The transport routes, or pathways, refer to how plastics losses become releases to the oceans.[252] Plastics enter the oceans via a few major pathways: coastal communities, maritime activities, and major river systems.[253] Literature often asserts that 80% of pollution comes from activities on land, and 20%

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[248] UN Environment, 'Mapping of Global Plastics Value Chain and Plastics Losses to the Environment (with a Particular Focus on Marine Environment)' (2018) 52.
[249] J Boucher and D Friot, 'Primary Microplastics in the Oceans: a Global Evaluation of Sources' (IUCN 2017) 13.
[250] UN Environment, 'Mapping of Global Plastics Value Chain and Plastics Losses to the Environment (with a Particular Focus on Marine Environment)' (2018) 12.
[251] AE Schwarz et al., 'Sources, Transport and Accumulation of Different Types of Plastic Litter in Aquatic Environments: A Review Study' (2019) 143 Marine Pollution Bulletin. 97.
[252] J Boucher and D Friot, 'Primary Microplastics in the Oceans: a Global Evaluation of Sources' (IUCN 2017) 38.
[253] UN Environment, 'Addressing Marine Plastics: A Systemic Approach – Stocktaking Report' (2018) 22.

from activities at sea.[254] However, "this figure is not well substantiated and does not inform the total mass of debris entering the marine environment from land-based sources."[255] Furthermore, in the absence of quantitative data on, eg, the loss of discarded fishing nets or input from natural disasters, sea-based sources of MPP may be underestimated. Eunomia assesses that sea-based sources can potentially form 10-30% of MPP globally.[256] Accidentally lost or intentionally left behind fishing gear, aquaculture gear lost to sea and shipping accidents contribute most to sea-based MPP.[257] Knowing the major pathways and roughly the division between contributions from land- and sea-based sources provides useful general guidance for action on a global level. The efforts should stress land-based plastics leakage from coastal communities, particularly mismanaged plastics wastes, as well as the main contributing sectors of maritime activities.

In addition, the plastic losses via major river systems should be addressed. Modeling studies indicate that plastics from river systems are a major threat to the marine environment.[258] Lebreton et al. calculated "that between 1.14 and 2.41 million tons of plastic waste are estimated to flow from rivers into the ocean each year."[259] Only six out of the thousand most polluting rivers are located in Europe or North-America. The rest are in Central and South America, Africa, and Asia, and 15 out of the 20 most polluting rivers in the world are located in Asia.[260] Moreover, many of the world's largest and most heavily polluted watercourses are international, such as the Ganges-Brahmaputra-Meghna, the Amazon and the Mekong, which highlights the highly transboundary nature of the plastics leakage problem that is not limited to oceans.[261]

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254 UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 23.

255 JR Jambeck et al., 'Plastic Waste Inputs from Land into the Ocean' (2015) 347 Science 6223. 768, 770.

256 C Sherrington et al., 'Study to Support the Development of Measures to Combat a Range of Marine Litter Sources' (Eunomia Research & Consulting Ltd 2016) 248; K Richardson et al. attempt "to provide the first statistically rigorous, quantitative gear loss estimates for major gear types around the world", however, their estimates are by percentage per fishing gear type and not by weight, which makes it difficult to estimate fishing gear's share of all MPP. See, K Richardson et al. 'Estimates of Fishing Gear Loss Rates at a Global Scale: A Literature Review and Meta-Analysis' (2019) 20 Fish and Fisheries 6. 1219, 1229.

257 UN Environment, 'Addressing Marine Plastics: A Systemic Approach – Stocktaking Report' (2018) 22; UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 44, 45.

258 C Schmidt et al., 'Export of Plastic Debris by Rivers into the Sea' (2017) 51 Environmental Science & Technology 21. 12246, 12252; C Schmidt et al. 'Correction to Export of Plastic Debris by Rivers into the Sea' (2018) 52 Environmental Science & Technology 2; LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications. 3.

259 LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications. 1.

260 The analysis was done by using an interactive map that has modelled riverine inputs of plastics (based on LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications), see The Ocean Cleanup, 'River Plastic Emissions to the World's Oceans' https://www.theoceancleanup.com/sources/

261 The Ocean Cleanup, 'River Plastic Emissions to the World's Oceans' https://www.theoceancleanup.com/sources/; LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications. 3.

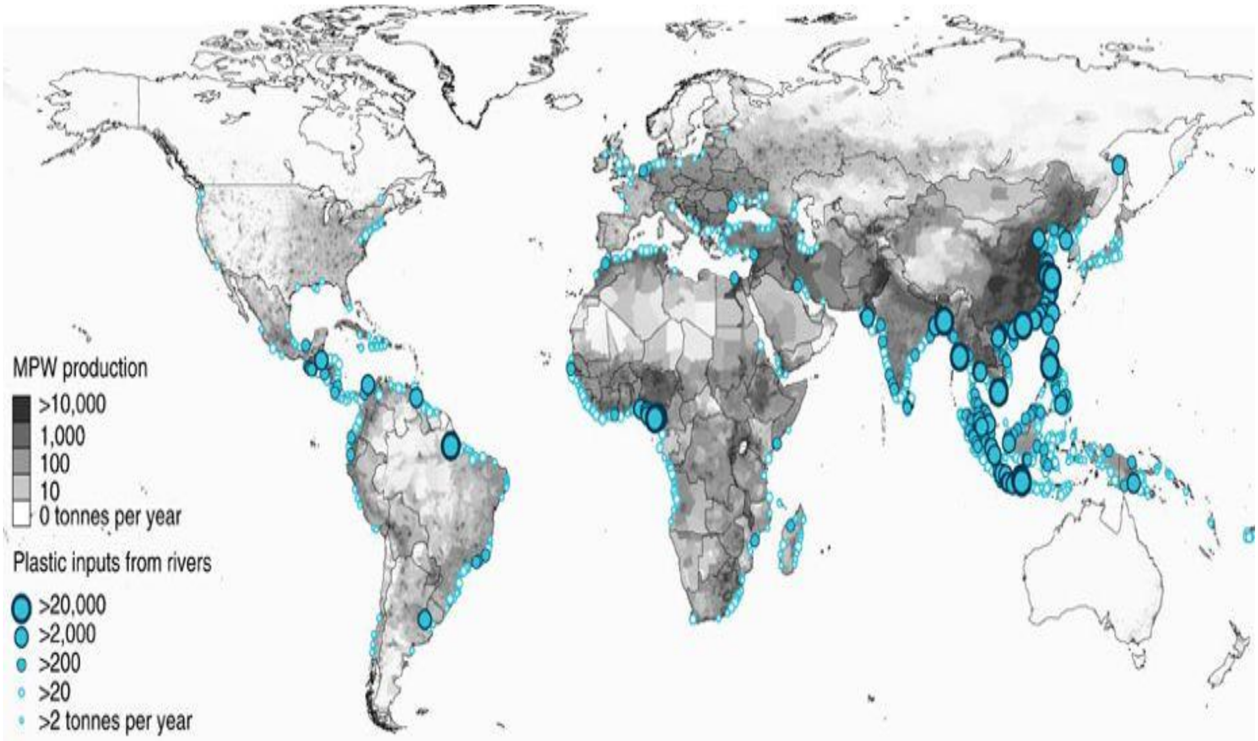

Fig. 7 Mass of river plastic flowing into oceans in tons per year.[262]

Understanding the amounts of plastic wastes and plastics entering the oceans each year highlights the urgency of preventive action. The main sources and source categories, and the pathways of plastics are crucial to steering the prevention efforts on global and regional levels. Scientific research from different fields has to date provided a solid basis to guide international efforts at preventing plastics leakage more effectively. The following legal analysis of international law is constructed on these scientific premises.

3.4 The International Legal Basis to Prevent Plastics Leakage to the Marine Environment

The current international legal framework lacks a specific legal obligation to prevent plastics leakage to the marine environment. However, public international law does provide more general obligations and principles to protect the oceans, which are also applicable to the prevention of plastics leakage. Applicable general principles of international law and IEL lay out common obligations and values of the international community with regards to the legal foundation of plastics leakage prevention. The most important of these principles in this context are the no-harm rule, the prevention principle, and the CBDR. Furthermore, the LOSC provides a framework and general obligations concerning

[262] LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications. 2.

protection of the marine environment. These principles and framework obligations provide the general legal foundation and interpretation guidance for the more specific instruments of international law applicable to plastics leakage.

The no-harm rule provides the most traditional legal foundation for pollution prevention:[263]

> States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or areas beyond the limits of national jurisdiction.[264]

The no-harm rule is a well-established rule of customary international law.[265] It is also well-established that this obligation not to cause transboundary harm is of due diligence in nature, that is, an obligation of conduct rather than result.[266] The no-harm rule has a long tradition in international law.[267] The *Trail Smelter Case* first established that no State has the right to use or permit the use of its territory in a manner that causes injury to another State.[268] The ICJ further developed the general rule in *the Corfu Channel Arbitration,* and recognized it in an environmental context in its advisory opinion on the *Legality of the Threat or Use of Nuclear Weapons* and the *Pulp Mills on the River Uruguay* case.[269] Furthermore, multiple multilateral treaties and soft law instruments refer the no-harm rule.[270] Consequently, the no-harm rule is binding on all States, be they a coastal or land-locked State. This is particularly valuable regarding plastics leakage prevention. It means that the obligation not to cause transboundary harm is not only relevant between two coastal States with a common maritime boundary, but could also

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263 L-A Duvic-Paoli, 'Fighting Plastics with Environmental Principles? The Relevance of the Prevention Principle in the Global Governance of Plastics' (2020) 114 American Journal of International Law Unbound. Symposium on Global Plastic Pollution. 195.
264 Principle 21, the United Nations Conference on Human Environment, 'Declaration of the United Nations Conference on the Human Environment' (Adopted 16 June 1972) UN Doc A/CONF.48/14/Rev.1 ('Stockholm Declaration'); Principle 2, the United Nations Conference on Environment and Development, 'Rio Declaration on Environment and Development' (Adopted 14 June 1992) UN Doc A/CONF.151/26 (Vol I) ('Rio Declaration').
265 See eg, P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009) 137; and P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 206.
266 *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)* (Judgment) [2010] ICJ Reports 2010. 69, para. 197; *Responsibilities and Obligations of States with respect to Activities in the Area* (Advisory Opinion) [2011] ITLOS Reports 2011. 43-44, paras 117-120.
267 See eg, P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009) 137; and P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 206.
268 *Trail Smelter Arbitration (United States v Canada)* (Award of 11 March 1941) III UNRIAA. 1965.
269 I Plakokefalos, 'Prevention Obligations in International Environmental Law' (2012) 23 Yearbook of International Environmental Law 1. 4; *The Corfu Channel Case (UK v Albania)* (Merits) [1949] ICJ Rep 1949. 22; *Legality of the Threat or Use of Nuclear Weapons* (Advisory Opinion) [1996] ICJ Reports 1996. 241-242, paras 27, 29; *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)* (Judgment) [2010] ICJ Reports 2010. 68, para 193.
270 Art 194(2), the LOSC; Art 7, Convention on the Law of the Non-Navigational Uses of International Watercourses (Adopted 21 May 1997, entered into force 17 August 2014) 2999 UNTS ('UNWC'); Principle 21, the United Nations Conference on Human Environment, 'Declaration of the United Nations Conference on the Human Environment' (Adopted 16 June 1972) UN Doc A/CONF.48/14/Rev.1 ('Stockholm Declaration'); Principle 2, the United Nations Conference on Environment and Development, 'Rio Declaration on Environment and Development' (Adopted 14 June 1992) UN Doc A/CONF.151/26 (Vol I) ('Rio Declaration').

have relevance in interactions between coastal States that do not share a maritime boundary or between coastal and riparian States.

The well-established binding legal status of the no-harm rule communicates that the international community values exploitation of natural resources only to the extent that these activities do not threaten the natural environment in other States' territories. However, the due diligence nature of the no-harm rule further pinpoints that this value is not absolute: some degree of degradation of the natural environment is accepted and allowed also in a transboundary context in the name of economic activity. Therefore, under the no-harm rule, plastics leakage to the oceans is acceptable as long as it does not cause transboundary harm above an agreed threshold under international law.

However, the no-harm rule "cannot provide an adequate response on its own."[271] The principle of prevention is closely related to the no-harm rule, as it "has evolved to encompass not only the negative duty to be established by that [no-harm] rule, but also a positive duty emphasizing the expected proactivity of states in the face of risk."[272] The main differences between the no-harm rule and prevention principle are that the prevention principle applies to all environmental spaces, not only to transboundary ones, and aims to protect the environment as a goal in itself. The prevention principle seeks primarily to prevent environmental harm, whereas the no-harm rule seeks primarily to prevent transboundary harm.[273] Therefore, the prevention principle complements the no-harm rule by extending the protection measures to also concern areas under national jurisdiction and beyond national jurisdiction (in addition to transboundary spaces between States) and by embracing a more proactive approach to prevent environmental risks.

Prevention is a multifaceted principle which incorporates many dimensions:

> The requirement to prevent harm is complex owing to the number and diversity of the legal instruments in which it appears. It can perhaps better be considered an overarching aim that gives rise to a multitude of legal mechanisms, including prior assessment of environmental harm and procedures to license or authorize hazardous activities, including setting the conditions for operation and the consequences of violations. Emission limits and other product or process standards, the use of best available techniques (BAT), and similar techniques can all be seen as applications of the principle of prevention. Prevention also can involve the elaboration and adoption of overarching strategies and policies.[274]

[271] L-A Duvic-Paoli, 'Fighting Plastics with Environmental Principles? The Relevance of the Prevention Principle in the Global Governance of Plastics' (2020) 114 American Journal of International Law Unbound. Symposium on Global Plastic Pollution. 196.
[272] *Ibid.* 197.
[273] P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 212.
[274] AC Kiss and D Shelton, *Guide to International Environmental Law* (Martinus Nijhoff Publishers 2007) 91.

The prevention principle applies to known environmental risks and "given the effects of marine pollution by plastic are documented, the application of this principle is evident".[275] The prevention principle has obtained near consensus of being a norm of customary international law and is also recognized to be of due diligence in nature.[276] As mentioned in the above quote, the prevention principle also provides related legal mechanisms, such as prior notification or environmental impact assessments (EIAs). The international courts and tribunals have used these legal mechanisms as means to evaluate whether a State is complying with its due diligence obligations to prevent environmental harm.[277] Furthermore, "the principle of prevention, through its due diligence standard, acts as a "legal connector"[278] that brings coherence to international legal frameworks and clarifies existing state duties in the face of plastics harm".[279] Both the principle of prevention and the no-harm rule allow plastics leakage to the oceans, as long as a State has fulfilled its due diligence obligations under them.

The LOSC provides the current international legal framework to further regulate the issue of plastics leakage. Applying the provisions of the LOSC to plastics leakage and marine plastics pollution requires that the definition of pollution in the LOSC covers MPP. Pursuant to Article 1(1)(4) of the LOSC, "pollution of the marine environment",

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

The LOSC definition provides three elements that match MPP: the anthropogenic origin of the substance, the direct and indirect sources, and deleterious environmental, economic and health impacts. Therefore, MPP can be argued to belong under the broad definition of pollution in the LOSC.[280] Economic activities and human behavior cause MPP. This can be direct, for example by

[275] A Stöfen-O'Brien, *The International and European Legal Regime Regulating Marine Litter in the EU* (Nomos Verlagsgesellschaft 2015) 76.

[276] L-A Duvic-Paoli, *The Prevention Principle in International Environmental Law* (Cambridge University Press 2018) 95; *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)* (Judgment) [2010] ICJ Reports 2010. 45, para 101

[277] M Jervan, 'The Prohibition of Transboundary Environmental Harm. An Analysis of the Contribution of the International Court of Justice to the Development of the No-Harm Rule' (2014) PluriCourts Research Paper No. 14-17. 94

[278] E Scotford, 'Environmental Principles Across Jurisdictions: Legal Connectors and Catalysts' in E Lees and J Vinuales (eds) *Oxford Handbook of Comparative Environmental Law* (Oxford University Press 2018) 651, 653.

[279] L-A Duvic-Paoli, 'Fighting Plastics with Environmental Principles? The Relevance of the Prevention Principle in the Global Governance of Plastics' (2020) 114 American Journal of International Law Unbound. Symposium on Global Plastic Pollution. 197.

[280] A Stöfen-O'Brien, *The International and European Legal Regime Regulating Marine Litter in the EU* (Nomos Verlagsgesellschaft 2015) 95.

dumping plastics wastes to the ocean, or indirect, for example by disposing plastics wastes in dumps close to river banks where it leaks to rivers and eventually reaches the ocean. MPP has negative effects on living resources and marine life, particularly due to ingestion and entanglement.[281] MPP can cause hazards to human health particularly due to the plastics' chemical properties.[282] MPP can hinder marine activities, impair the quality of seawater and reduce amenities provided by the oceans for example by causing navigation hazards, affecting tourism by reducing the aesthetic value of beaches, or by getting caught in fishing nets and reducing the catch.[283]

The general obligations to protect the marine environment stem from Part XII of the LOSC. Article 192 reads that "States have the obligation to protect and preserve the marine environment." This obligation is a rule of customary international law:

> In addition to their status as conventional obligations binding on States parties to the Convention, articles 192 and 193 are generally regarded as statements of customary international law on the extent of the environmental responsibility of States towards the oceans. The mandatory language used in the two provisions reflects the importance placed upon the issue by the international community: a State breaching its obligation to protect and preserve the marine environment would be in breach of international law.[284]

The obligation to protect the marine environment as a rule of international customary law is further evidenced by its implementation via regional treaties and other multilateral agreements.[285] Article 192 is a combination of a positive obligation to take active measures to protect and preserve the marine environment and a negative obligation not to degrade the marine environment. The obligations concern both present and future conditions.[286] Article 192 establishes the primary obligation of States to protect the oceans and "the general standards and the framework within which a much more complex and wide ranging structure of powers and duties must operate."[287]

The obligation to protect the marine environment from plastics leakage derives from the general obligation of Article 192 of the LOSC. Multilateral agreements with wide participation, especially the

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281 See eg, S Kühn et al., 'Deletorius Effetcs of Litter on Marine Life' in M Bergmann et al. (eds) *Marine Anthropogenic Litter* (Springer 2015) 78, 85, 92, 96.
282 See eg, CIEL, 'Plastic & Health: The Hidden Costs of a Plastic Planet' (2019) 54-55.
283 See, UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 105, 108.
284 UNGA 44th Session, 'Law of the Sea: Protection and Preservation of the Marine Environment' (1989) Report of the Secretary General. UN Doc A/44/461. 10, para 29.
285 P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009) 387; See also, K Raubenheimer, 'Towards an Improved Framework to Prevent Marine Plastic Debris, (Doctor of Philosophy Thesis, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong 2016) 93; CJ Joyner and S Frew, 'Plastic Pollution in the Marine Environment´ (1991) 22 Ocean Development and International Law 1. 54.
286 Y Tanaka, 'The South China Sea Arbitration: Environmental Obligations under the Law of the Sea Convention' (2018) 27 Review of European, Comparative & International Law 1. 91.
287 D Czybulka, 'Article 192 General Obligation' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017) 1279.

MARPOL Convention and the London Convention and Protocol, further indicate support for the LOSC provisions regarding the duty to protect the marine environment from plastics leakage:

> These international agreements have produced a normative standard for the international community that declares there should be no pollution of the ocean by plastic debris.[288]

Therefore, all States are obliged to protect the marine environment from *inter alia* plastics pollution. Yet the LOSC does not offer detailed measures how to fulfill this obligation. Article 192 needs to be read and interpreted together with "its further development in the subsequent provisions as well as the need to balance it with colliding (and equally legitimate) uses of the sea".[289] The obligation is further refined in Article 194 of the LOSC.[290] The wording of the Article 194(2) reveals that this obligation is one of due diligence:

> States shall take *all measures necessary* to *ensure* that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States and their environment, and that pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with this Convention.[291]

Though the LOSC does not explicitly mention the prevention principle, the obligations stipulated in Articles 192 and 194(2) reflect a version of it.[292]

Unlike many multilateral environmental agreements (MEAs), the LOSC is not a standard framework treaty. Amending it is not easy, and it does not establish a system to adopt further protocols and annexes to develop the regime in the face of new issues and priorities.[293] The LOSC is merely "of a framework nature and contains few detailed norms of environmental protection."[294] The significance of the LOSC as a framework for regulation of plastics leakage is twofold. First, the LOSC entails general due diligence obligations to protect the marine environment from pollution, though the content and standard of due diligence remain unclear regarding plastic leakage prevention. Second, it

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[288] CJ Joyner and S Frew, 'Plastic Pollution in the Marine Environment´ (1991) 22 Ocean Development and International Law 1. 54.
[289] A Proelss, 'The Contribution of the ITLOS to Strengthening the Regime for the Protection of the Marine Environment' in A Del Vecchio and R Virzo (eds) *Interpretations of the United Nations Convention on the Law of the Sea by International Courts and Tribunals* (Springer 2019) 95.; See also, J Harrison, *Saving the Oceans Through Law: The International Legal Framework for the Protection of the Marine Environment* (Oxford University Press 2017) 24.
[290] S Fietta et al., 'The South China Sea Award: A Milestone for International Environmental Law, the Duty of Due Diligence and the Litigation of Maritime Environmental Disputes' (2017) 29 Georgetown Environmental Law Review 4. 731.
[291] Cursives are mine.
[292] R Churchill, 'The LOSC Regime for Protection of the Marine Environment – Fit for the Twenty-First Century?' in R Rayfuse (ed) *Research Handbook on International Marine Environmental Law* (Edward Elgar Publishing Limited 2015) 7.
[293] AE Boyle, 'Further Development of the Law of the Sea Convention: Mechanisms for Change' (2005) 54 International and Comparative Law Quarterly 3. 564.
[294] R Churchill, 'The LOSC Regime for the Protection of the Marine Environment – Fit for the Twenty-First Century?' in R Rayfuse (ed) *Research Handbook on International Marine Environmental Law* (Edward Elgar Publishing Limited 2015) 5.

provides a source-based structure and obligations to address pollution, which to date have guided the legal efforts to prevent, reduce and control plastics leakage.[295]

The source-based structure refers to approaching pollution prevention based on leakage points as opposed to regulating specific substances.[296] Of the categories that the LOSC refers to, land-based pollution, vessel-source pollution and pollution by dumping are relevant for preventing plastics leakage. Under vessel-source pollution and pollution by dumping source categories, the LOSC refers to relevant generally accepted international rules and standards (GAIRAS).[297] However, "the legal framework established by the LOSC has not been filled to the same extent by agreed international and national standards for various sources and pathways of pollution of the marine environment", which is particularly striking when comparing vessel-source pollution with land-based pollution.[298]

The regional differences in plastics leakage call for considering the relevance of the CBDR regarding its prevention. Differential treatment between various groups of States, particularly between developed and developing countries, "constitutes one of the bases of existing international environmental law".[299] However, it should be "acknowledged that the principle does not have a fixed content or clear legal status".[300] Differential treatment derives from notions of fairness and equity, and is enshrined by the CBDR.[301] Principle 7 of the Rio Declaration defines the CBDR:

> States shall co-operate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, states have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.

The CBDR has two main components: allocation of rights and redistribution of resources. Allocation of rights can encompass for example less stringent obligations for particular groups of States, and

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295 A Stöfen-O'Brien, *The International and European Legal Regime Regulating Marine Litter in the EU* (Nomos Verlagsgesellschaft 2015) 98.
296 Arts 207-222, the LOSC; A Stöfen-O'Brien, *The International and European Legal Regime Regulating Marine Litter in the EU* (Nomos Verlagsgesellschaft 2015) 98.
297 AE Boyle, 'Further Development of the Law of the Sea Convention: Mechanisms for Change' (2005) 54 International and Comparative Law Quarterly 3. 564.
298 N Matz-Lück and E Van Doorn, 'Due Diligence Obligations and the Protection of the Marine Environment' (2017) 42 L'Observateur des Nations Unies. 170.
299 P Cullet, 'Differential Treatment in Environmental Law: Addressing Critiques and Conceptualizing the Next Steps' (2016) 5 Transnational Environmental Law 2. 305.
300 T Honkonen, 'The Principle of Common But Differentiated Responsibility in Post-2012 Climate Negotiations' (2009) 18 Review of European, Comparative & International Environmental Law 3. 258.
301 P Pauw et al., 'Different Perspectives on Differentiated Responsibilities: a State-of-the-Art Review of the Notion of Common but Differentiated Responsibilities in International Negotiations' (German Development Institute 2014) Discussion Paper No 6/2014. 6; P Cullet, 'Differential Treatment in Environmental Law: Addressing Critiques and Conceptualizing the Next Steps' (2016) 5 Transnational Environmental Law 2. 310.

redistribution of resources can entail *inter alia* assistance to build capacity in less developed States.[302] Regarding the allocation of rights, Article 194(1) of the LOSC provides that:

> States shall take, individually or jointly as appropriate, all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment from any source, using for this purpose the best practicable means at their disposal and *in accordance with their capabilities,* and they shall endeavour to harmonize their policies in this connection.[303]

This provision can be seen as an expression of differential treatment that would allow for a lower standard for protection of the marine environment from plastics leakage based on capabilities of a State. Regarding redistribution of resources, Articles 202 and 203 of the LOSC provide that developing States have a right to scientific and technical assistance, as well as the allocation of appropriate funds for the purpose of protecting the marine environment from pollution. Though the LOSC does not explicitly endorse the CBDR, these provisions can be seen as support for differential treatment in marine environmental protection from plastics leakage for developing States.

However, recognizing the CBDR and implementing it in the context of plastics leakage should be carefully assessed and tailored to the needs of required solutions to protect the oceans from plastics leakage. Mismanaged waste from developing countries is a major contributor to the global plastics leakage. Therefore, great caution should be exercised in differentiating responsibilities for developing States with respect to plastics leakage prevention from land-based sources. The need for redistributing resources is vital to reinforce plastics leakage prevention in the developing countries, particularly with regard to technical and financial capacity building to improve waste management infrastructure. Furthermore, developed States have exacerbated the pressures on waste management in developing States through waste trade and thus contributed indirectly to the global plastics problem that way. Therefore, they have at least morally a pronounced duty to engage in capacity building efforts in developing countries based on the values of fairness and equity underlying the CBDR.

The no-harm rule, the prevention principle, the CBDR, the general obligations of the LOSC to protect the marine environment, and the source-based obligations of the LOSC to prevent, control and reduce marine pollution provide a strong legal foundation for efforts to regulate plastics leakage to the oceans. However, as the majority of these principles and obligations are of a due diligence nature, it means that they allow activities to cause plastics leakage as long as States take the necessary measures to minimize it. The CBDR can further guide how developed and developing States should

[302] T Honkonen, 'The Principle of Common But Differentiated Responsibility in Post-2012 Climate Negotiations' (2009) 18 Review of European, Comparative & International Environmental Law 3. 257-258.
[303] Cursive is mine.

approach these efforts based on their differing capacities to regulate and comply with the regulations, including considerations for capacity building to strengthen compliance.

Having identified the main scientific features of plastics leakage to oceans and the international legal foundation providing the general direction to tackle this sub-problem, the focus will next turn to investigating in detail international rules on the four source categories (vessels, dumping, land-based and rivers), the content and standard of due diligence regarding plastic leakage prevention, and applicability of procedural obligations.

CHAPTER 4 – THE CURRENT INTERNATIONAL LEGAL FRAMEWORK APPLICABLE TO PLASTICS LEAKAGE TO THE MARINE ENVIRONMENT

4.1 Vessel-Source Plastics Leakage

An estimated 10-30% of MPP globally comes from sea-based sources.[304] Fishing gear is a major contributor to sea-based plastics leakage, because "modern gears are mostly made of non-biodegradable synthetic fibres and can persist in the environment for long periods".[305] Most fishing gear is composed of plastics, such as a nylon, polyester, polyethylene and polypropylene.[306] Therefore, it is the major focus of this sub-chapter on vessel-source plastics leakage, along with other plastics wastes that are generated on board. Other sea-based sources of plastics leakage, excluding dumping that is the main focus of the next sub-chapter, are not part of the analysis.[307] International law provides a set of binding and non-binding instruments to prevent plastics leakage to the marine environment from vessels.

4.1.1 The LOSC Framework for Vessel-Source Plastics Leakage

Pursuant to Article 211(1) of the LOSC, States have an obligation to establish internationals rules and standards to prevent, reduce and control pollution of the marine environment from vessels. The provisions following the main obligation of Article 211(1) on vessel-source pollution are amongst the

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304 C Sherrington et al., 'Study to Support the Development of Measures to Combat a Range of Marine Litter Sources' (Eunomia Research & Consulting Ltd 2016) 248.

305 J Brown and G Macfadyen, 'Ghost Fishing in European Waters: Impacts and Management Responses' (2007) 31 Marine Policy 4. 488.

306 AT Pruter, 'Sources, Quantities, and Distribution of Persistent Plastics in the Marine Environment' (1987) 18 Marine Pollution Bulletin 6B. 307.

307 These excluded sea-based sources of plastics leakage include *inter alia* aquaculture, shipping accidents, or fishing gear losses specifically due to illegal, unreported and unregulated (IUU) fishing. Each of these sources and their linkages to MPP represent important research areas as means to prevent plastics leakage, but are outside the scope of this dissertation due to the methodological choices. The plastics leakage prevention measures that Part II deals with can affect the act of not disposing plastics wastes into the oceans as the final disposal option, but cannot as effectively target accidental losses from aquaculture or shipping, where the losses are an inherent risk of the activity itself and therefore arguably require a different approach to lessen the chance of MPP. This also holds true with regard to accidental fishing gear losses when fishing is legal. Prevention measures relating to fishing gear are equally toothless in the face of accidents due to the nature of the activity that is affected by weather and rough conditions at sea. Lessening the risks of impacts of accidental losses and thus to reducing the problem of ghost fishing, requires that the synthetic materials used in modern fishing gear are replaced with biodegradable materials. However, the discussion of replacing plastics as a material is outside the scope of this dissertation. In IUU fishing, fishing gear is sometimes intentionally dumped to avoid getting caught engaging in illegal activity, and reducing plastics leakage from IUU fishing requires measures to reduce the illegal fishing activities themselves. (UN Environment, 'Addressing Marine Plastics: A Systemic Approach – Stocktaking Report' (2018) 22; UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 44, 45; Global Ghost Gear Initiative, 'IUU and Ghost Gear: What Are the Links?' (31 May 2017) <https://www.ghostgear.org/news/2017/5/31/iuu-and-ghost-gear-what-are-the-links>

most detailed in the LOSC. Moreover, the LOSC provides a framework for even more specific legal instruments that aim to prevent, reduce and control plastics leakage from vessels.[308]

Regarding vessel-source plastics leakage, the LOSC establishes two relevant sets of international rules. First, the LOSC sets out the jurisdictional rules regarding the oceans, and second, it provides a framework for substantive international rules to protect the marine environment from vessel-source pollution.[309] The rights and obligations of States to prescribe and enforce legislation to prevent plastics leakage under the LOSC are the result of combining different maritime zones in the oceans to the jurisdictional capacities of States to function in these zones as a coastal, port or flag State. This section briefly examines these concepts to provide the necessary terminological basis for the analysis that follows on more substantive rules on vessel-source plastics leakage.

The LOSC divides all of the ocean spaces of the world into legal maritime zones. The relevant maritime zones for the prevention of plastics leakage are internal waters, territorial sea, the Exclusive Economic Zone (EEZ), and high seas because the maritime activities that cause vessel-source plastics leakage occur in these zones.[310] A coastal State has full sovereignty over its internal waters and territorial sea, with the exception of the right of innocent passage of foreign States through its territorial sea.[311] In the EEZ, a coastal State exercises sovereign rights "for the purpose of exploring and exploiting, conserving and managing the natural resources".[312] The high seas are open to all States and no State can subject them to claims of sovereignty.[313]

The LOSC or any other global instrument does not define 'a coastal State'. The general understanding of the term is a State with a coastline next to a sea.[314] A coastal State's entitlement to maritime zones derives from its sovereignty over the land territory.[315] Coastal States' interests include protection of the marine environment, however, the extent of the right to regulate and take enforcement measures varies between maritime zones. Pursuant to Article 2(1) of the LOSC, a coastal State has sovereignty

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[308] H Ringbom, 'Vessel-Source Pollution' in R Rayfuse (ed) *The Research Handbook on International Marine Environmental Law* (Edward Elgar Publishing Limited 2015) 106, 107.
[309] See, eg, *Ibid.* 105.
[310] Arts 2, 8, 55, and 86, the LOSC. This does not mean that MPP has no impact on the excluded zones, as unknown proportion of MPP sinks to the seafloor. However, the activities that take place on the continental shelf or the Area do not currently contribute significantly to the plastics leakage problem and are therefore excluded.
[311] Arts 2, 17, the LOSC.
[312] Art 56(1)(a), the LOSC
[313] Art 89, the LOSC.
[314] EJ Molenaar, 'Port and Coastal States' in D Rothwell et al. (eds) *The Oxford Handbook of the Law of the Sea* (Oxford University Press 2015) 280.
[315] *Ibid.* 281.

over its internal waters, its archipelagic waters and its territorial sea.[316] The LOSC provides that a coastal State can proclaim an EEZ.[317] The EEZ is a jurisdictional hybrid zone in which the interests of flag States relating to free navigation are balanced against coastal States interests in regulating and taking enforcement measures against foreign vessels, including in relation to protecting and preserving the marine environment.[318]

The LOSC or any other global instrument does not provide a definition of 'a port State'.[319] Pursuant to Article 11 of the LOSC, "[f]or purposes of delimiting the territorial sea, the outermost permanent harbor works which form an integral part of the harbor system are regarded as forming part of the coast." It follows from this that the outermost parts of harbors serve as the baseline and the port lies landward of the baseline.[320] As the waters on the landward side of the baseline of territorial sea are part of the internal waters of a State, and States have sovereignty over their internal waters, ports thus form part of the sovereign territory of a State.[321] According to customary international law, a port State has full legislative and enforcement jurisdiction over all ships that are in its port.[322] Port State jurisdiction complements coastal and flag State jurisdiction and can help ensure compliance with national and international regulatory efforts relating to *inter alia* marine environmental protection.[323]

Pursuant to Article 91 of the LOSC, "ships have the nationality of the State whose flag they are entitled to fly." Vessels are subject to the primary prescriptive and enforcement jurisdiction of their flag State.[324] The right of navigation is the most important right a flag State enjoys.[325] At the same time, a flag State has the obligation to effectively exercise its jurisdiction *inter alia* in environmental protection matters over these vessels.[326]

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316 However, note that ships of all States enjoy the right of innocent passage through the territorial sea and archipelagic waters. Arts 17 and 52(1), the LOSC.
317 Arts 56-57, the LOSC.
318 H Ringbom, 'Vessel-Source Pollution' in R Rayfuse (ed) *The Research Handbook on International Marine Environmental Law* (Edward Elgar Publishing Limited 2015) 109.
319 EJ Molenaar, 'Port and Coastal States' in D Rothwell et al. (eds) *The Oxford Handbook of the Law of the Sea* (Oxford University Press 2015) 280.
320 R Churchill 'Port State Jurisdiction Relating to the Safety of Shipping and Pollution from Ships—What Degree of Extra-Territoriality? (2016) 31 The International Journal of Marine and Coastal Law 3. 444.
321 Arts 2(1) and 8(1), the LOSC.
322 R Churchill 'Port State Jurisdiction Relating to the Safety of Shipping and Pollution from Ships—What degree of Extra-Territoriality? (2016) 31 The International Journal of Marine and Coastal Law 3. 444-445.
323 EJ Molenaar, 'Port and Coastal States' in D Rothwell et al. (eds) *The Oxford Handbook of the Law of the Sea* (Oxford University Press 2015) 283.
324 D Freestone and M Salman, 'Ocean and Freshwater Resources' in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008) 343.
325 RA Barnes, 'Flag States' in D Rothwell et al. (eds) *The Oxford Handbook of the Law of the Sea* (Oxford University Press 2015) 313.
326 Art 217(1), the LOSC; JNK Mansell, *Flag State Responsibility: Historical Development and Contemporary Issues* (Springer 2009) 2.

The LOSC provides that States should establish the international rules and standards regarding vessel-source pollution through the competent international organization or general diplomatic conference.[327] The competent international organization relating to vessel-source pollution is the IMO.[328] In respect of vessel-source pollution, the LOSC refers to "international rules and standards",[329] "applicable international rules and standards",[330] and "generally accepted international rules and standards".[331] All these formulations refer to the same set of rules and standards of international law regarding vessel-source pollution and therefore will be referred to as GAIRAS. The relevant generally accepted international rules and standards in respect of vessel-source plastics leakage are the 1973 International Convention for the Prevention of Pollution from Ships (the MARPOL Convention) and Annex V of the 1978 Protocol Relating to the International Convention for the Prevention of Pollution from Ships (particularly its Annex V, 'MARPOL Annex V').[332]

4.1.2 IMO Instruments and Plastics Leakage

IMO has actively improved its approach to vessel-source plastics leakage. IMO revised the original MARPOL Annex V in a response to the UNGA Resolution 60/30, which made a request for the IMO to review MARPOL Annex V in respect of its effectiveness to regulate sea-based sources of marine litter.[333] After a review, IMO adopted amendments with the Resolution MEPC. 201(62) and the revised MARPOL Annex V entered into force in 2013.[334] MARPOL Annex V is optional but it has been ratified by 154 states representing 99% of the world's shipping tonnage.[335] In 2017, IMO adopted the 2017 Guidelines for the Implementation of MARPOL Annex V to facilitate the

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327 Art 211(1), the LOSC.
328 IMO, 'Implications of the United Nations Convention on the Law of the Sea for the International Maritime Organization' (2014) LEG/MISC.8. 56; Law of the Sea Bulletin, No 79 (1996) 87-89; See also, Art 2(2) of Annex VIII. LOSC.
329 Arts 211(1), 211(6)(a), 211(7), 217(2), 217(3), the LOSC.
330 Arts 217(1), 218(1), 220(1)-(3), 228(1), 230(1), the LOSC.
331 Arts 211(2), 211(5), 211(6)(c), the LOSC.
332 United Nations, Division for Ocean Affairs and the Law of the Sea Office of Legal Affairs, 'The Law of the Sea – Obligations of State Parties under the United Nations Convention on the Law of the Sea and Complementary Instruments' (2004) 51-57.
333 UNGA Res 60/30 'Oceans and the Law of the Sea' (29 November 2005) UN Doc A/RES/60/30. 12, paras 67, 68.
334 IMO, Res MEPC.201(62) 'Amendments to the Annex of the Protocol of the 1978 Relating to the International Convention for the Prevention of Pollution from Ships, 1973 (Revised MARPOL Annex V)' (Adopted 15 July 2011, entered into force 1 January 2013) ('MARPOL Annex V')
335 Art 14(1), International Convention for the Prevention of Pollution from Ships (Adopted 2 November 1973) 1340 UNTS 184, as amended by Protocol Relating to the 1973 International Convention for the Prevention of Pollution from Ships (Adopted 17 February 1978, entered into force 2 October 1983) 1340 UNTS 61 ('MARPOL Convention'); IMO, 'Status of Treaties' (12 February 2021) https://wwwcdn.imo.org/localresources/en/About/Conventions/StatusOfConventions/Status%20-%202021.pdf

interpretation of the revised MARPOL Annex V.[336] Most recently, IMO has adopted an Action Plan to Address Marine Plastic Litter from Ships.[337]

4.1.2.1 Prohibition on Discharging Plastics and Its Exceptions

MARPOL Annex V is the most essential instrument regulating plastics leakage from ships.[338] MARPOL Annex V regulates the act of discharging plastics wastes into the ocean and applies to all ships.[339] MARPOL explicitly regulates discharges containing plastics. Pursuant to Regulation 1(9) of the MARPOL Annex V, "garbage means – all plastic" and more precisely, according to Regulation 1(13):

> Plastic means a solid material which contains as an essential ingredient one or more high molecular mass polymers and which is formed (shaped) during either manufacture of the polymer or the fabrication into a finished product by heat and/or pressure. Plastics have material properties ranging from hard and brittle to soft and elastic. For the purposes of this annex, "all plastics" means all garbage that consists of or includes plastic in any form, including synthetic ropes, synthetic fishing nets, plastic garbage bags and incinerator ashes from plastic products.[340]

Regulation 3 of MARPOL Annex V provides the prohibition against discarding plastics in the oceans:

> Except as provided in regulation 7 of this Annex, discharge into the sea of all plastics, including but not limited to synthetic ropes, synthetic fishing nets, plastic garbage bags and incinerator ashes from plastic products is prohibited.[341]

If plastic is mixed with other garbage, this garbage must be treated according to the rules of managing plastic discharges.[342]

The exceptions to discarding plastics in MARPOL Annex V are listed in Regulation 7. First, the discharge of garbage is allowed for the purpose of securing the safety of the a ship or those on board or saving a life at sea.[343] Second, Regulation 3 does not apply to the accidental loss of garbage resulting from damage to a ship.[344] Third, Regulation 3 does not concern the accidental loss of synthetic fishing gear.[345] And fourth, the ban does not concern situations where the discharge of fishing gear is done

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336 IMO, Res MEPC.295(71) '2017 Guidelines for the Implementation of MARPOL Annex V' (Adopted 7 July 2017) MEPC 71/17/Add.1
337 IMO, Res MEPC.310(73) 'Action Plan to Address Marine Plastic Litter from Ships' (Adopted 26 October 2018) MEPC 73/19/Add.1
338 UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 27.
339 Regulation 2, the MARPOL Annex V.
340 Regulation 1(9) and 1(13), the MARPOL Annex V.
341 Regulation 3(2), the MARPOL Annex V.
342 IMO, Res MEPC.295(71) '2017 Guidelines for the Implementation of MARPOL Annex V' (Adopted 7 July 2017) MEPC 71/17/Add.1. 11-12.
343 Regulation 7(1), the MARPOL Annex V.
344 Regulation 7(2), the MARPOL Annex V.
345 Regulation 7(3), the MARPOL Annex V.

to protect the marine environment or safety of the ship or its crew.[346] In addition, Regulation 3 also does "not apply to any warship, naval auxiliary or other ship owned or operated by a state and used only on government or non-commercial service."[347] These exceptions to the prohibition to discharge plastics can cause plastics leakage to the oceans, especially because there is no further guidance to elaborate what constitutes the four situations in Regulation 7. It is most likely that plastics would leak to the ocean if the ship is damaged or because of the accidental loss of synthetic fishing gear. Also excluding public vessels may involve a risk for the oceans if the flag State has not taken its own initiative to regulate their discharges.

4.1.2.2 Legislative Jurisdiction of Coastal State and IMO Instruments

Coastal states remain free to adopt national plastics leakage prevention measures under certain conditions imposed by international law to further strengthen the protection of the marine environment. In their territorial seas, coastal States may adopt laws and regulations for the prevention, reduction and control of MPP from foreign vessels, including vessels exercising the right of innocent passage. Such laws and regulations cannot, however, hamper the innocent passage of foreign vessels.[348] If a coastal State adopts laws and regulations relating to innocent passage to preserve its environment and/or to prevent, reduce and control MPP,[349] these cannot apply to the design, construction, manning, or equipment of foreign ships unless these laws and regulations are in accordance with generally accepted international rules.[350]

Thus coastal States remain free to adopt national legislation in their territorial sea to prevent plastics leakage more effectively as long as these measures do not obstruct the right to innocent passage and are not stricter than generally accepted rules of international law regarding the design, construction, manning, or equipment of foreign ships. Under these preconditions, coastal States are authorized to make further specifications to the exceptions of the prohibition on discharging plastics under the Regulation 7 of the MARPOL Annex V in their territorial seas.

In their EEZ, coastal States may adopt laws and regulations for the prevention, reduction and control of pollution from vessels but these must conform to and give effect to generally accepted international rules and standards for the purposes of enforcement.[351] Coastal states are not allowed to adopt any measures in their EEZ on MPP if the measures would be stricter than the generally accepted

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[346] Regulation 7(4), the MARPOL Annex V.
[347] Art 3(3), the MARPOL Convention.
[348] Art 211(4), the LOSC.
[349] Art 21(1)(f), the LOSC.
[350] Art 21(2), the LOSC.
[351] Art 211(5), the LOSC.

international rules and standards. In both its territorial sea and its EEZ a coastal State is not allowed to regulate the design, construction, manning, or equipment of foreign ships more stringently than generally accepted rules of international law.[352] Standards and use of onboard incinerators for the disposal of garbage or other standards to improve onboard waste management would fall into this category.[353] Any improvements aiming to better protect the marine environment from vessel-source plastics in the EEZ have to be thus achieved through amendments to the MARPOL Annex V.

4.1.2.3 Legislative Jurisdiction of Port State and Implementation of IMO Instruments in Ports

According to the LOSC, States may "establish particular requirements for the prevention, reduction and control of pollution of the marine environment as a condition for the entry of foreign vessels into their ports or internal waters or for a call at their off-shore terminals".[354] These requirements must be given due publicity and communicated to the IMO.[355] MARPOL Annex V establishes such particular requirements which are directly relevant to plastics leakage prevention.

Pursuant to MARPOL Annex V parties have to "ensure the provision of adequate facilities at ports and terminals for the reception of garbage without causing undue delay to ships, and according to the needs of the ships using them."[356] The IMO Guidelines for 'Ensuring the Adequacy of Port Waste Reception Facilities' provide more detailed criteria for evaluating adequacy. Adequate facilities are those which

> mariners use, fully meet the needs of the ships regularly using them, do not provide mariners with a disincentive to use them, and contribute to the improvement of the marine environment…meet the needs of the ships normally using the port; and allow for the ultimate disposal of ships' wastes to take place in an environmentally appropriate way.[357]

Ships are recommended to have the means to separate plastics on board due to differences in port reception facilities.[358] The aspiration of the IMO Action Plan to Address Marine Plastic Litter from Ships is that it would be a requirement for port reception facilities to provide for separate garbage collection for plastics wastes from ships, including fishing gear to facilitate reuse or recycling.[359] The

352 Arts 21(2), 211(6)(c), the LOSC.
353 K Raubenheimer, 'Towards an Improved Framework to Prevent Marine Plastic Debris, (Doctor of Philosophy Thesis, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong 2016) 111.
354 Art 211(3), the LOSC.
355 Art 211(3), the LOSC.
356 Regulation 8(1), the MARPOL Annex V.
357 IMO, Res MEPC.83(44) 'Guidelines for Ensuring the Adequacy of Port Waste Reception Facilities' (Adopted 13 March 2000) MEPC 44/20. 5.
358 IMO, Res MEPC.295(71) '2017 Guidelines for the Implementation of MARPOL Annex V' (Adopted 7 July 2017) MEPC 71/17/Add.1. 24.
359 IMO, Res MEPC.310(73) 'Action Plan to Address Marine Plastic Litter from Ships' (Adopted 26 October 2018) MEPC 73/19/Add.1. 6.

recommendation for ships for separate collection of plastics wastes and the recommendation for port reception facilities to provide separate collection of plastics wastes should be streamlined and made compulsory by amending the MARPOL Annex V. This would simplify the practices, minimize differences in port reception facilities and prevent undue delays.

Furthermore, though "IMO cannot prescribe standards for waste streams and effluents…it can guide States on how to integrate their port reception facilities into national waste management systems."[360] The adequacy of a port reception facility is thus also tied to its integration into national or regional waste management systems. If the garbage ends up in the oceans due to poor land-based waste management practices, the port reception facilities systems are not achieving their purpose.[361] The IMO Action Plan to Address Marine Plastic Litter from Ships "encourage[s] Member States to address the entire process of plastic garbage handling and ensure that landed garbage is managed in a sustainable manner ashore."[362] One concrete way to do this would be a requirement for the mandatory use of port waste management plans.[363] Such plans should include specific requirements for plastics wastes.

Raubenheimer has noted that the MARPOL Annex V does not establish a duty for vessels to discharge garbage when they arrive at port and the MARPOL Annex V should, at a minimum, oblige vessels to discharge the garbage at the first port that has the facilities to receive the type of waste that is on board.[364] The IMO has addressed this issue in the Action Plan to Address Marine Plastic Litter from Ships by suggesting that mechanisms to enhance the enforcement of the MARPOL Annex V requirements for the delivery of garbage to reception facilities should be considered.[365]

The MARPOL Annex V and the relevant guidelines (Guidelines for Ensuring the Adequacy of Port Waste Reception Facilities, Consolidated Guidance for Port Reception Facility Providers and Users and Port Reception Facilities – How to Do It) provide a comprehensive framework of obligations and guidance to establishing adequate port reception facilities to receive plastics wastes. However, in

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[360] G Argüello, 'Regime Interaction and GAIRS' in PK Mukherjee et al. (eds) Maritime Law in Motion (Springer 2020) 8 WMU Studies in Maritime Affairs. 27.
[361] *Ibid.* 26-27; IMO, Res MEPC.83(44) 'Guidelines for Ensuring the Adequacy of Port Waste Reception Facilities' (Adopted 13 March 2000) MEPC 44/20. 8; IMO, 'Port Reception Facilities – How to Do It' (2016) 35.
[362] IMO, Res MEPC.310(73) 'Action Plan to Address Marine Plastic Litter from Ships' (Adopted 26 October 2018) MEPC 73/19/Add.1. 7.
[363] *Ibid.*; See also, IMO, 'Port Reception Facilities – How to Do It' (2016) 35.
[364] K Raubenheimer, 'Towards an Improved Framework to Prevent Marine Plastic Debris, (Doctor of Philosophy Thesis, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong 2016) 175.
[365] IMO, Res MEPC.310(73) 'Action Plan to Address Marine Plastic Litter from Ships' (Adopted 26 October 2018) MEPC 73/19/Add.1. 6.

practice, port reception facilities are still deemed inadequate to properly manage plastics wastes.[366] Gold et al. have suggested that stronger qualitative and quantitative standards for port reception standards should be developed and incorporated to the MARPOL Annex V.[367] Hagen has further stressed that in the absence of enforceable international standards for port reception facilities, the risk that these facilities remain improperly maintained rises.[368]

So far IMO has provided a set of recommendations to improve port reception facilities but the MARPOL Annex V has not been revised to provide more specific obligations based on these recommendations. In the light of providing an explicit provision to discard plastics from vessels, it would be advisable that the MARPOL Annex V also provides more specific obligations for the disposal of plastics wastes in port reception facilities and specifies the adequacy criteria in this regard to strengthen compliance with Regulation 3. These could include specifications for separate collection of plastics wastes on board and in port reception facilities, and obligatory delivery of plastics wastes. Moreover, plastics wastes should be explicitly addressed in port waste management plans and these plans should be coordinated with land-based waste management plans to ensure that the collected plastic wastes in ports do not subsequently end up in the oceans due to the deficiencies of waste management practices on land.

4.1.2.4 Legislative Jurisdiction of Flag State and IMO Instruments

Coastal (and port) State jurisdiction are tied to specific maritime zones. Flag State jurisdiction, on the other hand, applies irrespective of the ship's location and a flag State has the primary jurisdiction over ships flying its flag.

Pursuant to the LOSC:

> States shall adopt laws and regulations for the prevention, reduction and control of pollution of the marine environment from vessels flying their flag or of their registry. Such laws and regulations shall at least have the same effect as that of generally accepted international rules and standards established through the competent international organization or general diplomatic conference.[369]

Flag States must also ensure compliance with these adopted rules, standards, laws and regulations and provide for their effective enforcement.[370] MARPOL Annex V sets out a range of rules relating to

[366] A Trouwborst, 'Managing Marine Litter: Exploring the Evolving Role of International and European Law in Confronting a Persistent Environmental Problem' (2011) 27 Merkourios 73. 17.
[367] M Gold et al., 'Stemming the Tide of Plastic Marine Litter: A Global Action Agenda' (2014) 27 Tulane Environmental Law Journal 2. 187.
[368] PE Hagen, 'The International Community Confronts Plastics Pollution from Ships: MARPOL Annex V and the Problem that Won't Go Away' (1990) 5 American University International Law Review 2. 478.
[369] Art 211(2), the LOSC.
[370] Art 217(1), the LOSC.

dealing with plastics wastes that applies to flag States. These rules concern placards, garbage management plans and garbage record keeping on board a vessel.

Regulation 10 of MARPOL Annex V specifies the requirements for ships of different sizes regarding placards, garbage management plans and garbage record keeping. Every ship of 12 m or more in length and with fixed or floating platforms shall display placards notifying the crew and passengers of the discharge requirements under MARPOL Annex V.[371] Every ship of 100 gross tons or above and any ship certified to carry 15 or more persons, and with fixed or floating platforms shall carry a garbage management plan detailing written procedures for minimizing, collecting, storing, processing and disposing of garbage.[372] Every ship of 400 gross tons or above and every ship certified to carry 15 or more persons engaged in voyages to ports or offshore terminals shall be provided with a garbage record book, the form of which is specified.[373] All discharges into the sea or to a port reception facility and incinerations have to be recorded in the garbage record book.[374] Especially relevant to monitoring plastics leakage is that any discharges or accidental losses listed under Regulation 7 need to be recorded in detail in the garbage record book.[375]

These MARPOL Annex V rules have been criticized because only a small percentage of vessels fall into the category that has the strictest rules for keeping a record of plastics wastes in a garbage record book.[376] The new IMO Action Plan to Address Marine Plastic Litter from Ships has taken note of this shortcoming and suggested that the application of placards, garbage management plans and garbage record-keeping should be reviewed and Regulation 10 of MARPOL Annex V should be amended, for example, by making the Garbage Record Book mandatory for ships of 100 GT and above.[377] However, this would only tighten the requirements for that same small percentage of the world fishing fleet, because at present ships of 100 GT and above must have a garbage management plan that would then have to be changed into a garbage record book. Given that fishing gear is major contributor to plastics leakage, the requirements should be even stricter. For example, the requirement to have the garbage record book should be obligatory for all categories – for every ship of 12 m or

371 Regulation 10(1)(1), the MARPOL Annex V.
372 Regulation 10(2), the MARPOL Annex V.
373 Regulation 10(3), the MARPOL Annex V.
374 Regulation 10(3)(1), the MARPOL Annex V.
375 Regulation 10(3)(4), the MARPOL Annex V.
376 K Raubenheimer, 'Towards an Improved Framework to Prevent Marine Plastic Debris, (Doctor of Philosophy Thesis, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong 2016) 186.
377 IMO, Res MEPC.310(73) 'Action Plan to Address Marine Plastic Litter from Ships' (Adopted 26 October 2018) MEPC 73/19/Add.1. 5.

more in length to ships of 400 GT and above – because the garbage record book is the only way to keep track of discharges to port reception facilities and accidental losses.

Relevant to ships of all sizes is Regulation 10(6) requiring that accidental loss or discharge of fishing gear regulated under Regulation 7(1)(3) which poses a significant threat to the environment shall be reported to the flag State, and also to the coastal State if the discharge occurs within waters subject to its jurisdiction.[378] "Significant threat" sets a high threshold for the reporting obligation and most likely means that most cases of accidental losses or discharges of plastics will not be reported.

4.1.2.5 Enforcement Jurisdiction and IMO Instruments

The LOSC Articles form the legal basis for enforcement measures of coastal, port and flag States. The MARPOL Convention and MARPOL Annex V complement the enforcement rules of the LOSC.[379]

A coastal State has enforcement jurisdiction in respect of violations concerning the prevention, reduction or control of pollution from vessels which have occurred within its territorial sea or EEZ.[380] With regard to plastics leakage prevention, violations of the MARPOL Annex V Regulation that prohibits any discharge of plastics are relevant. A coastal State may institute proceedings in three scenarios.

In the first scenario the vessel in question has to be voluntarily in a port or off-shore terminal and the violation must relate to either national laws and regulations that have been adopted according to the LOSC or applicable international rules and standards, and the violation must have occurred within the territorial sea or the EEZ.[381] In the second scenario, a Coastal State may institute proceedings "[w]here there are clear grounds for believing that a vessel navigating in the territorial sea of a State has, during its passage therein, violated laws and regulations of that State adopted in accordance with this Convention or applicable international rules and standards for the prevention, reduction and control of pollution from vessels".[382] In the third scenario: if there is clear objective evidence that a vessel navigating in the EEZ or the territorial sea of a coastal State has, in the EEZ, committed a violation of the above-mentioned pollution laws and regulations, and this discharge is causing major

[378] Regulation 10(6), the MARPOL Annex V.
[379] Art 9, the MARPOL Convention.
[380] Art 220, the LOSC.
[381] Art 220(1), the LOSC.
[382] Art 220(2), the LOSC.

damage or threat of major damage to the coastline or related interests of the coastal State, or to any resources of its territorial sea or the EEZ.[383]

However, what constitutes "major damage" or "threat of major damage", especially in respect of MPP, is ambiguous. Gathering clear objective evidence against one particular vessel is a challenging, if not impossible, task once plastics or plastics wastes have leaked into the ocean. It is also doubtful whether one vessel is even capable of discharging so much plastics and/or plastics wastes into the ocean that such event would cause major damage or threat of major damage. In such cases where the damage can be linked to a vessel, Articles 4, 6(1), 6(3) and 6(4) of the MARPOL Convention on violations and detection of violations and enforcement can be used for enforcement support. In such instance there is no need for the damage or risk of damage to be major, because any discharge of plastics is prohibited under Regulation 3 of MARPOL Annex V and is thus a violation of the Convention.

A coastal State may also undertake physical inspections of vessels and/or require the vessel to provide information under certain conditions. If there are clear grounds to believe that a vessel has violated the above-mentioned laws and regulations in the territorial sea, physical inspection may take place.[384] If such a violation has occurred in the EEZ, a coastal State can demand the vessel to provide further information.[385] If such a violation occurs in the EEZ and results in significant threat of pollution to marine environment either in the territorial sea or the EEZ, and the vessel refuses to provide further information, the physical inspection may also take place.[386] Setting the threshold of "significant threat" means that vessel-generated plastics wastes are again unlikely to meet this standard set out in the LOSC, which weakens the usefulness of the provision with regard to MPP.[387] However, in these instances Articles 6(2) and 6(5) of the MARPOL Convention on inspections would provide further enforcement support if the ship enters the port of a Coastal State after such an incident involving plastic discharges.

A port State may undertake investigations and institute proceedings in three basic scenarios under the LOSC. First, if a vessel is voluntarily in a port or an off-shore terminal of the port State and has violated applicable international rules and standards in respect of any discharge outside the internal

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383 Arts 220(3) and 220(6), the LOSC.
384 Art 220(2), the LOSC.
385 Art 220(3), the LOSC.
386 Art 220(5), the LOSC.
387 PE Hagen, 'The International Community Confronts Plastics Pollution from Ships: MARPOL Annex V and the Problem that Won't Go Away' (1990) 5 American University International Law Review 2. 476; A Stöfen-O'Brien, *The International and European Legal Regime Regulating Marine Litter in the EU* (Nomos Verlagsgesellschaft 2015) 113-114.

waters, territorial sea or EEZ of a port State.[388] Second, the port State may institute proceedings regarding a discharge violation in the internal waters, territorial sea or the EEZ if "requested by that State, the flag State, or a State damaged or threatened by the discharge violation" or if "the violation has caused or is likely to cause pollution in the internal waters, territorial sea or exclusive economic zone of the State instituting the proceedings."[389] An third, the port State may institute proceedings when a vessel is voluntarily in its port and the port State receives "requests from any State for investigation of a discharge violation referred to in paragraph 1, believed to have occurred in, caused, or threatened damage to the internal waters, territorial sea or exclusive economic zone of the requesting State" or "requests from the flag State for investigation of such a violation, irrespective of where the violation occurred."[390]

In addition, a port State has the option to undertake administrative measures to prevent a ship from sailing if the port State discovers that a ship in one of its ports is violating international rules and standards regarding the seaworthiness of ship and thus threatening to damage the marine environment.[391] The same critique of the exercising of coastal State jurisdiction applies to these scenarios of port State jurisdiction. It is unlikely that discharges of plastics or plastics wastes could be traced to one particular ship.

Enforcement regulations of MARPOL Annex V complement the LOSC. Regarding operational requirements, Regulation 9(1) of MARPOL Annex V provides that "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", a ship in a port is subject to inspection.[392] Concerning enforcement relating port reception facilities, Regulation 8(2) of MARPOL Annex V provides that "each Party shall notify the Organization for transmission to the Contracting Parties concerned of all cases where the facilities provided under this regulation are alleged to be inadequate." Port States have "the ultimate responsibility for ensuring that adequate port waste reception facilities are available to ships calling at ports within the port State's jurisdiction."[393] However, flag States have to provide port States with information accurately listing the inadequacies of ports visited by its ships and when "shipowners or masters identify an inherent inadequacy of reception facilities", a report needs to be

[388] Art 218(1), the LOSC.
[389] Art 218(2), the LOSC.
[390] Art 218(3), the LOSC.
[391] Art 219, the LOSC.
[392] Regulation 9, the MARPOL Annex V.
[393] IMO, Res MEPC.83(44) 'Guidelines for Ensuring the Adequacy of Port Waste Reception Facilities' (Adopted 13 March 2000) MEPC 44/20. 14.

made to the flag State, port State and the IMO.[394] Active reporting of the inadequacies of port reception facilities in managing plastics wastes could enhance the protection of the marine environment from further plastics leakage.

A flag State has the obligation to ensure compliance of a vessel flying its flag with applicable international rules and standards and with its national laws and regulations adopted in accordance with the LOSC for the prevention, reduction and control of pollution of the marine environment. A flag State must also adopt laws and regulations and possibly take other measures necessary for their implementation. A flag State is under the obligation to provide for the effective enforcement of such rules, standards, laws and regulations, irrespective of where a violation occurs.[395] A flag State has to provide for immediate investigation and where appropriate institute proceedings if a vessel commits a violation of international rules and standards on pollution, irrespective of where the violation occurred or where the pollution caused by such violation has occurred or has been spotted.[396] A flag state is obliged to do the same if another State sends it a written request.[397] A flag State also has the obligation to prohibit vessels from sailing if they do not comply with international rules and standards on pollution and to ensure that vessels carry on board certificates in accordance with these rules and standards.[398] In a situation where there are clear grounds to believe that a vessel has committed a violation of the above mentioned laws and regulations, the vessel is required to provide the relevant information for the coastal State in whose EEZ the violation occurred.[399] The flag State of the vessel is obliged to take the necessary measures to ensure that all vessels comply with these information requests.[400]

The LOSC provides a detailed legal framework for flag State enforcement measures and these measures have an important role in ensuring compliance regarding vessel-source pollution. However, historically, flag State enforcement has demonstrated limited effectiveness which also has repercussions for plastics leakage prevention.[401] To improve implementation and enforcement, the IMO has established a Mandatory State Audit Scheme (IMSAS) that entered into force 1 January

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394 *Ibid.* 12-13; IMO, 'Revised Consolidated Format for Reporting Alleged Inadequacy of Port Reception Facilities' (1998) MEPC/Circ.34; IMO, 'Consolidated Guidance for Port Reception Facility Providers and Users' (Adopted 1 March 2018) MEPC.1/Circ.834/Rev.1

395 Art 217(1), the LOSC.

396 Art 217(4), the LOSC.

397 Art 217(6), the LOSC.

398 Arts 217(2)-217(3), the LOSC.

399 Art 220(3), the LOSC.

400 Art 220(4), the LOSC.

401 A Stöfen-O'Brien, *The International and European Legal Regime Regulating Marine Litter in the EU* (Nomos Verlagsgesellschaft 2015) 112.

2016.[402] The purpose of IMSAS is to study to which extent coastal, port, and flag States have implemented and enforced their obligations deriving from IMO Conventions, including MARPOL and MARPOL Annex V. This includes *inter alia* possibility of auditing compliance with garbage management plans and garbage record books in respect of plastics wastes management.[403]

4.1.2.6 The Main Strengths and Weaknesses of Vessel-Source Plastics Leakage Prevention Instruments

The LOSC and the IMO instruments provide comprehensive and detailed prescriptive regulations on vessel-source plastics leakage. The IMO in particular has been active in developing and recommending measures that could decrease plastics leakage from ships. The main strength of the regime to reduce plastics leakage from vessels is the prohibition on discarding plastics and plastics wastes in the oceans in Regulation 3 of MARPOL Annex V. The LOSC and the MARPOL Convention also provide enforcement rules, which have the potential to strengthen compliance with the prohibition. Wide ratification of the LOSC and the MARPOL Annex V further reinforces their potential to reduce plastics leakage globally.

However, implementation and compliance challenges concerning IMO instruments remain.[404] Though the LOSC and the MARPOL are widely ratified and apply to all ships, only a small part of ships are required to maintain a garbage management plan or a Garbage Record Book to monitor in detail plastics wastes management on board.[405] This in turn diminishes the use of IMSAS as a tool to measure compliance of States with MARPOL Annex V regulations on plastics. Furthermore, the adequacy of port reception facilities regarding plastics wastes is subject to only a general obligation and specific guidance on the issue is voluntary, which complicates strengthening compliance. In addition, the nature of the activities taking place at sea inherently complicates effective enforcement because violations are difficult to trace back to one particular vessel and accidental losses are prone to happen.

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402 IMO, 'Member State Audit Scheme' <https://www.imo.org/en/OurWork/MSAS/Pages/Default.aspx>; IMO, Resolution A.1067(28) 'Framework and Procedures for the IMO Member State Audit Scheme' (Adopted 5 December 2013, entered into force 1 January 2016) A28/RES.1067. 3.

403 IMO, Res MEPC.246(66) 'Amendments to the Annex of the Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships, 1973 (Amendments to MARPOL Annexes I, II, III, IV and V to Make the Use of the III Code Mandatory) (Adopted 4 April 2014, entered into force 1 January 2016) Paras 12-14; IMO, Resolution A.1067(28) 'Framework and Procedures for the IMO Member State Audit Scheme' (Adopted 5 December 2013, entered into force 1 January 2016) A28/RES.1067. 5.

404 UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 149.

405 *Ibid.* 18, 54.

4.2 Plastics Leakage by Dumping

Regulation of dumping is highly relevant to plastics and plastics wastes as a way of eliminating deliberate dumping at sea as an option for their final disposal. The LOSC, the London Convention and the London Protocol[406] together set out the international legal rules regarding dumping of plastics wastes into the oceans.

The definitions in the LOSC, the London Convention and the London Protocol are integrated.[407] The LOSC defines dumping as "any deliberate disposal of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea" or "any deliberate disposal of vessels, aircraft, platforms or other man-made structures at sea."[408]

But the LOSC says dumping does not include

> the disposal of wastes or other matter incidental to, or derived from the normal operations of vessels, aircraft, platforms or other man-made structures at sea and their equipment, other than wastes or other matter transported by or to vessels, aircraft, platforms or other man-made structures at sea, operating for the purpose of disposal of such matter or derived from the treatment of such wastes or other matter on such vessels, aircraft, platforms or structures.[409]

Dumping also does not include "placement of matter for a purpose other than the mere disposal thereof, provided that such placement is not contrary to the aims of the LOSC."[410] This definition covers all maritime zones,[411] though the approach to the status of internal waters differs between the instruments.[412] The London Convention and Protocol specify that "wastes or other matter" denote "material and substance of any kind, form or description."[413] Therefore, it also covers plastics and plastics wastes.

4.2.1 The LOSC and Dumping

The LOSC provides articles on both adopting and enforcing regulation on dumping at sea. Article 210(1) of the LOSC imposes the obligation on all States, whether coastal or landlocked, to adopt

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406 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Adopted 7 November 1996, entered into force 24 March 2006) 36 ILM 1 ('London Protocol')
407 See, Articles I and III(1) of the London Convention and; Articles 1(4) and 1(8) of the London Protocol.
408 Art 1(1)(5)(a)(i)-(ii), the LOSC
409 Art 1(1)(5)(b)(i), the LOSC.
410 Art 1(1)(5)(b)(ii), the LOSC.
411 F Wacht, 'Article 210 Pollution by Dumping' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017) 1412.
412 F Wacht states with regards to the LOSC that the definition covers also internal waters. (F Wacht, 'Article 210 Pollution by Dumping' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017) 1412); The London Convention excludes internal waters (Art III(3)), whereas the London Protocol includes internal waters (Art 7).
413 Art III(4), the London Convention; Art 1(8), the London Protocol.

binding national legislation to protect the marine environment from pollution by dumping.[414] States are also obliged to take other necessary measures to prevent, reduce and control such pollution.[415] Furthermore, States should endeavor to establish global and regional rules, standards, and recommended practices and procedures through competent international organizations or diplomatic conferences.[416] The competent international organization in respect of dumping is the IMO.[417] The global rules and standards provide the minimum level of protection from pollution by dumping and "national laws, regulations and measures shall be no less effective".[418]

Article 216 of the LOSC provides an obligation of enforcement with respect to pollution by dumping. The task of enforcement of national laws and regulations and applicable international rules and standards relating to dumping is divided between the concepts of State sovereignty over its territory and port State, coastal State and flag State jurisdiction[419]. States as sovereigns are to enforce legislative action in relation to the loading of wastes or other matter within their territories or off-shore terminals.[420] Coastal states are responsible for enforcement regarding dumping within their territorial sea, EEZ, and continental shelf.[421] Flag states are to implement laws and regulations or applicable international rules and standards with regard to vessels flying their flag.[422]

4.2.2 The London Convention and the London Protocol

The London Convention) and the London Protocol provide the more specific international rules on dumping at sea. The London Protocol builds on and improves the London Convention, and is intended to eventually replace it.[423] Both instruments regulate dumping of plastics or plastics wastes.

The dumping of plastics is prohibited under the London Convention and the London Protocol. According to Article IV(1)(a) and Annex I(4)of the London Convention, dumping of "persistent plastics and other persistent synthetic materials, for example, netting and ropes, which may float or may remain in suspension in the sea in such a manner as to interfere materially with fishing, navigation

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414 F Wacht, 'Article 210 Pollution by Dumping' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017) 1412.
415 Art 210(2), the LOSC.
416 Art 210(4), the LOSC.
417 IMO, 'Implications of the United Nations Convention on the Law of the Sea for the International Maritime Organization' (2014) LEG/MISC.8. 56.
418 Art 210(6), the LOSC.
419 Art 216, the LOSC.
420 Art 216(c), the LOSC.
421 Art 216(b), the LOSC.
422 Art 216(a), the LOSC.
423 P Verlaan, 'Current Legal Developments: London Convention and London Protocol' (2011) 26 The International Journal of Marine Coastal Law 1. 185; Pursuant to Article 23 of the London Protocol, it "will supersede the Convention as between Contracting Parties to this Protocol which are also Parties to the Convention."

or other legitimate uses", is prohibited. Pursuant to London Protocol Article 4(1) "Contracting Parties shall prohibit the dumping of any wastes or other matter with the exception of those listed in Annex I." Annex I makes no reference to plastics as an exception, and thus the Protocol prohibits the dumping of plastics.[424] The London Protocol has a compliance mechanism to "assess and promote compliance…with a view to allowing for the full and open exchange of information, in a constructive manner."[425] Any individual, systemic or other compliance matter relating to the dumping of plastics or plastics wastes at sea should be reported and dealt with under this mechanism.[426]

Article IV(1)(a) and Annex I(4) of the London Convention and Article 4(1) of the London Protocol are part of the global rules and standards that Article 210(6) of the LOSC refers to, and "national laws and regulations have to be at least as effective as the global rules and standards." Therefore, the prohibition on dumping plastics and plastics wastes at sea is the minimum standard for all State parties to the LOSC, the London Convention or the London Protocol.

4.2.3 The Main Strengths and Weaknesses of Instruments Preventing Dumping of Plastics Wastes

Dumping plastics and plastics wastes deliberately into the oceans is the worst possible option for their final disposal. Prohibition of deliberate dumping of plastics wastes into the ocean thus remains an essential element and starting point for regulating plastics leakage.

The London Convention has 87 parties and the Protocol 53 parties.[427] The map below shows in yellow the London Convention parties, in green the London Protocol parties and those States that are not parties to either in red. Achievement of a wider acceptance of the London Convention and Protocol has remained a challenge and the IMO is actively promoting accession to, and ratification of, the London Protocol as part of its Strategic Plan for the London Protocol and the London Convention.[428] As the map shows, the non-parties to the London Convention and Protocol are located mainly in Africa and Asia. Encouraging ratification of the London Protocol in these regions is particularly crucial because of the severity of the plastics leakage there.

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424 Art 4(1) and Annex I, the London Protocol.
425 Art 11, the London Protocol.
426 Revised 2017 Compliance Procedures and Mechanisms Pursuant to Article 11 of the 1996 Protocol to the London Convention, 1972 (Adopted in 2007, revised in 2017) LC 39/16, Annex 5.
427 IMO, 'Status of Treaties' (12 February 2021) https://wwwcdn.imo.org/localresources/en/About/Conventions/StatusOfConventions/Status%20-%202021.pdf
428 IMO, 'Strategic Plan for the London Protocol and the London Convention' (2017) 2.

Map of Parties to the London Convention/Protocol

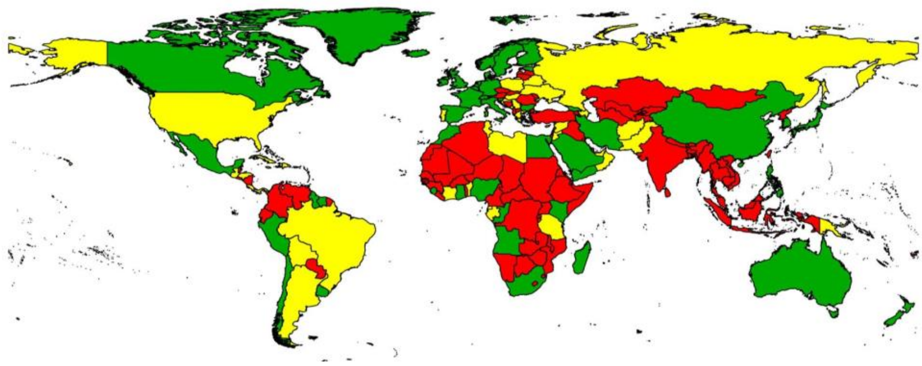

Fig. 8 Map of the Parties to the London Convention/Protocol.[429]

However, with regard to States that are not parties to the London Convention or Protocol, but have ratified the LOSC, "it can be argued that an implied duty to comply with its measures is established through article 210 of the United Nations Convention on the Law of the Sea, which mandates that States adopt national laws to prevent pollution by dumping that are "no less effective … than global rules and standards.""[430]

IMO has reviewed knowledge gaps with respect to other waste streams regulated under the London Convention and Protocol to investigate whether they contain plastics. These other waste streams require an authorization process before dumping at sea is allowed. The review focused particularly on sewage sludge and dredged materials, and concluded that both these streams are likely to contain plastics.[431] There are ongoing efforts to close this gap.[432] Furthermore, the waste stream entailing vessels is likely to also include plastics.[433] IMO has noted the issue of end-of-life management of fibre

[429] IMO, 'Map of the Parties to the London Convention/Protocol' (February 2019) https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Parties%20to%20the%20LCLP%20February%202019.pdf
[430] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 78; P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009) 466; IMO, 'Implications of the United Nations Convention on the Law of the Sea for the International Maritime Organization' (2014) LEG/MISC.8. 75-76; F Wacht, 'Article 210 Pollution by Dumping' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017) 1418.
[431] IMO, 'Review of the Current State of Knowledge Regarding Marine Litter in Wastes Dumped at Sea Under London Convention and Protocol – Final Report' (IMO 2016) 6-7.
[432] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 86.
[433] A Stöfen-O'Brien, *The International and European Legal Regime Regulating Marine Litter in the EU* (Nomos Verlagsgesellschaft 2015) 147.

reinforced plastic vessels and is currently in the process of collecting more information to be able to determine its next course of action on the issue.[434]

The (integrated) definition of dumping in the LOSC, the London Convention and the London Protocol excludes the placement of matter for a purpose other than mere disposal. The phrase "placement of matter for a purpose other than mere disposal" is ambiguous. For example, placing synthetic fishing gear in the ocean with the intention of retrieval but later deciding to abandon it would not be considered as dumping under the London Protocol.[435]

Deliberate coastal dumping of plastics and plastics wastes is not prohibited explicitly under the LOSC, the London Convention or the London Protocol. These situations fall under regulation of land-based sources of pollution, as well as the general obligations of the LOSC to protect the marine environment, the no-harm rule, and principles of international environmental law, such as prevention or precautionary principles. Though deliberate coastal dumping of plastics and plastics wastes is not explicitly banned, both the LOSC Article 195 and the London Protocol Article 3(3) provide an obligation "not to transfer one type of pollution into another".[436] Therefore, land-based plastics pollution should not become marine plastics pollution. This does not establish a general obligation not to dump land-based wastes in the oceans. However, plastics wastes should not be discarded from a coastal area into oceans as a replacement option for dumping them from a vessel, and in this limited situation Article 195 of the LOSC and Article 3(3) of the London Protocol would apply.

4.3 Land-Based and Riverine Plastics Leakage[437]

Most of the plastics that end up in the oceans come from land and comprise mismanaged plastics wastes either from coastal areas or rivers.[438] The LOSC is the only binding global instrument that explicitly addresses regulation of land-based sources of pollution. The international community has

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[434] IMO, 'End-of-Life Management of Fibre Reinforced Plastic Vessels: Alternatives to At Sea Disposal' (2019); A Birchenough and F Haag, 'The London Convention and London Protocol and Their Expanding Mandate' (2020) 34 Ocean Yearbook Online 1. 272.
[435] K Raubenheimer, 'Towards an Improved Framework to Prevent Marine Plastic Debris, (Doctor of Philosophy Thesis, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong 2016) 132.
[436] A Stöfen-O'Brien, *The International and European Legal Regime Regulating Marine Litter in the EU* (Nomos Verlagsgesellschaft 2015) 151.
[437] This sub-chapter builds on the author's co-authored and previously published article: L Finska and J Gjørtz Howden, 'Troubled Waters – Where Is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3.
[438] JR Jambeck et al., 'Plastic Waste Inputs from Land into the Ocean' (2015) 347 Science 6223. 769; C Schmidt et al., 'Export of Plastic Debris by Rivers into the Sea' (2017) 51 Environmental Science & Technology 21. 12246, 12252; C Schmidt et al. 'Correction to Export of Plastic Debris by Rivers into the Sea' (2018) 52 Environmental Science & Technology 2; LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications. 3.

mainly adopted a soft law approach to targeting land-based activities which threaten the marine environment.[439] In addition to the LOSC and the soft law instruments on land-based plastics leakage, this sub-chapter also incorporates international law applicable to riverine inputs of plastics because of the inseparable physical link between watercourse and marine environments.[440] This investigation is, however, limited to international watercourses and international water law, and their interrelations with the law of the sea and international environmental governance concerning plastics leakage prevention.

4.3.1 THE 1982 UNITED NATIONS CONVENTION ON THE LAW OF THE SEA

The LOSC has five angles to regulating land-based pollution that are particularly relevant for plastics: general obligation on land-based pollution, a more specific provision on toxic, harmful or noxious substances, a specific mention of rivers and estuaries as sources of land-based marine pollution, a provision on monitoring and reporting risks and effects of pollution, and an obligation to conduct EIAs.

Article 207 of the LOSC is a framework provision which sets out an obligation to adopt laws and regulations to prevent, reduce and control pollution of the marine environment from land-based sources.[441] To do this, States have to take into account internationally agreed rules, standards and recommended practices and procedures on land-based sources of pollution.[442] The LOSC encourages States to harmonize these legal measures regionally and/or globally.[443] States should also enforce these legal measures and adopt laws and regulations and take other measures that are deemed necessary in order to implement applicable international rules and standards concerning pollution of the marine environment.[444]

Though the LOSC imposes this obligation to regulate prevention of land-based (plastics) pollution, to date the international community has not established what are "internationally agreed rules, standards and recommended practices and procedures" on land-based sources of pollution.[445] The

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[439] DL VanderZwaag et al., 'The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities: A Myriad of Sounds, Will the World Listen?' (1998) 13 Ocean Yearbook. 184.
[440] See, S Vinogradov, 'Marine Pollution via Transboundary Watercourses – An Interface of the 'Shoreline' and 'River-Basin' Regimes in the Wider Black Sea Region' (2007) 22 International Journal of Marine and Coastal Law 4. 586.
[441] Art 207(1), the LOSC; EA Kirk and N Popattanachai 'Marine Plastics: Fragmentation, Effectiveness and Legitimacy in International Lawmaking' (2018) 27 Review of European, Comparative and International Environmental Law 3. 223.
[442] Art 207(1), the LOSC.
[443] Arts 207(3), 207(4), and 213, the LOSC.
[444] Art 213, the LOSC.
[445] D Hassan, *Protecting the Marine Environment from Land-Based Sources of Pollution: Towards Effective International Cooperation* (Ashgate 2006) 82; EA Kirk and N Popattanachai 'Marine Plastics: Fragmentation, Effectiveness and Legitimacy in International Lawmaking' (2018) 27 Review of European, Comparative and International Environmental Law 3. 223.

Article 207 is normatively weak for a multitude of reasons.[446] The level of generality and vagueness of Article 207 mean that it fails to provide any useful guidance or criteria for States regarding the content or minimum standard of further legislation.[447] Moreover, Article 207 does not outline which international organizations are the competent authorities in respect of land-based pollution.[448]

The LOSC deals with material and chemical properties aspects of plastics indirectly in Articles 194(3)(a) and 207(5). Pursuant to Article 194(3)(a):

> The measures taken pursuant to this Part shall deal with all sources of pollution of the marine environment. These measures shall include, inter alia, those designed to minimize to the fullest possible extent…(a) the release of toxic, harmful or noxious substances, especially those which are persistent, from land-based sources, from or through the atmosphere or by dumping

Similarly, Article 207(5) provides:

> Laws, regulations, measures, rules, standards and recommended practices and procedures referred to in paragraphs 1, 2 and 4 shall include those designed to minimize, to the fullest extent possible, the release of toxic, harmful or noxious substances, especially those which are persistent, into the marine environment.

The LOSC does not specify the substances these articles refer to. All plastics are persistent and to some degree harmful in the marine environment.[449] In respect of the toxicity or noxiousness of plastics, it depends on their chemical compositions, which can vary considerably between different plastics. It is possible that plastics contain chemicals that make them toxic or noxious.[450] Applying the Articles 194(3)(a) and 207(5) to a substance requires that one of the conditions, "toxic, harmful, or noxious" is fulfilled.[451] Plastics are always more or less harmful in the environment and can also possess toxic or noxious substances, or become toxic or noxious in the oceans by absorbing chemicals

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446 EA Kirk and N Popattanachai 'Marine Plastics: Fragmentation, Effectiveness and Legitimacy in International Lawmaking' (2018) 27 Review of European, Comparative and International Environmental Law 3. 223; A Stöfen-O'Brien, *The International and European Legal Regime Regulating Marine Litter in the EU* (Nomos Verlagsgesellschaft 2015) 101.
447 D Hassan, *Protecting the Marine Environment from Land-Based Sources of Pollution: Towards Effective International Cooperation* (Ashgate 2006) 82.
448 EA Kirk and N Popattanachai 'Marine Plastics: Fragmentation, Effectiveness and Legitimacy in International Lawmaking' (2018) 27 Review of European, Comparative and International Environmental Law 3. 223.
449 AL Andrady, 'Persistence of Plastic Litter in the Oceans' in M Bergmann et al. (eds) Marine Anthropogenic Litter (Springer 2015) 57.
450 See eg, F Gallo et al., 'Marine Litter Plastics and Microplastics and their Toxic Chemicals Components: the Need for Urgent Preventive Measures' (2018) 30 Environmental Sciences Europe 13. 1-14.
451 F Wacht, 'Article 207 Pollution from Land-Based Sources' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017) 1390.

from the seawater.[452] Therefore, plastics are within the scope of the application of the Article, which is further supported by their persistence in the marine environment.[453]

Pursuant to Article 207(1) of the LOSC "States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment from land-based sources, including *rivers, estuaries,* pipelines and outfall structures, taking into account internationally agreed rules, standards and recommended practices and procedures."[454] Thus, the general obligation to prevent, reduce and control pollution from land-based sources explicitly includes rivers and estuaries as sources of pollution threatening the marine environment. However, the LOSC does not provide any further guidance on how to deal with pollution from rivers and estuaries.[455]

Pursuant to Article 213, states have to enforce the laws and regulations that have been adopted in accordance with Article 207, and adopt laws and regulations and take other necessary measures to implement the international rules and standards.[456] However, the same vagueness repeats itself in Article 213. Boyle notes that when it comes to land-based sources of pollution the LOSC also fails to provide any direct means of enforcement.[457]

The LOSC also provides that States should endeavor to monitor the risks or effects of pollution and provide monitoring reports for a competent international organization.[458] However, these provisions have never been operationalized regarding land-based pollution, let alone land-based plastics leakage specifically, and the competent organization has not been clarified in either case.[459] Furthermore, Article 206 makes a reference to an EIA:

> When States have reasonable grounds for believing that planned activities under their jurisdiction or control may cause substantial pollution of or significant and harmful changes to the marine environment, they shall, as far as practicable, assess the potential effects of such activities on the marine environment and shall communicate reports of the results of such assessments in the manner provided in article 205.

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452 EL Teuten, 'Transport and Release of Chemicals from Plastics to the Environment and to Wildlife' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences 1526. 2042.
453 See, AL Andrady, 'Persistence of Plastic Litter in the Oceans' in M Bergmann et al. (eds) Marine Anthropogenic Litter (Springer 2015)
454 Art 207(1), the LOSC. Emphasis mine.
455 L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 247.
456 Art 213, the LOSC.
457 AE Boyle, 'Land-Based Sources of Pollution: Current Legal regime' (1992) 16 Marine Policy 1. 25.
458 Arts 204 and 205, the LOSC.
459 UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 48, 76. However, the report notes that GPA could be considered as a competent organization.

Applying EIA to land-based activities that cause plastics leakage poses interesting questions which will be discussed in more detail in relation to evaluating compliance with due diligence obligations in the section 4.3.5.

With regard to land-based pollution, the balancing of interests between protecting the environment and deferring to the needs of domestic economies has time and again tilted towards the needs of domestic economies. States have not been willing to engage in the same level of international pollution control as was imposed on vessel-source pollution because the social and economic costs have been deemed excessive.[460] However, “if international law is to be used to ensure better protection of the marine environment from land-based pollution, it is this assumption, that the matter is essentially one for national discretion, which must be challenged.”[461] This means that both downstream and upstream activities relating to plastics should be regulated also on the international level to some extent. Practically speaking, the regulation should target both economic activities and the management of wastes from these activities. So far, the treatment of wastes has remained within the discretion of States as a matter falling under State sovereignty.[462] States have not elaborated in binding instruments the relationship between land-based pollution prevention measures and national waste management measures despite the obvious practical connection between the two. Strengthening this connection in downstream plastics leakage prevention in the future would mean, for example, specific targets for what proportion of plastics wastes should be landfilled or used for energy recovery and how this might happen.

4.3.2 The United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses and the Convention on the Protection and Use of Transboundary Watercourses and International Lakes

Plastics from river systems are a major threat to the marine environment and many of the world's largest and most heavily polluted watercourses, such as the Ganges-Brahmaputra-Meghna, the Amazon and the Mekong, are international.[463] The watercourse's terminus in the sea constitutes an evident connection between the international environmental governance of international watercourses and plastics leakage prevention measures. Two global conventions are applicable in this

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[460] AE Boyle, ‘Land-Based Sources of Pollution: Current Legal regime’ (1992) 16 Marine Policy 1. 26.
[461] *Ibid.*
[462] N Simon and ML Schulte, ‘Stopping Global Plastic Pollution: The Case for an International Convention’ (adelphi 2017) 43 Heinrich Böll Stiftung Publication Series Ecology. 34.
[463] C Schmidt et al., ‘Export of Plastic Debris by Rivers into the Sea’ (2017) 51 Environmental Science & Technology 21. 12246, 12252; C Schmidt et al. ‘Correction to Export of Plastic Debris by Rivers into the Sea’ (2018) 52 Environmental Science & Technology 2; LCM Lebreton et al., ‘River Plastic Emissions to the World's Oceans’ (2017) 8 Nature Communications. 3.

field: the Convention on the Law of Non-Navigational Uses of International Watercourses ('UNWC') and Convention on the Protection and Use of Transboundary Watercourses and International Lakes ('the UNECE Water Convention').[464]

According to the UNWC, "pollution of an international watercourse" denotes "any detrimental alteration in the composition or quality of the waters of an international watercourse which results directly or indirectly from human conduct."[465] Though the definition of pollution does not expressly mention plastics, the broad mandate includes marine plastics pollution.[466] The UNWC addresses the connection between international watercourses and oceans in its Article 23:

> Watercourse States shall, individually and, where appropriate, in cooperation with other States, take all measures with respect to an international watercourse that are necessary to protect and preserve the marine environment, including estuaries, taking into account generally accepted international rules and standards.[467]

This provision draws attention to the connection between watercourses and the marine environment and the impact that watercourse pollution can have on the latter.[468] In its commentary on the draft articles of the UNWC, the ILC underlines that the provision does not contain a commitment to protect the marine environment as such, but a duty to manage the watercourse in a manner that does not harm that environment.[469]

Protecting the marine environment pursuant to Article 23 is a duty separate from the obligation not to cause significant transboundary harm (Article 6), and to prevent, reduce and control pollution in an international watercourse (Article 22), as these obligations address harm to other watercourse States."[470] As the ILC notes, a watercourse State "could conceivably damage an estuary through pollution of an international watercourse without breaching its obligation not to cause significant harm to other watercourse States".[471] Pertinent questions in this regard are how this provision is

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[464] L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 248.
[465] Art 21(1), UNWC.
[466] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 30.
[467] Art 23, UNWC.
[468] L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 248.
[469] ILC 'Yearbook of the International Law Commission 1994, Volume II Part 2: Report of the Commission to the General Assembly on the Work of Its Forty-Sixth Session' (1994) UN Doc A/CN.4/ SER.A/1994/Add.1. 124; L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 248.
[470] L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 248.
[471] ILC 'Yearbook of the International Law Commission 1994, Volume II Part 2: Report of the Commission to the General Assembly on the Work of Its Forty-Sixth Session' (1994) UN Doc A/CN.4/ SER.A/1994/Add.1. 124.

complied with, in light of the large volume of plastics leakage deriving from international watercourses, and whether and how such compliance is monitored given that some coastal States are not party to the UNWC.[472]

In its Preamble the UNECE Water Convention stresses the importance of environmental protection, emphasizing the need for national and international measures "to prevent, control and reduce the release of hazardous substances into the aquatic environment and to abate eutrophication and acidification, as well as pollution of the marine environment, in particular coastal areas, from land-based sources."[473] Although not explicitly targeting freshwater resources, the preamble highlights the close connection between land-based sources and marine pollution. Marine areas are not "transboundary waters" as these are defined in Article 1(1), but are included in the larger scope of the convention, presented in Article 2(6). This provision compels member States to develop policies, programs and strategies "aimed at the prevention, control and reduction of transboundary impact and aimed at the protection of the environment of transboundary waters or the environment influenced by such waters, including the marine environment."[474]

In terms of scope, the UNWC and the UNECE Water Convention are similar: they both target the protection and use of international freshwater resources while acknowledging the direct impact such resources can have on the marine environment and the obligation of States to actively reduce this impact.[475] Therefore, the UNWC and the UNECE Water Convention could have a broader scope of application to land-based plastics leakage prevention.[476] However, the UNWC has only been ratified by 37 States and the UNECE Water Convention by 44.[477] Low ratification and, as yet, weak interaction with international marine environmental law signify challenges for any future efforts.

There are a range of issues that complicate the relationship between international watercourses and protection of the marine environment and thus affect plastics leakage prevention. The legal fields of

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472 L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 248.
473 Preamble, Convention on the Protection and Use of Transboundary Watercourses and International Lakes (adopted 17 March 1992, entered into force 6 October 1996) 1936 UNTS 269 ('UNECE Water Convention')
474Art 2(6), the UNECE Water Convention; A Tanzi et al., 'Guide to Implementing the Water Convention' (UNECE 2013) ECE/MP.WAT/39. 14.
475 A Rieu-Clarke and R Kinna, 'Can Two Global UN Water Conventions Effectively Co-exist? Making the Case for a 'Package Approach' to Support Institutional Coordination' (2014) 23 Review of European, Comparative & International Environmental Law 1. 20-21.
476 See also, UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 30.
477 United Nations Treaty Collection, 'Depositary: Status of Treaties' https://treaties.un.org/Pages/ParticipationStatus.aspx?clang=_en

international water law and marine environmental law both belong to the larger body of international environmental law and are based on the same general legal principles – that is, the no-harm rule and the prevention and precautionary principles.[478] Although sharing the same general values, coastal States and watercourse States do not necessarily have the same interests.[479] Though coastal States are not in a position to reduce plastics deriving from watercourses, they are exposed to the impact from such pollution. Watercourse States are also affected by plastics while they are *in situ* in the watercourse, but as the plastics flow downriver, the State is no longer directly affected. Moreover, watercourse States also enjoy the benefit of polluting and thus have less economic motivation for investing in better waste management systems.[480]

When dealing with plastics leakage from international watercourses, problematic situations of legal fragmentation arise. The two parallel legal regimes create legal 'blind spots', which are issues or areas that emerge in the transition between the regimes, but remain unregulated in both. The problem of pollution is well addressed in both marine environmental law and international water law, and both sub-fields outline clear obligations for their members to prevent, control and reduce discharge of plastic items and pollution in general. However, the legal regimes fail to address the links between them and how they relate to and influence each other. In the case of MPP deriving from watercourses there is even a physical link – the passage of freshwater into the sea, which is the point where plastic pollution goes from being the watercourse State's responsibility to becoming the responsibility of the coastal State, or from being regulated by the corpus of international water law to being regulated by the law of the sea. These unregulated links thus become blind spots of international law, on the boundary between the two sub-fields. The absence of legal interaction in these areas creates legal shortcomings and environmental deterioration that contradicts the main interests, principles and values of both sub-fields.[481] Therefore, it is crucial to address these blind spots to combat substantial riverine inputs of plastics leakage to the marine environment.

4.3.3 Soft Law Instruments Relevant for Land-Based Plastics Leakage

The most pertinent voluntary commitments applicable to plastics leakage prevention are the GPA, the Global Partnership on Marine Litter (GPML) and the Honolulu Strategy. Though these

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[478] L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 252.
[479] S Vinogradov, 'Marine Pollution via Transboundary Watercourses – An Interface of the 'Shoreline' and 'River-Basin' Regimes in the Wider Black Sea Region' (2007) 22 International Journal of Marine and Coastal Law 4. 586.
[480] L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 252.
[481] *Ibid.*

instruments are not officially established to be the international rules and standards referred to by Article 207 of the LOSC, they are the most relevant existing international standards States can voluntarily use as guidance for national and regional action on land-based sources of plastics leakage prevention.[482]

The GPA is "the only global intergovernmental mechanism entirely dedicated to" plastics leakage from land-based sources. It is also the only mechanism that directly addresses "the connections between terrestrial, freshwater, coastal and marine ecosystems."[483] The GPA is relevant for plastics wastes because they belong to one of its main source categories, marine litter.[484] The GPA recognizes a variety of important sources of land-based marine litter, all of which are relevant for plastics leakage prevention:

> Sources include poorly managed or illegal waste dumps adjacent to rivers and coastal areas, windblown litter from coastal communities, resin pellets used as industrial feedstocks and litter that is channeled to the marine and coastal environment through municipal stormwater systems and rivers. Marine litter is also caused by dumping of garbage into the marine and coastal environment by municipal authorities[.][485]

The aim of the GPA is "to be a source of conceptual and practical guidance to be drawn upon by national and/or regional authorities in devising and implementing sustained action to prevent, reduce, control and/or eliminate marine degradation from land-based activities."[486] In particular "the overall objective of this programme is to provide health protecting environ- mentally safe waste collection and disposal services to all people."[487] The GPA *inter alia* advocates States to establish "regulatory measures and/or economic instruments and voluntary agreements to encourage reduction in the

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[482] See, EA Kirk and N Popattanachai 'Marine Plastics: Fragmentation, Effectiveness and Legitimacy in International Lawmaking' (2018) 27 Review of European, Comparative and International Environmental Law 3. Note that the authors only discuss explicitly the relationship of the Article 207 of the LOSC and the GPA in this article.

[483] UNEP, 'Possible options for the future of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities: An Analysis' http://wedocs.unep.org/bitstream/handle/20.500.11822/27513/GPA%20Option%20Paper%2026%20Feb%202019.pdf?sequence=6&isAllowed=y 7.

[484] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 12.

[485] Intergovernmental Conference to Adopt a Global Programme of Action for the Protection of the Marine Environment from Land- based Activities, Washington, D.C., (23 October-3 November 1995), Global Programme of Action for the Protection of the Marine Environment from Land-based Sources (3 November 1995): Selected Documents and Proceedings. 645.

[486] UNEP/Intergovernmental Conference to Adopt a Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, 'Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities' (Adopted 5 December 1995) UN Doc UNEP(OCA)/LBA/IG.2/7 ('GPA') 9.

[487] Intergovernmental Conference to Adopt a Global Programme of Action for the Protection of the Marine Environment from Land- based Activities, Washington, D.C., (23 October-3 November 1995), Global Programme of Action for the Protection of the Marine Environment from Land-based Sources (3 November 1995): Selected Documents and Proceedings. 645.

generation of solid wastes."[488] Prevention of plastics leakage within the framework of the GPA is closely linked to the establishment and improvement of waste management services in both urban and rural areas, the target year for achieving these being 2025.[489]

Currently 108 governments and the EU have adopted the GPA.[490] The States are to effectively develop and implement national programmes of action (NPAs), which around 80 States have done so far.[491] The criteria of the GPA for NPAs includes: identification and assessment of problems; establishment of priorities; setting management objectives for priority problems; identification, evaluation and selection of strategies and measures; criteria for evaluating the effectiveness of strategies and measures; and programme support elements.[492] Whether the issue of plastics wastes in particular is part of the NPAs is thus left to the discretion of States. Were it in the interest of a State, the NPA criteria can however provide a useful framework to target the issue of land-based plastics leakage nationally, or can be a benchmark to evaluate its current laws against. In addition to NPAs, the GPA also links to UNEP's Regional Seas Programme (RSP) as a means of its regional implementation.[493]

Progress of the GPA is followed through Intergovernmental Review Meetings (IGR) held every five years.[494] The IGR evaluates implementation of the GPA based on national surveys, not by reviewing the NPAs per se. The survey includes some directly relevant factors for reporting of plastics and plastics wastes. In the survey, States have to indicate the main "marine pollution areas that have generally received policy attention over the last five years" and "marine litter/plastics" is one possible option.[495] States can also report significant projects or programme investments being planned to address plastics.[496] Other questions in the survey are of a general nature. To follow more specifically

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[488] *Ibid.* 646.
[489] United Nations Conference on Environment and Development, 'Agenda 21' (Adopted 14 June 1992) UN Doc A/CONF.151/26/Rev.1 (Vol I) Para 21.39.
[490] UN Environment, 'Governing the Global Programme of Action' <https://www.unenvironment.org/explore-topics/oceans-seas/what-we-do/addressing-land-based-pollution/governing-global-programme>
[491] B Meier-Wehren, 'The Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities' (2013) 17 New Zealand Journal of Environmental Law 1. 36.
[492] UNEP/Intergovernmental Conference to Adopt a Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, 'Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities' (Adopted 5 December 1995) UN Doc UNEP(OCA)/LBA/IG.2/7 ('GPA') 10-16.
[493] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 49.
[494] UN Environment, 'Governing the Global Programme of Action' https://www.unenvironment.org/explore-topics/oceans-seas/what-we-do/addressing-land-based-pollution/governing-global-programme
[495] B7, National Reporting for the Fourth Inter-Governmental Review (IGR) of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) https://docs.google.com/forms/d/e/1FAIpQLSe7_sa3L12Zx8JKwUxI-1goiQqvIBetvtSz1GB2ggtlFTsuDQ/viewform
[496] *Ibid.* G1-G2.

the progress of implementation regarding plastics it would be advisable to address the matter on the survey more comprehensively. For example, the question on monitoring does not allow for specifying monitoring of plastics leakage at all.[497]

Currently the future of the GPA is under review: "the primary challenges opposing successful implementation of the GPA are lack of interest on the side of States, the non-binding status of the GPA and lack of compliance mechanisms, as well as lack of assistance for developing countries."[498] The absence of sustained support by UNEP and governments in operating its key mechanisms, such as a clearing house system as a means of capacity building – combined with poor visibility – have likely contributed to the lack of adequate and predictable funding for the GPA.[499] However, "the Global Programme of Action ha[s] served as an "incubator" to bring certain source categories of pollution to the forefront of the global environmental agenda for international action."[500] One of these categories is MPP.

A Global Partnership on Marine Litter (GPML) has functioned under the auspices of the GPA since 2012,[501] and has multi-stakeholder membership from over 50 countries around the world.[502] It functions via voluntary local, national, and regional seas organizations' marine litter action plans and a regional nodes network, and it endorses and promotes implementation of the Honolulu Strategy.

The Honolulu Strategy is a framework document for a comprehensive, multi-stakeholder global effort to reduce the ecological, human health, and economic impacts of MPP globally.[503] It outlines strategies on regulating land-based sources of marine litter, including plastics:

> Strategy A4. Develop, strengthen, and enact legislation and policies to support solid waste minimization and management
>
> Strategy A5. Improve the regulatory framework regarding stormwater, sewage systems, and debris in tributary waterways strategy

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[497] See, *Ibid.* D2.
[498] B Meier-Wehren, 'The Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities' (2013) 17 New Zealand Journal of Environmental Law 1. 36.
[499] UNEP, 'Possible options for the future of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities: An Analysis' http://wedocs.unep.org/bitstream/handle/20.500.11822/27513/GPA%20Option%20Paper%2026%20Feb%202019.pdf?sequence=6&isAllowed=y 9.
[500] *Ibid.* 8.
[501] UNEP/Intergovernmental Review Meeting on the Implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, 'Report of the Third Session of the Intergovernmental Review Meeting on the Implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities' (26 January 2012) UN Doc UNEP/GPA/IGR.3/6. 11.
[502] GPML, 'Our Members' https://www.gpmarinelitter.org/who-we-are/our-members
[503] UNEP, 'The Honolulu Strategy: A Global Framework for Prevention and Management of Marine Debris' (2016) ('Honolulu Strategy') ES-1.

Strategy A6. Build capacity to monitor and enforce compliance with regulations and permit conditions regarding litter, dumping, solid waste management, stormwater, and surface runoff strategy[504]

Each of these points has subpoints, which provide for banning the most common plastic items found in beach cleanups, improving solid waste management, targeting pellet losses with binding rules, and enforcement of these regulations.[505] The Honolulu Strategy does not contain any targets, reporting, and monitoring or detail a review mechanism for implementation of these strategies.

The GPA and the Honolulu Strategy also both address the connection between rivers and oceans and plastics. The Honolulu Strategy, as part of Strategy A5, recommends developing Total Maximum Daily Load (TMDL) levels for trash in rivers and other water systems.[506] The GPA addresses the linkages at national and regional levels. States are recommended to formulate and implement improved management programmes in small rural communities to prevent litter escaping into rivers and the marine and coastal environment. On a regional level, States are encouraged to involve river authorities and commissions in the development and implementation of regional programs of action, as well as including land-locked States whose river systems and drainage basins are linked to a particular marine region. Moreover, it is suggested States further identify and characterize drainage basins that are closely linked to degradation of the coastal areas and the marine environment.[507]

4.3.4 Due Diligence in Relation to Plastics Leakage Prevention From Land-Based Sources

The concept of due diligence "performs an important task in the international legal system in that it is applicable to new situations where no specific regulation exists."[508] Furthermore, "due diligence obligations can assist with overcoming alleged gaps and shortcomings that result from developments in scientific knowledge with regard to threats to the ocean and new approaches to protect the marine environment."[509] In the absence of international obligations explicitly targeting land-based plastics leakage, due diligence can play an important role in marine environmental protection.

Additionally, the due diligence obligation has a particularly important function in respect of compliance with international law by private persons under the exclusive jurisdiction and control of

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[504] *Ibid.* ES-2.
[505] *Ibid.* 15, 16, 35.
[506] *Ibid.* 35.
[507] UNEP/Intergovernmental Conference to Adopt a Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, 'Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities' (Adopted 5 December 1995) UN Doc UNEP(OCA)/LBA/IG.2/7 ('GPA') 10, 19, 22, 56.
[508] T Koivurova, in 'Due Diligence' *Max Planck Encyclopedia of Public International Law* (2010)
[509] N Matz-Lück and E Van Doorn, 'Due Diligence Obligations and the Protection of the Marine Environment' (2017) 42 L'Observateur des Nations Unies. 170.

a State.[510] Historically, the main impact of due diligence has been on the responsibility of States for private actors – that is, preventive measures a State should take to prohibit private actors from breaching international law.[511] This is particularly relevant for land-based plastics leakage, because the polluting actors are almost always private ones and the activity takes place in the sovereign territory of a State. Under due diligence, the role of the State is to regulate these activities and to control compliance to prevent plastics leaking into the oceans.

Matz-Lück and Van Doorn have suggested a procedure to analyze due diligence in the context of marine environmental protection. First, one "has to identify a due diligence obligation for States in the law of the sea; second, one has to "define the threshold for due diligence"; third, one has to "define the precise standards a State has to meet to evade State responsibility; and lastly, one has to involve "discussion of applicable principles of environmental law."[512] This method offers here a source of inspiration and guidance to evaluate the standard of due diligence in relation to land-based plastics leakage prevention.

Identifying and defining standards of due diligence for States' obligations concerning the protection and preservation of the marine environment entails connecting relevant concepts and principles of environmental law to the general obligations of the LOSC.[513] As already examined in sub-chapter 3.4, which established the international legal basis for preventing plastics leakage to the marine environment, the due diligence obligation of States were identified to be grounded in the no-harm rule, the prevention principle and the general obligations of the LOSC to protect the marine environment in Articles 192 and 194(2).

The content of both the general rules and due diligence remains elusive.[514] Defining the precise standards and threshold of due diligence a State has to meet to avoid State responsibility for causing transboundary damage from land-based plastics leakage is a challenging task. Case law from ICJ, ITLOS and PCA has affirmed the due diligence nature of the obligation not to cause transboundary harm and provided interpretative guidance to evaluate the standards a State has to meet.[515] ITLOS in

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510 T Koivurova, in 'Due Diligence' *Max Planck Encyclopedia of Public International Law* (2010)

511 *Ibid.*; Though States' responsibility to regulate activities of private actors are the main focus in this study, due diligence obligations also apply to activities of State actors.

512 N Matz-Lück and E Van Doorn, 'Due Diligence Obligations and the Protection of the Marine Environment' (2017) 42 L'Observateur des Nations Unies. 171-172.

513 *Ibid.* 171.

514 I Plakokefalos, 'Prevention Obligations in International Environmental Law' (2012) 23 Yearbook of International Environmental Law 1. 4

515 *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)* (Judgment) [2010] ICJ Reports 2010. 69, para. 197; 69, para 197; *Responsibilities and Obligations of States with respect to Activities in the Area* (Advisory Opinion) [2011] ITLOS Reports 2011. 43-44, paras 117-120.

its advisory opinion on *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area* depicts the content of due diligence:

> The content of "due diligence" obligations may not easily be described in precise terms. Among the factors that make such a description difficult is the fact that "due diligence" is a variable concept. It may change over time as measures considered sufficiently diligent at a certain moment may become not diligent enough in light, for instance, of new scientific or technological knowledge. It may also change in relation to the risks involved in the activity.[516]

Case law repeatedly refers to two main components of due diligence. For example, in the *South China Sea Arbitration*, the Tribunal "specified two components of the obligation of due diligence: (i) a duty to adopt rules and measures to prevent harmful acts; and (ii) a duty to maintain a level of vigilance in enforcing those rules and measures."[517] In *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area*, ITLOS specifies that the applicable standard of due diligence has to be "reasonably appropriate".[518] Furthermore, procedural obligations have become increasingly important in case law to evaluate whether a State has fulfilled its due diligence obligations of prevention.[519]

The investigation here focuses on examination of the content of due diligence standard on preventing land-based transboundary plastics leakage. However, it should be noted that such examination has been approached with doubt: "while the regulation of specific forms of pollution of the marine environment has to be viewed in context of the general obligations established inter alia by Article 192 and Article 194(2), it is subject to discussion to what extent general due diligence obligations can be instrumentalized to address specific forms of pollution."[520] The analysis in this sub-chapter is an attempt to instrumentalize due diligence to address specifically land-based plastics leakage. It is pertinent to ask in this context whether soft law on land-based sources of plastics leakage prevention could be used to inform the standard of due diligence.

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516 *Responsibilities and Obligations of States with respect to Activities in the Area* (Advisory Opinion) [2011] ITLOS Reports 2011. 43, para 117.

517 *The South China Sea Arbitration (The Republic of the Philippines v People's Republic of China)* (Award) [2016] PCA Case No 2013–19. 382, para 961; Y Tanaka, 'The South China Sea Arbitration: Environmental Obligations under the Law of the Sea Convention' (2018) 27 Review of European, Comparative & International Law 1. 92; See also, *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)* (Judgment) [2010] ICJ Reports 2010. 69, para. 197; 69, para 197; *Responsibilities and Obligations of States with respect to Activities in the Area* (Advisory Opinion) [2011] ITLOS Reports 2011. 43-44, paras 117-120.

518 *Responsibilities and Obligations of States with respect to Activities in the Area* (Advisory Opinion) [2011] ITLOS Reports 2011. 44, para 120.

519 AC Kiss and D Shelton, *Guide to International Environmental Law* (Martinus Nijhoff Publishers 2007) 92; See eg, *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)* (Judgment) [2010] ICJ Reports 2010. 72-73, para 204.

520 N Matz-Lück and E Van Doorn, 'Due Diligence Obligations and the Protection of the Marine Environment' (2017) 42 L'Observateur des Nations Unies. 185-186.

Due diligence "can be used to reinforce…duties…by drawing into the scope of due diligence those policy and guidance measures in soft law instruments that articulate how a State should give effect to its obligations of conduct."[521] Thus it could be seen as an "implicit requirement" for soft law instruments that "their content should be able to inform the laws and regulations adopted by States."[522] The GPA provides a framework for establishing national programmes of action on marine litter, including plastics, to improve solid waste management systems in particular.[523] The Honolulu Strategy provides guidance for States relating to banning the most common plastic items found in beach cleanups, improving solid waste management, targeting pellet losses with binding rules, and enforcement of these regulations.[524] These instruments can be argued to have relevance for evaluating whether a State has adopted the necessary rules to prevent plastics leakage. However, this line of argumentation clearly goes beyond systematic or evolutionary interpretation of the law and rather represents progressive development of law.[525]

However, "from the perspective of effective ocean governance and a high standard of protection and preservation of the marine environment, the concept of due diligence must be open towards standards defined in soft-law instruments when they articulate how a State should give effect to obligations of conduct."[526] From this perspective, it would be valid to argue that the due diligence obligations can be instrumentalized to target specific pollution types. In the case of preventing transboundary harm from plastics leakage, the GPA and the Honolulu Strategy can further inform operationalizing the no-harm rule, the prevention principle, the general obligations of the LOSC, as well as Articles 207 and 213 of the LOSC. The GPA, and particularly the Honolulu Strategy, can provide a minimum standard concerning the content of the regulatory conduct required of States.

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521 RA Barnes, 'Flag States' in D Rothwell et al. (eds) *The Oxford Handbook of the Law of the Sea* (Oxford University Press 2015) 323.
522 N Giannopoulos, 'Global Environmental Regulation of Offshore Energy Production: Searching for Legal Standards in Ocean Governance' (2019) 28 The Review of European, Comparative & International Environmental Law 3. 10; BH Oxman, 'The Duty to Respect Generally Accepted International Standards' (1991) 24 New York University Journal of International Law and Politics. 148.
523 UNEP/Intergovernmental Conference to Adopt a Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, 'Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities' (Adopted 5 December 1995) UN Doc UNEP(OCA)/LBA/IG.2/7 ('GPA') 55.
524 UNEP, 'The Honolulu Strategy: A Global Framework for Prevention and Management of Marine Debris' (2016) ('Honolulu Strategy') 35.
525 N Matz-Lück and E Van Doorn, 'Due Diligence Obligations and the Protection of the Marine Environment' (2017) 42 L'Observateur des Nations Unies. 186.
526 *Ibid.*; RA Barnes, 'Flag States' in D Rothwell et al. (eds) *The Oxford Handbook of the Law of the Sea* (Oxford University Press 2015) 323.

4.3.5 Procedural Obligations in Relation to Due Diligence and Plastics Leakage

Recent case law from the ICJ has also stressed the importance of procedural obligations in evaluating compliance with due diligence. The procedural principles of international environmental law include notification, consultation, and carrying out an EIA.[527] An EIA is a preliminary method of investigation with a dual objective: it aims to determine the viability of a proposed project and its effects on the domestic environment and territory of other States.[528] A notification aims at promptly "initiating a framework for consultations so that the State of origin can take into account the interests of those likely to be affected" by a possible transboundary harm.[529] In consultations, "both the notifying and the notified States have an opportunity to discuss the impact of the proposed activities, and where possible to try and counteract their potential or actual adverse effects."[530] Multiple international binding and non-binding instruments require EIAs, notifications and consultations. However, the exact scope and content of a transboundary EIA, notification and consultations remain unspecified.[531] Outside treaties, the general legal status of these procedural obligations is likewise unclear. In the Pulp Mills Case, the ICJ concluded:

> [I]t may now be considered a requirement under general international law to undertake an environmental impact assessment where there is a risk that the proposed industrial activity may have a significant adverse impact in a transboundary context[.][532]

In the joined cases of *Certain Activities Carried out by Nicaragua in the Border Area (Costa Rica v Nicaragua) and Construction of a Road in Costa Rica along the San Juan River (Nicaragua v Costa Rica)*, the ICJ clarified that the obligation of due diligence in preventing transboundary harm underlies the procedural principles of environmental law.[533] In the *Case Concerning Pulp Mills on the River Uruguay (Argentina v Uruguay)*, the Court noted that the obligation of due diligence triggers the procedural obligations to carry out an EIA and to consequently notify and consult the potentially affected state should the EIA confirm a risk of significant harm.[534] As the protection of the marine environment from land-based

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527 M Koyano, 'The Significance of Procedural Obligations in International Environmental Law: Sovereignty and International Co-Operation' (2011) 54 Japanese Yearbook of International Law. 101.
528 PN Okowa, 'Procedural Obligations in International Environmental Agreements' (1997) 67 British Yearbook of International Law 1. 279.
529 *Ibid.* 289, 291, 299.
530 *Ibid.* 302.
531 *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)* (Judgment) [2010] ICJ Reports 2010. 73, para 205.
532 *Ibid.* 72-73, para 204.
533 R Yotova, 'The Principles of Due Diligence and Prevention in International Environmental Law' (2016) 75 The Cambridge Law Journal 3. 446-447; *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica* v. *Nicaragua) and Construction of a Road in Costa Rica along the San Juan River (Nicaragua* v. *Costa Rica)* (Judgment) [2015] ICJ Reports 2015. 45-46, para 104.
534 R Yotova, 'The Principles of Due Diligence and Prevention in International Environmental Law' (2016) 75 The Cambridge Law Journal 3. 446.

plastics leakage is based on prevention obligations of due diligence nature, it is relevant to examine how the procedural principles relate to evaluating compliance with the due diligence obligation to prevent plastics leakage into the oceans.

The key issue with procedural obligations in relation to plastics leakage is the object of an EIA, notification or consultation. In the *Case Concerning Pulp Mills on the River Uruguay (Argentina v Uruguay),* the ICJ referred to industrial activities.[535] However, it may be argued that "the underlying principle applies generally to proposed activities which may have a significant adverse impact in a transboundary context."[536] Some activities relevant for plastics that require an EIA under international law are regulated under the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) and the related Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Protocol).

The Espoo Convention lists activities subject to transboundary EIA requirements and thus can provide some guidance on the topic.[537] The relevant activities that concern plastics under the Espoo Convention are "integrated chemical installations and major storage facilities for petroleum, petrochemical and chemical products".[538] The relevant activities in the Espoo Protocol comprise "integrated chemical installations; major storage facilities for petroleum, petrochemical and chemical products; installations for surface treatment of metals and plastic materials using an electrolytic or chemical process; manufacture and assembly of motor vehicles and manufacture of motor-vehicle engines; manufacture and treatment of elastomer-based products; waste-disposal installations (including landfill), as far as not included in annex I; and installations for the incineration or chemical treatment of non-hazardous waste; and waste-water treatment plants."[539] These plastics-related activities provide a list of examples which have been identified to have potential transboundary impacts. Though ratification of the Espoo Convention and Protocol remains modest, they can nevertheless demonstrate where an EIA is relevant – and not just for States that have ratified them.

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535 *Pulp Mills on the River Uruguay (Argentina v. Uruguay)* (Judgment) [2010] ICJ Reports 14. 72-73, para 204.
536 *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica* v. *Nicaragua) and Construction of a Road in Costa Rica along the San Juan River (Nicaragua* v. *Costa Rica)* (Judgment) [2015] ICJ Reports 2015. 45, para 104.
537 See, Convention on Environmental Impact Assessment in a Transboundary Context (Adopted 25 February 1991, entered into force 10 September 1997) 1989 UNTS 309 ('Espoo Convention') Appendix I; Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context (adopted 21 May 2003, entered into force 11 July 2010) 2685 UNTS 140 ('Espoo Protocol') Annex I-II.
538 Convention on Environmental Impact Assessment in a Transboundary Context (Adopted 25 February 1991, entered into force 10 September 1997) 1989 UNTS 309 ('Espoo Convention') Appendix I.
539 Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context (adopted 21 May 2003, entered into force 11 July 2010) 2685 UNTS 140 ('Espoo Protocol') Annex I-II.

[540] In situations which concern a proposed activity and a where a State is a party to the Espoo Convention or the Protocol, the application of an EIA is not problematic. However, as most States are not parties, it is up to their national regulations to require an EIA for activities related to plastics production or plastics wastes management. Furthermore, the instruments cover only some activities relevant for plastics.

However, the critique of the applicability of procedural obligations to activities relating to plastics stems from the possibly distant and indirect link between a specific activity and the polluting act:

> In a narrow sense, environmental impact assessment (EIA)…focus on specific sites and assess compatibility of projects with regard to environmental conditions, social practices, and standards considering local circumstances. In many jurisdictions such assessments are part of a project approval process and are conducted to comply with regulatory requirements. Due to the site-specific nature of traditional EIA…the scope and boundaries are restricted to impacts on the local environment and society only, whereas environmental and social impacts in other parts of the value chain, which could be of critical importance, are not considered.[541]

A site-specific polluting act is evident, for example, when an installation producing plastics pellets discharges these pellets into waterways and oceans. However, these situations are not the main cause of widespread plastics leakage. More often the site that produces, for example, plastics packaging has no control over where its products are disposed of, and an EIA does not cover such situations. Neither is such a site in a position to undertake consultations or make a notification that its products may cause transboundary harm in the oceans. Also the Governance Report notes that an "EIA is a difficult concept to apply to diffuse sources of plastic waste."[542]

When the activities and actors causing plastics leakage are too diffuse and fragmented along lengthy, complex and global value chains, the contemporary site-specific form of a procedural obligations to notify, consult or carry out an EIA is not fit-for-purpose to evaluate whether a State has fulfilled its due diligence to prevent plastics leakage to the marine environment from land-based sources. At best, procedural obligations can capture individual activities along the value chain, such as an installation producing plastic pellets or a waste management facility burning plastics wastes. It is currently very difficult to establish a clear enough link between a certain actor in the plastics value chain and leakage of plastics wastes into the marine environment. Therefore, the procedural obligations are only of marginal benefit to assess compliance with due diligence concerning plastics leakage prevention.

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[540] The Espoo Convention has 45 Parties and the Espoo Protocol 33 Parties. United Nations Treaty Collection, 'Depositary: Status of Treaties' https://treaties.un.org/Pages/ParticipationStatus.aspx?clang=_en
[541] Econsense – Forum for Sustainable Development of German Business, 'Assessing Environmental and Social Impacts: Information and Guidance for Organizations' (2015) 3.
[542] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 90.

4.3.6 THE MAIN STRENGTHS AND WEAKNESSES OF LAND-BASED PLASTICS LEAKAGE PREVENTION INSTRUMENTS

The source-based structure to prevent pollution is particularly problematic when it comes to land-based sources because the number of activities and substances causing plastics leakage is variable and significant. It is thus difficult to provide any useful criteria to determine a minimum standard of protection from all these activities and substances. Plastics are a good example. Though via interpretation these instruments and principles can be applied to plastics leakage, and it can even be argued subsequently that a general obligation to prevent plastics leakage to the oceans exists, none of the binding or non-binding instruments or principles specifically targets plastics leakage. Thus the content of such an obligation remains vague and enforcement consequently difficult.

The source-based structure to address marine pollution is fit-for-purpose in the LOSC to delegate responsibilities to the IMO to regulate prevention of plastics leakage from vessels in the form of operational wastes and dumping. In fact, the IMO has in its further work taken a more substance-based approach, and the IMO instruments specifically regulate plastics. A similar development has not yet happened regarding land-based pollution and plastics. The most obvious shortcomings are the lack of clarity in terms of which " competent international organization" is to develop and adopt further rules on land-based pollution and target plastics, and consequently the absence of a clear, substantive and enforceable international obligation to prevent plastics leakage from land-based sources.

The obligation of due diligence to protect the marine environment complements the vague provisions of the LOSC on land-based pollution. This obligation has a binding status as customary law and applies to all States, thus strengthening the legal framework for preventing land-based plastics leakage. To some extent, the due diligence obligation to prevent transboundary and global harm to the oceans and the soft law instruments on marine litter consisting of the GPA, the GPML and the Honolulu Strategy fill this gap and provide some indication as to the minimum content to prevent plastics leakage. The GPA and the Honolulu Strategy in particular have value in instrumentalizing due diligence to address a specific source of pollution and determining a more precise content for due diligence standards. However, arriving at such a conclusion requires an evolutionary interpretation if not a progressive development of law which complicates the legal situation for States seeking to understand what exactly is currently required of them to comply with their due diligence obligations with regards to land-based plastics leakage.

Furthermore, the limited applicability of the procedural environmental obligations to activities concerning plastics complicates evaluating compliance with the due diligence obligations. Procedural obligations can further strengthen due diligence only when new plastics-related activities are planned. However, in many instances the contemporary site-specific procedural obligations fail to take into account the nature of plastics production, consumption and disposal activities, which are dispersed along complex global value chains, making establishing and evaluating the transboundary environmental impacts of one activity further along the value chain a complicated matter. In these cases procedural obligations are of little use to assess compliance with the due diligence standard.

Further issues stem from reconciling international law concerning prevention of plastics leakage to national waste management, which is a matter of State sovereignty. All international plastics leakage prevention measures, including vessel-source plastics wastes that are collected at port reception facilities, ultimately depend on national waste management on land. Yet, this requirement for at least basic waste management services is not operationalized in detail even in soft law instruments on marine litter. Furthermore, establishing even the most basic waste management in the form of sanitary landfills or incineration and related collection services is a major undertaking requiring strenuous capacity building efforts and technical support in the developing countries. This is another significant issue that needs to be addressed in global efforts to curb plastics leakage. The LOSC and the CBDR provide a framework to enhance capacity building in this area. As mismanaged plastics wastes originate from both coastal areas and from rivers, it is essential that enhanced waste management is a matter of concern for the States upstream from estuaries as well as for coastal States.

The rules and standards in this Chapter are the primary substantive rules on preventing plastics leakage into the oceans under current international law, selected as per the methodology presented in Chapter 2. Part III on remedies will further examine whether it is possible to hold a State responsible for breaching these primary rules – whether treaty-based obligations on vessel-source plastics pollution and the dumping of plastics, or the due diligence standard to protect the oceans from transboundary and global harm.

CHAPTER 5 – FURTHER LEGAL MEASURES TO PREVENT PLASTICS LEAKAGE TO THE MARINE ENVIRONMENT

5.1 Introduction

The international legal framework is insufficient to confront the issue of plastics leakage mainly due to gaps in addressing land-based leakage with clear obligations or targets, and due to enforcement issues regarding ocean-based leakage sources. It fails to address plastics leakage from rivers to oceans, and the combination of soft law instruments and due diligence obligations remain too vague to effectively target the problem of land-based plastics leakage. These gaps are identified as main concerns in this chapter, which sets out discuss how riverine inputs of plastics could be addressed better through international cooperation and why a new treaty would bring significant added value to the current international legal framework applicable to plastics leakage.

5.2 Targeted Action at a Regional Level: Combining The Global Partnership on Marine Litter, Regional Seas Programmes and River Basin Organizations[543]

5.2.1 Introduction

Although this study focuses otherwise merely on international and not regional instruments, the ocean-river connection and international cooperation was chosen because this issue has barely been discussed in the legal literature despite riverine inputs forming a significant source of plastics leakage to oceans, and because the topic interlinks closely with shortcomings in interaction between two branches of international law, IEL and international water law. Moreover, the GPML specifically promotes regional cooperation on marine litter through its regional nodes which could be used as an existing international platform for further collaboration.

One of the major pathways of plastics leakage to the marine environment is river systems and many of the world's largest and most heavily polluted watercourses are international, such as the Ganges-Brahmaputra-Meghna, the Amazon and the Mekong.[544] However, international marine environmental law and international water law lack regime interaction and have shortcomings in terms of plastics leakage prevention from rivers to oceans. The purpose of this sub-chapter is to further develop this

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[543] This sub-chapter builds on our co-authored and previously published article: L Finska and J Gjørtz Howden, 'Troubled Waters – Where Is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3.

[544] See sub-chapter 3.3, 'Framing the Problem: Plastics Leakage to the Marine Environment'; C Schmidt et al., 'Export of Plastic Debris by Rivers into the Sea' (2017) 51 Environmental Science & Technology 21. 12246, 12251-12252; C Schmidt et al. 'Correction to Export of Plastic Debris by Rivers into the Sea' (2018) 52 Environmental Science & Technology 2; LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications. 3.

discussion and provide a concrete recommendation for strengthening regional cooperation between these two sub-fields of international law in relation to plastics leakage prevention. The benefit of this approach is that institutions and channels to do this already exist and cooperation between them is supported by international law. Therefore this process would not be dependent on whether the international community starts negotiating a new treaty on plastics, though a new treaty could endorse the developments that are suggested here under its coordination mechanism.

A recent UNEP report suggested that improved cooperation between regional seas organizations (RSOs) and river basin organizations (RBOs) could provide a mechanism to better address transboundary sources of plastics.[545] RSOs are part of the UN Environment's Regional Seas Programme (RSP). The RSP includes currently 18 regions.[546] RBOs are institutions that riparian States have established to govern internationally shared watercourses.[547]

The rationale for building on UNEP's suggestion of improved cooperation between RSOs and RBOs is based on the notion that, except for the Amazon, most of the polluted international watercourses have their estuaries in regions that have a regional seas organization in place.[548] In addition, the most heavily polluted national rivers and their estuaries are situated in States that are parties to a regional seas organization.[549] This means such improved cooperation could play an important role in promoting an integrated approach to controlling riverine inputs of plastics leakage to the marine environment.[550] The legal basis for such interaction is well established both under international marine environmental law and international water law, though no explicit obligation to do this exists.[551] However, even without an explicit obligation it can be argued that the principles of cooperation and

545 UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 119.
546 UN Environment, 'Why Does Working with Regional Seas Matter?' https://www.unenvironment.org/explore-topics/oceans-seas/what-we-do/working-regional-seas/why-does-working-regional-seas-matter
547 S Schmeier et al., 'Clearing the Muddy Waters of Shared Watercourses Governance: Conceptualizing International River Basin Organisations' (2016) 16 International Environmental Agreements: Politics, Law and Economics. 598.
548 L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 249.
549 The analysis was done by using an interactive map that has modelled riverine inputs of plastics (based on LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications), see The Ocean Cleanup, 'River Plastic Emissions to the World's Oceans' https://www.theoceancleanup.com/sources/. The interactive map was compared with Google Maps to identify the rivers and their locations; See, L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 249.
550 L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 249.
551 L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 248; Sub-chapter 4.3, 'Land-Based and Riverine Plastics Leakage'.

prevention and the no-harm rule provide a common value basis for riparian and coastal States to collaborate.[552]

5.2.2 The Global Partnership on Marine litter and Regional Nodes

The GPML is a voluntary multi-stakeholder partnership that brings together all actors working to prevent marine litter and microplastics and provides a global platform to share knowledge and experience.[553] The GPML aims at protecting the global marine environment, human well-being and animal welfare from the problem of marine litter by "providing a mechanism for cooperation and coordination; sharing ideas, knowledge and experiences; identifying gaps and emerging issues."[554]

The GPML recognizes that the participation of regional bodies is essential for its success. Already, "regional seas programmes and regional fisheries management organizations provide existing networks of relevant major stakeholders" and can be recognized as GPML regional nodes. Other types of relevant institutions could also function as regional nodes if they are able to fulfill the proposed objectives and draft terms of reference.[555] The general purpose of regional nodes is to promote the development and implementation of the GPML on a regional basis.[556] The high-level objectives of regional nodes under the GPML are:

1. To create an effective regional network of public and private bodies to promote the objectives of the GPML.
2. To ensure representation from relevant governance, industrial/commercial, academia, education, citizens' groups and other relevant organisations.
3. To promote implementation of the GPML approach by developing regionally-appropriate communication channels, encouraging exchange of expertise and good practice, providing advice and training, developing cost-effective monitoring programmes and undertaking practical exercises to raise awareness.[557]

Five of the regional seas organizations that have a marine litter action plan have been recognized as regional nodes under the GPML. These organizations are the North-West Pacific Region, Pacific Region, Caribbean Region, Mediterranean Region and South Asian Seas.[558] As the GPML is open to also including other regional seas organizations and other relevant institutions as regional nodes, the main interest in this sub-chapter is to look into which other regional seas organizations should be

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[552] The principle of cooperation is a well-established obligation under international law. See, P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 215.
[553] GPML, 'Purpose, Function and Organization' (2018) Framework Document. 3.
[554] GPML, 'Purpose, Function and Organization' (2018) Framework Document. 3.
[555] *Ibid.* 5.
[556] *Ibid.* Annex 1.
[557] *Ibid.* Annex 1.
[558] The Global Partnership on Marine Litter Network, 'Regional Nodes' https://marinelitternetwork.engr.uga.edu/regional-nodes/

involved, whether river basin organizations could qualify as other relevant institutions, and which RSOs and RBOs could be coupled as collaborating institutions under the GPML.

5.2.3 Coupling RSOs and RBOs as Potential Regional Nodes under the GPML

The basic requirement to couple a regional seas organization with a river basin organization is that both exist in the area where an estuary becomes a regional sea. Not all international watercourses have an RBO in place. The governance of a shared watercourse can take the form of bilateral cooperation between the respective riparian States or there may be other institutions involved which are not RBOs. Therefore, it is not possible to match each RSO with an RBO. The first step is to investigate the RSOs already designated as regional nodes under the GPML and to look into which international watercourses terminate in these areas, how much plastics they are estimated to deliver each year to the oceans, whether there is an RBO in place, and whether the regional seas organization and river basin organization address the plastics leakage issue from rivers to oceans.[559]

In the North-West Pacific Region (NOWPAP), the Amur River is a shared watercourse between China and Russia and is estimated to deliver 11 900 kg of plastics to the oceans each year.[560] The NOWPAP Regional Action Plan on Marine Litter encourages participating States to "develop the national plans on the Integrated Coastal Area and River Basin Management (ICARM) where the marine litter issues should be included".[561] It also recommends that these plans should include "local planning and management capacity to avoid location of waste dump sites near coastlines or waterways as well as to avoid litter escape to the marine and coastal environment."[562] However, the governance of the Amur River relies on bilateral action between the two States and has no RBO.[563]

In the South Asian Seas Region (SACEP), the Ganges-Brahmaputra-Meghna is a shared watercourse between India, China, Nepal, Bangladesh, and Bhutan.[564] It delivers an estimated 7 515 000 kilograms of plastics each year in the Indian Ocean and is the most polluting international watercourse in the

559 Those regional seas programmes that are regional nodes under the GPML but do not have international watercourses in the region, or where the delivery of plastics via an international watercourse is minor (below 10 000 kilograms yearly), are excluded from the analysis (the Pacific Region and the Caribbean Region).
560 The analysis was done by using an interactive map that has modelled riverine inputs of plastics (based on LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications), see The Ocean Cleanup 'River Plastic Emissions to the World's Oceans' https://www.theoceancleanup.com/sources/
561 NOWPAP, 'Regional Action Plan on Marine Litter' (2008) 5.
562 *Ibid.* 7-8.
563 N Pervushina, 'Water Management and Use in the Amur–Heilong River Basin: Challenges and Prospects in Environmental Security' in V Lagutov (ed) *Environmental Security in Watersheds: The Sea of Azov* (Springer 2012) 234-235.
564 FAO, 'Transboundary River Basin Overview – Ganges-Brahmaputra-Meghna' (2011) FAO AQUASTAT Reports. 1.

world.[565] The South-Asia Co-operative Environment Programme's report on marine litter stated that "numerous cities and industries with inadequate waste management are situated along major rivers such as the Ganges, Narmada, Brahmaputra, Indus, Kelaniya and Mahaweli".[566] The report also acknowledges that many of the hotspots of pollution "include areas near the mouths of rivers situated in numerous cities".[567] As a way forward, the report suggests "reducing land-based waste and litter through application at national and regional levels, the Integrated Solid Waste Management (ISWM) focusing on river litter and coastal litter management based on the Three Rs' Approach of Reducing, Re-using and Recycling waste in the SAS region".[568] However, the river system has no RBO in place.[569]

In the Mediterranean Region two international watercourses terminate in the regional sea. The Orontes River is a shared watercourse between Syria and Turkey and delivers an estimated 492 000 kilograms of plastics in the ocean annually.[570] The Nile is a shared watercourse between South Sudan, Sudan, Ethiopia, Uganda, Kenya, Tanzania, Burundi, Rwanda, the Democratic Republic of Congo, Eritrea, and Egypt, in whose territory the Nile terminates.[571] It delivers an estimated 550 000 kilograms of plastics into the Mediterranean each year.[572] In the Mediterranean Sea, the regional plan on marine litter management is binding.[573] According to the regional plan, contracting States must "by the year 2020 take necessary measures to establish as appropriate adequate urban sewer, wastewater treatment plants, and waste management systems to prevent runoff and riverine inputs of litter".[574] Article 18 of the plan also encourages cooperation with other relevant institutions in the region to combat marine litter.[575] The Orontes River is managed through bilateral means between the riparian States and has no RBO in place.[576] The governance of the Nile is based on the Nile Basin

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565 The analysis was done by using an interactive map that has modelled riverine inputs of plastics (based on LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications), see The Ocean Cleanup, 'River Plastic Emissions to the World's Oceans' https://www.theoceancleanup.com/sources/
566 SACEP, 'Marine Litter in the South Asian Seas Region' (2007) iii.
567 *Ibid.* 9.
568 SACEP, 'Marine Litter in the South Asian Seas Region' (2007) 88.
569 AK Biswas, 'Management of Ganges–Brahmaputra–Meghna System: Way Forward' in O Varis et al. (eds) *Management of Transboundary Rivers and Lakes* (Springer 2008) 143.
570 The analysis was done by using an interactive map that has modelled riverine inputs of plastics (based on LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications), see The Ocean Cleanup, 'River Plastic Emissions to the World's Oceans' https://www.theoceancleanup.com/sources/
571 Nile Basin Initiative, https://nilebasin.org
572 The analysis was done by using an interactive map that has modelled riverine inputs of plastics (based on LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications), see The Ocean Cleanup, 'River Plastic Emissions to the World's Oceans' https://www.theoceancleanup.com/sources/
573 Art 21, UNEP, 'Regional Plan for the Marine Litter Management in the Mediterranean' UN Doc UNEP(DEPI)/MED WG.379/5 (2013).
574 *Ibid.* Art 9(4).
575 *Ibid.* Art 18.
576 T Kaissi, 'Invalidating the Orontes River Treaty in the Context of Middle Eastern Politics' (2014) 26 Georgetown International Environmental Law Review 2. 175-176.

Initiative (NBI).[577] The NBI, in its environmental and social policy, acknowledges that pollution is increasing in the Nile.[578] However, none of its schemes address plastics specifically or make reference to protecting the Mediterranean Sea.[579]

Of the existing regional nodes under the GPML, only the Mediterranean Region and its regional seas organization could be coupled with a river basin organization, the Nile Basin Initiative. Therefore, as a second step of the analysis of relevant institutions, it must be investigated whether improved cooperation would be possible in other areas, where both an RSO and RBO exist.[580]

In East Asian Seas, the Mekong River is a shared watercourse flowing through Cambodia, Laos, Thailand and Vietnam.[581] Each year it delivers approximately 760 000 kilograms of plastics into the ocean.[582] The East Asian Seas Region has no marine litter action plan. Its Regional Programme of Action mentions the need for integrated catchment and coastal planning without making a reference to marine litter or plastics specifically.[583] However, the report on marine litter in the East Asian Seas proposes encouraging and assisting "municipal councils in each country to implement litter prevention and interception systems in urban catchments, by sharing information on the use of engineering and non-engineering approaches, including but not limited to litter booms, physical traps/interceptors, Stormwater Quality Improvement Devices (SQIDs) and similar measures".[584] The East Asian Seas Region is also part of 'SEA-Circular: Solving Plastic Pollution at Source' initiative in collaboration with UN Environment and Sweden.[585] Within this initiative, it recognized that riverine plastic leakage is a significant issue in the region: "plastic waste near waterways is a major concern as every metric ton of uncollected waste near waterways results in 18 kg of plastic entering the ocean."[586]

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577 Nile Basin Initiative, https://nilebasin.org
578 NBI, 'Environmental and Social Policy' (2013) 1, 8.
579 NBI, 'Transboundary Policies' https://nilebasin.org/transboundary-policies
580 This investigation is focused on major hotspots of riverine plastics leakage (over 300 000 kg yearly delivery of plastics via an international watercourse) and good examples of cooperation, and therefore it is not an exhaustive list of all possible options.
581 Mekong River Commission, 'About' https://www.mrcmekong.org/about/mrc/
582 The analysis was done by using an interactive map that has modelled riverine inputs of plastics (based on LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications), see The Ocean Cleanup, 'River Plastic Emissions to the World's Oceans' https://www.theoceancleanup.com/sources/
583 COBSEA/UNEP, 'The Regional Programme of Action for the Protection of the Marine Environment of the East Asian Seas from the Effects of Land-based Activities' (2000) 11.
584 COBSEA/UNEP, 'Marine Litter in the East Asian Seas Region' (2008) 32.
585 COBSEA, 'Sweden and UN Environment announce $6 Million Project to Beat Plastic Pollution in Southeast Asia' (10 September 2018) https://www.unenvironment.org/cobsea/news/story/sweden-and-un-environment-announce-6-million-project-beat-plastic-pollution-southeast
586 UNEP/COBSEA/Stockholm Environment Institute, 'Marine Plastic Litter in East Asian Seas: Gender, Human Rights and Economic Dimensions' (2019) 42; Ocean Conservancy and McKinsey Center for Business and Environment, 'Stemming the Tide: Land-Based Strategies for a Plastic-Free Ocean' (2015) 14.

The Mekong River is governed through the Mekong River Commission.[587] The Mekong River Protection Agreement does not refer to protection of the marine environment, but concerns itself with protecting the river basin from pollution.[588] However, monitoring plastics pollution in the Mekong River has recently become part of the Mekong River Commission's agenda. Monitoring plastics leakage will be included in the new Mekong Basin Development Strategy and the Mekong River Commission is collaborating with UNEP in an assessment that "will involve monitoring and collecting plastic debris and waste leakage in five sites located in major urban cities of the Mekong River".[589]

In West, Central and Southern Africa, two major international river systems function as pathways of plastics leakage. The Congo River is a shared watercourse between Cameroon, the Republic of Congo, the Democratic Republic of Congo, the Central African Republic, Gabon and Angola. The Congo River empties into the Atlantic Ocean and delivers an estimated 545 000 kg of plastics into the ocean annually. The Niger River is an international watercourse between Algeria, Benin, Burkina Faso, Cameroon, Chad, Ivory Coast, Guinea, Mali, Niger, Nigeria and Sierra Leone. It also terminates in the Atlantic Ocean and delivers an estimated 402 000 kg of plastics into the ocean each year.[590]

The 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 ('Abidjan Protocol') provides that:

> The Contracting Parties shall cooperate in the formulation and adoption of agreed measures, procedures, practices and standards, such as but not limited to, the precautionary principle, the polluter pays principle, environmental assessment and audit, environmental standards and integrated coastal area and river basin management to prevent, reduce, mitigate and control pollution from land-based sources and activities and to promote environmental management in conformity with the objectives of the Convention and this Protocol.[591]

The Additional Protocol to the Abidjan Convention on Integrated Coastal Zone Management ('ICZM Protocol') further elaborates requirements for integrated governance of rivers and ocean in

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[587] Mekong River Commission, 'About' https://www.mrcmekong.org/about/mrc/

[588] Art 3, Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin (Adopted and entered into force 5 April 1995) 2069 UNTS 3 ('Mekong River Protection Agreement').

[589] Mekong River Commission, 'New Strategy to Address Mekong Wide Challenges Near Finishing Line' (12 June 2020) http://www.mrcmekong.org/news-and-events/news/bds-20200612/; Mekong River Commission, 'Actions to Address Mekong Plastic Pollution Take Shape' (13 February 2020) http://www.mrcmekong.org/news-and-events/news/actions-to-address-mekong-plastic-pollution-take-shape/

[590] The analysis was done by using an interactive map that has modelled riverine inputs of plastics (based on LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications), see The Ocean Cleanup, 'River Plastic Emissions to the World's Oceans' https://www.theoceancleanup.com/sources/

[591] Art 5(2), The 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 (Adopted 22 June 2012) ('Abidjan Protocol')

the region. Its objectives include prevention and reduction of pollution from land-based sources and one of the general principles to guide implementation is "the principle of complementarity and the interdependence between the marine area, coastline, estuaries, floodplains, riverbeds and watersheds".[592] One of its main concepts in this regard is "Integrated Coastal area and River Basins Management" (ICRBM). It denotes "the adoption of guidelines, objectives and policies and the establishment of management mechanisms that take into account the interrelations between the two systems (river basins and coastal areas) in order to ensure environmental protection and socio-economic development."[593]

The Abidjan and ICZM Protocols demonstrate that the interconnection between river and ocean pollution is firmly recognized within the RSO in West, Central and Southern African region. Moreover, in the Draft Decision to amend the Abidjan Convention, expanding the geographical scope of the Convention was discussed particularly due to rivers. The amendment proposal was motivated by the transboundary nature of river basins and particularly by the understanding that "many pollutants reaching the sea originated from inland river basins, and that environmental marine and coastal issues required an integrated approach".[594] Furthermore, a draft decision on marine plastic litter is under consideration within the RSO.[595]

The Congo River is governed by the International Congo-Ubangui-Sangha Commission (CICOS). The mandate of the CICOS includes promotion of Integrated Water Resources Management (IWRM), which incorporates environmental preservation and pollution prevention.[596] However, the issue of riverine plastics pollution is not specifically dealt with within the CICOS. The Niger River is governed by the Niger Basin Authority (NBA). The treaty establishing the Niger Basin Authority has as one of its objectives protecting the river from pollution or other negative changes to its biological

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[592] Arts 5(1)(5) and 6(1)(1), The Additional Protocol to the Abidjan Convention on the Integrated Coastal Zone Management (Adopted 31 March 2017) ('ICZM Protocol')

[593] Art 2(1)(h), The Additional Protocol to the Abidjan Convention on the Integrated Coastal Zone Management (Adopted 31 March 2017) ('ICZM Protocol')

[594] Twelfth Meeting of the Contracting Parties to the Convention for Cooperation in the Protection, Management and Development of the Marine and Coastal Environment of the Atlantic Coast of the West, Central and Southern Africa Region, 'Draft report of the Twelfth Meeting of the Contracting Parties to the Convention for Cooperation in the Protection, Management and Development of the Marine and Coastal Environment of the Atlantic Coast of the West, Central and Southern Africa Region: Draft Decision [CP.12/3]: Amendment of the Text of the Abidjan Convention.' (27–31 March 2017) UN Doc UNEP/ABC-WACAF/COP.12/7. Paras 35, 36.

[595] Second Bureau Meeting of the Contracting Parties to the Convention on Cooperation for the Protection, Management and Development of the Marine Environment and Coastal Areas of the Atlantic Coast of the West, Central and Southern African Region (Abidjan Convention), 'List of Draft Decisions under Consideration' (23 June 2020) UN Doc ABC-WACAF/Bureau Meeting.2/COP12/ Inf.3.

[596] A Medinilla, 'Understanding the International Congo-Ubangui-Sangha Commission (CICOS)' (ECDPM 2017) 10-11; CICOS, 'Schéma Directeur d'Aménagement et de Gestion des Eaux de la CICOS (SDAGE): Programme de Mesures 2016-2020' (CICOS 2016) 17, 36.

characteristics.[597] Furthermore, Article 12 of the Water Charter promotes the strengthening of the protection of the aquatic environment, ensuring reduction of transboundary pollution and preventing the aggravation of pollution.[598] However, the NBA has so far not addressed plastic pollution specifically.

In the Eastern Africa region the Zambezi River is a shared watercourse between Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia and Zimbabwe. The Zambezi River empties into the Indian Ocean and delivers estimate 33 600 kg of plastics into the ocean.[599] The Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region ('Nairobi Convention') provides that "the Contracting Parties shall endeavor to take all appropriate measures to prevent, reduce and combat pollution of the Convention area caused by coastal disposal or by discharges emanating from rivers, estuaries, coastal establishments, outfall structures or any other sources within their territories."[600] The Strategic Action Programme for the Protection of the Coastal and Marine Environment of the Western Indian Ocean from Land-based Sources and Activities takes into account the interconnection between oceans and rivers and aspires to establish links between river basin and coastal water management.[601] The plastics leakage issue is recognized and included in the work of the Eastern African RSO:[602]

> Most of the major cities and towns found in the WIO region generate significant amounts of solid wastes, some of which reach the sea to contribute to marine litter problem. Important land-based sources of solid waste are found in major urban centres (ports, industrial and commercial areas and informal settlements) and discharges through rivers (transporting solid waste/debris from urban areas located in their watersheds).[603]

The Zambezi River is managed by the Zambezi Watercourse Commission (ZAMCOM). Its objective is "to promote the equitable and reasonable utilization of the water resources of the Zambezi Watercourse as well as the efficient management and sustainable development thereof".[604] The

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597 Art 4(3), Revised Convention Creating the Niger Basin Authority (Adopted 27 October 1987)
598 Niger Basin Water Charter (Adopted 30 April 2008, entered into force 19 July 2010) ('Water Charter')
599 The analysis was done by using an interactive map that has modelled riverine inputs of plastics (based on LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications), see The Ocean Cleanup, 'River Plastic Emissions to the World's Oceans' https://www.theoceancleanup.com/sources/
600 Art 7, the Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region (Adopted 21 June 1985, entered into force 30 May 1996) ('Nairobi Convention')
601 UNEP/Nairobi Convention Secretariat, 'Strategic Action Programme for the Protection of the Coastal and Marine Environment of the Western Indian Ocean from Land-based Sources and Activities' (2009) 101.
602 Ninth Conference of the Contracting Parties to the Amended Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Western Indian Ocean Region, 'Proposed Work Programme for the Period 2018–2022 for the Implementation of the Nairobi Convention' (31 August 2018) UN Doc UNEP/EAF/CP.9/2/Rev.1. 5, para 25.
603 UNEP/Nairobi Convention Secretariat, 'Strategic Action Programme for the Protection of the Coastal and Marine Environment of the Western Indian Ocean from Land-based Sources and Activities' (2009) 22.
604 ZAMCOM 'About ZAMCOM', http://www.zambezicommission.org/about-zamcom/about-zamcom

management is based on the ZAMCOM Agreement and the Integrated Water Resources Management Strategy and Implementation Plan for the Zambezi River Basin. The ZAMCOM Agreement has to be interpreted according to the principles of international environmental law.[605] It provides an obligation to "prevent, reduce and control pollution of the…watercourse and to protect and enhance the quality status of the water and associated ecosystems for the benefit of present and future generations" and to "prevent, eliminate, mitigate and control adverse transboundary impacts".[606] Moreover, the Integrated Water Resource Management Strategy and Implementation Plan for the Zambezi Watercourse promotes controlling water pollution from point sources, particularly urban centers.[607] The problem of increasing plastics consumption and plastics wastes generation and the inadequacy of waste management in basin States are recognized in the Zambezi Environmental Outlook.[608] However, the Zambezi Commission has no specific plans to prevent riverine plastic pollution ending up in the Indian Ocean.

In the Black Sea region, the Danube River is a shared watercourse between Germany, Austria, Slovakia, Hungary, Croatia, Serbia, Romania, Bulgaria, Moldova and Ukraine. It delivers estimate 69 400 kg of plastics to the Black Sea annually.[609] The interconnectedness between the Black Sea and the Danube River is recognized within both regimes. The Danube River Protection Convention endeavors "to contribute to reducing the pollution loads of the Black Sea from sources in the catchment area".[610] The Black Sea Commission and the International Commission for the Protection of the Danube River have agreed in their Memorandum of Understanding (MoU) to combine efforts to control riverine inputs of pollution reaching the Black Sea, and have established an ad hoc Danube/Black Sea Joint Technical Group to implement the MoU.[611] The Black Sea Commission has undertaken a report on marine litter in the Black Sea region and among its recommendations is that existing institutional arrangements should be strengthened to combat marine litter.[612] Therefore, these

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605 Art 12, Agreement on the Establishment of the Zambezi Watercourse Commission (Adopted 13 July 2004, entered into force 19 June 2011) ('ZAMCOM Agreement')

606 Art 14(3)(a)-(b), the ZAMCOM Agreement.

607 SADC-WD, SIDA/DANIDA, 'Integrated Water Resources Management Strategy and Implementation Plan for the Zambezi River Basin (Euroconsult Mott MacDonald 2008) 45.

608 SADC, Zambezi Environment Outlook (SADC 2015) 216, 222, 246, 269.

609 The analysis was done by using an interactive map that has modelled riverine inputs of plastics (based on LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications), see The Ocean Cleanup, 'River Plastic Emissions to the World's Oceans' https://www.theoceancleanup.com/sources/

610 Art 2, Convention on Cooperation for the Protection and Sustainable Use of the Danube River (Adopted 29 June 1994, entered into force 22 October 1998) CELEX 21997A1212(03).

611 Memorandum of Understanding between the International Commission for the Protection of the Black Sea and the International Commission for the Protection of the Danube River on Common Strategic Goals (2001); Chapter 3, The Black Sea Commission, 'Marine Litter in the Black Sea Region' (2009) http://www.blacksea-commission.org/_publ-ML-CH3.asp.

612 Chapter 3, The Black Sea Commission, 'Marine Litter in the Black Sea Region' (2009) http://www.blacksea-commission.org/_publ-ML-CH3.asp

already existing linkages between the Black Sea Commission and the Danube Commission can prove valuable for more targeted action to combat riverine inputs of plastics and the cooperation also serves as a great example for other regions to follow[613]

In the North-East Atlantic (OSPAR) Region, the Rhine River is a shared watercourse running between Austria, Belgium, France, Germany, Italy, Liechtenstein, Luxemburg, the Netherlands and Switzerland. It delivers approximately 62 300 kg of plastics to the Atlantic annually.[614] The Marine Litter Action Plan in the region highlights "the importance of cross-sectoral cooperation and implementation of the regional action in close collaboration with other relevant institutions, including river and river basin commissions."[615] The action plan provides that States must seek "cooperation in the river and river basin authorities in order to include impacts of litter on the marine environment in river and river basin management plans".[616] The International Commission for the Protection of the Rhine considers protection of the North Sea an additional dimension of its international cooperation, and the Convention for the Protection of the Rhine has included this aim in the treaty text.[617] The links between the work of the OSPAR Commission and the Rhine Commission is exemplary case of well-established cooperation and mutual recognition in protecting the environment.[618]

The examples shown in this section on RSOs and RBOs run the spectrum from no cooperation to concerted efforts to tackle riverine inputs of plastics leakage. It is common that protecting the marine environment from pollution from rivers is better recognized within the governing instruments of RSOs than RBOs. However, in Europe in particular, the Danube Commission and the Rhine Commission fully acknowledge the role they have in protecting the marine environment in their respective regional seas. This link is weakest within the African RBOs – the Nile Basin Initiative, the Niger Basin Authority and the International Congo-Ubangui-Sangha Commission. Concerted efforts between RSOs and RBOs to explicitly target plastics leakage are mostly non-existent, excluding the collaboration of the Black Sea regional seas programme and the Danube Commission. However, the

[613] L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 251.
[614] The analysis was done by using an interactive map that has modelled riverine inputs of plastics (based on LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications), see The Ocean Cleanup, 'River Plastic Emissions to the World's Oceans' https://www.theoceancleanup.com/sources/
[615] OSPAR Commission, 'Marine Litter Regional Action Plan' (2014) 7.
[616] *Ibid.* 14.
[617] Art. 3(5), Convention for the Protection of the Rhine (adopted 12 April 1999, entered into force 1 January 2003) CELEX 22000A1116(01).
[618] L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 251.

problem of plastic pollution is increasingly recognized in RSOs and also to a lesser extent in RBOs. Although the efforts to address the issue have not been coordinated between RSOs and RBOs, all organisations, apart from NBI, NBA and CICOS have at least raised the issue internally, and are therefore potential actors to participate in the GPML and be included as regional nodes under the GPML.

5.2.4 Procedure to Add Regional Nodes and the Benefits of Strengthening the Regional Nodes Network

Currently all the regional seas programmes that have been accepted as regional nodes under the GPML have a marine litter action plan in place. So far, no RBOs have been included as regional nodes. As potential participants in regional nodes, the GPML provides a list of examples of governance-related actors: RSOs, FAO Regional Fisheries Bodies, IMO Shipping (MARPOL Annex V, London Convention and London Protocol), national governments, municipalities and sub-national governance bodies. The list is not exhaustive and the GPML notes that "despite anticipated differences in the precise make-up of each Regional Partnership Node, reflecting cultural, economic and social characteristics, certain types of organisation can be expected to be represented".[619] Though RBOs are not explicitly mentioned, the fact that rivers deliver significant amounts of plastics to regional seas should also be considered within the GPML. RBOs would provide a valuable addition to the GPML regional node network.

The GPML has a procedure to add regional nodes under its regional node network: "the GPML members can propose the establishment of a regional node to the Steering Committee if they are able to take responsibility for that node. Any such proposal must be approved by the Steering Committee."[620] The GPML provides draft terms of reference to evaluate additions to the regional nodes network. It recommends initiating "a regional node through/in collaboration with a regional seas programme or other established regional body, as appropriate" and using "existing networks, or create new networks, to extend invitations to participate to representatives of relevant groups".[621] Due to the physical linkage of riverine inputs of plastics into regional seas, collaboration between RSOs and RBOs is a natural starting point for combined efforts between them to combat plastics leakage. Regional examples of where the RSO and the RBO have taken at least initial steps to address this relationship are the East Asian Seas regional seas programme and the Mekong River Commission,

[619] Annex I, GPML, 'Purpose, Function and Organization' (2018) Framework Document.
[620] *Ibid.* 5.
[621] *Ibid.* Annex I.

the Eastern Africa regional seas programme and the Zambezi River Commission, and the Black Sea regional seas programme and the Danube Commission. The interconnectivity between the rivers and oceans is also explicitly recognized by the North-East Atlantic regional seas programme and the Rhine Commission. Therefore, at least these organizations have the potential to be added as regional nodes under the GPML.

Participation of RSOs and RBOs that recognize the common issue of riverine inputs of plastics leakage and marine environmental protection of the regional seas would contribute to efforts to meet many of the objectives of the GPML and the regional nodes network. Awareness-raising of the marine litter issue is an objective of both the GPML and of the draft terms of reference for regional nodes.[622] In itself, enlisting RBOs in the GPML would raise awareness of riverine inputs of plastics and would serve these objectives. Furthermore, RBO participation would widen the geographical scope of raising awareness as it would also involve land-locked riparian States that are member States of RBOs and contribute to plastics leakage from rivers into regional seas.

Strengthened cooperation between RSOs and RBOs under a more coordinated framework of the GPML would contribute to improved preventive action. Further cooperation between RSOs and RBOs could be operationalized with common plastics leakage prevention action plans, which would also support the goal of the GPML to "contribute to marine litter action plans at different levels where appropriate".[623] So far, however, no common action plans have been formulated.

Exchanging information and instances of best practice is one the main objectives of the GMPL and also a prime reason to strengthen the regional nodes network.[624] A variety of different concepts and measures are already present in the existing instruments discussed in the previous section, and a platform such as the GPML could be used to share examples of best practice and experiences from implementation. It would also "help identify and address gaps to avoid duplications, and on financing opportunities and to facilitate match-making".[625] Concepts such as Integrated Coastal Area and River Basin Management (ICARM), Integrated Water Resources Management (IWRM) or Integrated Solid Waste Management (ISWM), which are in use in the North West Pacific, Western Africa, South Asian Seas, the Zambezi River and the Congo River governance, could be helpful to share experiences of

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622 *Ibid.* 4; Annex I.
623 L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 253; GPML, 'Purpose, Function and Organization' (2018) Framework Document. 4.
624 GPML, 'Purpose, Function and Organization' (2018) Framework Document. 3, 4; Annex I.
625 *Ibid.* 4.

implementation and possibly serve as exemplars for other regions. Other examples include monitoring practices, rules relating to the location of dump sites, prevention and interception systems in urban catchment areas, and establishing a Memorandum of Understanding on marine litter between organizations. RSOs and RBOs have already gathered experience of different measures on the topic but currently lack a platform for sharing this knowledge.

Lastly, the GPML aspires to "support the implementation of legal, policy, institutional frameworks and relevant frameworks that implement international law relevant to marine litter and microplastics."[626] Further collaboration between RSOs and RBOs would address the previously discussed blind spots between international marine environmental law and international water law with regards to prevention of plastics leakage and thus support both legal and institutional frameworks to implement international law relevant to the matter.[627]

5.3 Added Value of a New Treaty to Prevent Plastics Leakage to the Oceans

5.3.1 Rationale for a New Treaty

The severity and global nature of the problem of plastics leakage to the marine environment, and the lack of a tailored and binding instrument targeting it invites the question whether the international community should negotiate a new international binding agreement to address the issue. The added value of a new treaty stems from its potential to complement and coordinate existing leakage prevention efforts as well as to develop regulations further and address gaps in the current international legal framework applicable to plastics. A new treaty should have as one of its objectives prevention of (transboundary) harm from plastics leakage to the environment, particularly from land-based sources and rivers, and should translate this into a measurable substantive obligation with time-bound targets. In terms of plastics leakage to the marine environment, this component would be the most important contribution of a new treaty and is thus the main focus of this subchapter.

5.3.2 Elements of a New Treaty

> Developing a new agreement requires careful design and grouping of essential elements can help to conceptualise its content and structure. A global framework agreement for plastics would contain the traditional elements of a vision, objective, scope, guiding principles and approaches and definitions for the interpretation of the agreement, ideally supported by strategic goals and timebound targets. Other elements that need consideration include functional elements (e.g. science and knowledge,

[626] *Ibid.* 4.

[627] L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3. 252.

> measuring progress), operational elements (e.g. general commitments and national implementation plans) and institutional elements (e.g. governing body and secretariat).[628]

Regarding the development of a new global treaty to manage plastics, one of the fundamental questions is what should be governed at the global level in relation to these elements (traditional, functional, operational and institutional).[629] This study focuses on these elements from the viewpoints of plastics leakage (in this sub-chapter) and extensive plastics wastes generation (in sub-chapter 12.5). However, overlap between these two viewpoints exists in particular concerning other than the traditional elements. Therefore, these issues are discussed in the last section of each of two sub-chapters under a heading "Functional, Operational and Institutional Elements" (sub-chapters 5.3.6 and 12.5.6).

5.3.3 Vision, Principles, Objectives and Definitions

The problem-solving effectiveness of MEAs depends on compliance and behavioral change, but also on the depth and nature of the particular agreement's commitments.[630] Therefore, it is essential that a new treaty incorporates ambitious vision and objectives. A vision should reflect the overall purpose of a treaty and be broader and more general than merely a combination of objectives. It is usually situated in the preamble of a treaty.[631] For example, regarding plastics, a new treaty should envision a world where plastics are produced and consumed in a sustainable and circular manner that respects the Earth System and where the aspiration is to protect the environment and humans holistically from the negative impacts of plastics production, consumption, and pollution.

The no-harm rule and prevention principle provide for minimum protection relating to transboundary harm and harm to the environment, and the general obligations of the LOSC provide for minimum protection of the marine environment more generally (both within and beyond national jurisdiction). A new treaty should reaffirm these rules and principles in the plastics pollution context to clarify which principles of IEL are to be taken into account when systematically interpreting the treaty provisions. Furthermore, a new treaty should also incorporate the CBDR in a manner that respects the vision but levels the playing field between States of different capacities. In this regard, the treaty should also carefully spell out its substantive commitments and related time-bound targets.

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628 K Raubenheimer and N Urho, 'Rethinking Global Governance of Plastics -The Role of Industry' (2020) 113 Marine Policy. 1-2.
629 *Ibid.* 1.
630 D Bodansky, *The Art and Craft of International Environmental Law* (Harvard University Press 2010) 257.
631 Environment Canada, University of Joensuu and UNEP, *Multilateral Environmental Agreement: Negotiator's Handbook* (2nd Edition, 2007) University of Joensuu – UNEP Course Series 5. 2-18.

It should also precisely stipulate financial and technical assistance and capacity building provisions, as well as how the CBDR affects plastics leakage prevention efforts.

More specific objectives can be extracted from the general vision of a treaty and the guiding principles. One of these objectives should entail preventing (transboundary) harm from plastics leakage to the oceans: "[a]n internationally binding treaty should…pursue the goal of eliminating plastic waste discharge into the environment, as a necessary condition to keep the oceans clean."[632] Raubenheimer and Urho have further delineated that one of the fundamental objectives should be "[s]ustainable plastic waste management: To minimize plastic leakage into the oceans in accordance with binding, specific and measurable targets, focusing on waste management practices and minimization."[633] These suggestions for objectives resonate well with the prevention of plastics leakage.

Additionally, a new treaty would need to define the necessary terminology: "[a] set of globally agreed definitions and standards would support a harmonized legislative landscape, thus addressing the current issues of fragmented and ineffective policies."[634] Definitions and terminology that are relevant for plastics leakage include, at a minimum, explanations for the terms plastic(s), leakage, and downstream activities.

5.3.4 Scope and Coordination

Plastics enter the oceans via a few major pathways: coastal communities, maritime activities, and major river systems.[635] All the major pathways have to be recognized within a new treaty. However, this means that a new treaty should include in its substantive scope only those major pathways that are inadequately addressed within the current international legal framework. Pathways that are already addressed by instruments of international law should be recognized in the treaty text to include them under a wider coordination mechanism:

> It is well-recognized that a number of existing conventions and agreements could be or are actively taking steps to address aspects of plastic pollution. However, none of the existing frameworks is specifically designed to prevent increasing flows of plastic pollution into the biosphere, nor to comprehensively manage the plastic pollution already present in the biosphere. Coordination with existing actions in these other fora should therefore be central to the governance of a new Convention

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[632] S Nils and ML Schulte, 'Strengthening Plastic Governance: Towards a New Global Convention' (adelphi 2017) 4.
[633] K Raubenheimer and N Urho, 'Possible Elements of a New Global Agreement to Prevent Plastic Pollution' (Nordic Council of Ministers 2020) 31-32, 43.
[634] WWF, Ellen MacArthur Foundation and Boston Consulting Group, 'Business Case for a UN Treaty on Plastic Pollution' (2020) 21.
[635] UN Environment, 'Addressing Marine Plastics: A Systemic Approach – Stocktaking Report' (2018) 22.

on Plastic Pollution, fully recognizing that these are separate bodies with their own mandates and jurisdiction.[636]

Vessel-source plastics leakage and plastics leakage by dumping are already governed by a mandate of the IMO and comprehensively covered by the LOSC, the MARPOL Annex V and the London Convention and London Protocol. These instruments collectively address sea-based sources of plastics leakage and their pathways to the marine environment. Therefore, it would suffice for a new treaty to make reference to these instruments and only focus on the coordination aspects in relation to maritime activities and plastics leakage, particularly monitoring and reporting. This would also place a new treaty into the already existing source-based structure established by the LOSC and respect the rules of reference regarding generally accepted international rules and standards on vessel-source pollution and dumping.

The main scope of a new treaty with regards to plastics leakage would thus be land-based sources of plastics, which leak to the oceans mainly via two of the remaining pathways: coastal communities and major river systems. This means that a new treaty should aim at high ratification among both coastal and land-locked (riparian) States. The most crucial land-based source of plastics is mismanaged waste as it accounts for 73.4% of the total macroplastics loss, and secondary microplastics mostly originate from mismanaged waste.[637] Therefore, this source of plastics leakage and its pathways to the oceans needs to be addressed through an obligation to prevent plastics leakage to the environment. Moreover, explicitly including river systems within the scope would help overcome the legal blind spots that have persisted in regime interaction regarding plastics leakage prevention between international marine environmental law and international water law.

Furthermore, a new treaty should take a more general approach to preventing plastics leakage to the environment than solely targeting the marine environment. Instead of merely focusing on the entry points of plastics pollution to oceans, a new treaty should holistically provide for an obligation to eliminate plastics leakage to any environmental compartments, including but not limited to the marine environment.

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636 CIEL, 'Toward a New Global Convention with a Multi-Layered Governance Approach to Address Plastic Pollution' (CIEL 2018) 2.

637 UN Environment, 'Mapping of Global Plastics Value Chain and Plastics Losses to the Environment (with a Particular Focus on Marine Environment)' (2018) 52; J Boucher and D Friot, 'Primary Microplastics in the Oceans: a Global Evaluation of Sources' (IUCN 2017) 13.

5.3.5 Substantive Commitments with Time-Bound Targets

The objective of eliminating plastics wastes discharges to the environment and establishing sustainable plastic waste management has to be formulated into a substantive commitment with time-bound targets that would address the most crucial gap in international law: the lack of a specific obligation to prevent plastics leakage.

In this regard lessons can be learned from the analysis of the current international legal framework applicable to plastics. The content of current due diligence obligations applicable to land-based plastics leakage remain vague and imprecise. Consequently, it complicates mobilizing a concerted effort by the international community to curb the current substantial volumes of plastics leakage. Part of the reason is the nature of the due diligence obligation itself. By design due diligence obligations allow some pollution, and the precise threshold needs to be decided on a case-by-case basis. The general threshold under current customary international law is defined as 'significant' or 'substantial', which functions poorly when the crux of the problem is cumulative pollution originating from diffuse sources, such as land-based plastics leakage. Therefore, it is of the essence that a new treaty formulates obligations based on results rather than conduct. Such a formulation would also enhance the possibility of verifying through reporting and monitoring whether States are complying with their obligations and enable the development of an effective compliance mechanism to aid States that struggle to meet their targets for plastics leakage reduction.

Moreover, the current soft law approach to preventing marine pollution from land-based sources has not managed to curb plastics leakage though it has provided useful guidance for States and played a role in clarifying the content of existing due diligence obligations to some extent. Therefore, one of the major benefits of a new treaty would be its binding character. Existing soft law instruments, for example the GPA and the Honolulu Strategy, that have already had an effect on measures that States have adopted, would continue to be relevant as further guidance or basis of national action plans in relation to a new treaty.

A new treaty should endorse the GPML, as it provides a platform for cooperation between all interested stakeholders. The GPML should also be included in the coordination mechanism of a new treaty because it has already been established as a global focal point for exchanging best practice on marine litter action plans from local to regional level and it has a functioning regional nodes network that incorporates marine litter-related action under the regional seas programmes. The GPML could be made more influential by including more regional organizations, such as river basin commissions.

All current instruments of international law applicable to plastics leakage have been widely criticized for failing to set any time-bound targets to reduce leakage. A new treaty should address this inadequacy by providing clear, measurable targets to curb plastics leakage to the environment. The binding character of such targets would show "a high-level of long-term commitment both at the international as well as at the national level."[638]

This objective of stopping plastics leakage into the marine environment needs to be concretely operationalized and include specific, monitorable targets.[639] Measuring waste collection rates would be more viable than measuring actual plastics leakage to the environment. Nils and Schulte suggest that:

> One option to do so would translate the goal to cover the share of plastic waste that is not properly collected, and to demand an increase in waste collection rates. Though possibly touching on sensitive sovereignty issues already, such goal could be interpreted as a proxy for the amount of plastic that enters the oceans via various pathways, which is more difficult to measure. This goal has the advantage of being more directly translatable into measures targeting the main problem, i.e. lacking waste collection systems.[640]

Borrelle et al. also recommend an increase in the proportion of managed waste adjusted to States' status as high-income (HI), upper-middle income (UMI), lower-middle income (LMI) and low income (LI) countries.[641] Another option would be to determine an overall global target for increasing the proportion of managed waste and leave the regulatory choices on how to nationally achieve this to States. To do this, at least an estimate of global plastic leakage is needed to set a specific target for reduction efforts. Currently an environmentally acceptable threshold is yet to be defined. However, the estimation of eight million metric tons of annual plastics leakage is well-established in the literature and could be used in determining a global annual reduction target for plastics leakage prevention.[642] A new treaty could set temporal targets – for example every five years – and make the targets more stringent after each term.

The considerable national and regional differences in capacities should also be taken into account when determining reduction targets. In this regard applying the CBDR is pivotal, and should be balanced against the characteristics of the plastics leakage problem. The precise obligation could be

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[638] R Bodle and S Sina, 'A Treaty on Plastic Waste' (Ecologic 2019) Discussion Paper. 3.
[639] S Nils and ML Schulte, 'Stopping Global Plastic Pollution: The Case for an International Convention' (Heinrich Böll Stiftung 2017) 43 Publication Series Ecology. 34, 37.
[640] *Ibid.*
[641] SB Borrelle et al., 'Predicted Growth in Plastic Waste Exceeds the Efforts to Mitigate Plastic Pollution' (2020) 369 Science 6510. 1516. Borrelle et al. use socioeconomic statuses that are based on World Bank definitions: The World Bank, 'Data Catalog: Population Estimates and Projections' (2019) https://datacatalog.worldbank.org/dataset/population-estimates-and-projections
[642] *Ibid.* 1515. See also, N Simon et al., 'No More Plastics in the Ocean: Gaps in Global Plastic Governance and Options for a Legally Binding Agreement to Eliminate Marine Plastic Pollution' (adelphi 2018) Discussion Paper. 31.

based on a global target to prevent plastics leakage to the oceans (eg, eight million metric tons) and elaborated further according to the different socio-economic positions of States.[643] Such differentiated responsibilities should be complemented with the second element of the CBDR, the redistribution of resources and capacity building. One major barrier to preventing plastics leakage is "a lack of funds to install infrastructure for collection, treatment or disposal of plastic waste in countries that currently dump (plastic) waste in landfills."[644] Therefore, a new treaty should include a provision on technical and financial assistance regarding waste management practices. Reducing plastics leakage to an acceptable threshold and developing waste management systems to respond to this aspiration is an enormous challenge for infrastructure, regulation and enforcement, and the costs are potentially vast.[645]

In conclusion, a substantive commitment relevant to addressing the problem of plastics leakage to the marine environment should fit into the source-based framework of the LOSC by targeting land-based plastics leakage. It should be of binding character; formulated as an obligation of result (preferably in relation to waste management) which aims at stopping or at least minimizing leakage; be supported by science-based, time-bound targets; and include in its scope other environmental compartments in addition to the marine environment to encourage also land-locked riparian States to become parties.

5.3.6 Functional, Operational and Institutional Elements

Discussion of a new treaty also involves functional, operational and institutional elements that relate to,[646] for example, financial and technical assistance; education, training and public awareness; research; governing and subsidiary bodies; secretariat, focal points, and authorities; compliance, communication, and reporting; review of effectiveness; dispute settlement; treaty mechanisms; and common final provisions.[647] The purpose of this section is to highlight some of these aspects that are particularly crucial to preventing plastics leakage to the (marine) environment and to instituting the support measures discussed earlier.

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643 N Simon et al., 'No More Plastics in the Ocean: Gaps in Global Plastic Governance and Options for a Legally Binding Agreement to Eliminate Marine Plastic Pollution' (adelphi 2018) Discussion Paper. 31.
644 *Ibid.* 28.
645 K Raubenheimer and N Urho, 'Rethinking Global Governance of Plastics -The Role of Industry' (2020) 113 Marine Policy. 1.
646 *Ibid.* 1-2.
647 See, Environment Canada, University of Joensuu and UNEP, *Multilateral Environmental Agreement: Negotiator's Handbook* (2nd Edition, 2007) University of Joensuu – UNEP Course Series 5.

A new treaty would need a secretariat, which is ”[t]he body established under an international agreement to arrange and service meetings of the governing body of that agreement, and assist Parties in coordinating implementation of the agreement. It also “performs other functions as assigned to it by the agreement and the decisions of the governing body.”[648] Regarding the mandate of a secretariat for a new treaty, it should have a dual function. In addition to providing the above-mentioned services, the secretariat should be in charge of coordinating international legal efforts to tackle the global plastic problem. Ferraro and Failler argue that “[for] effective global governance of marine plastic pollution, coordination among the various organisations involved around a leading UN agency is crucial.”[649]

The most natural choice for hosting the secretariat of a new treaty would be the UN Environment for a multitude of reasons.[650] UN Environment already provides the secretariats for the Basel and Stockholm Convention and seven regional seas programmes. It also hosts the GPA and GMPL, has a public-private partnership Global Commitment with the Ellen MacArthur Foundation (EMF) on the CE, and has initiated major campaigns to raise awareness, such as ‘Beat Pollution’ or ‘Cleans Seas’.[651] Coordination should comprise at least UN Environment, IMO, FAO, and RSP. The added benefit of having a clear coordination mechanism between different organizations is that:

> [r]elevant commitments made elsewhere, such as under regional and other international instruments, would be incorporated into the national action plans so as to consolidate all actions into one document, a one-stop shop for national action against plastic pollution.[652]

National action plans that transpose international obligations onto country-level policies and legislation are an essential part of a new binding agreement.[653] In this regard, an obligation to increase the proportion of managed plastics waste to minimize plastics leakage to the environment could be “combined with a bottom-up and voluntary approach establishing a set of measures in line with each

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[648] UNEP, ‘Glossary of Terms for Negotiators of Multilateral Environmental Agreements’ (UNEP 2007) 83.
[649] G Ferraro and P Failler, ‘Governing Plastic Pollution in the Oceans: Institutional Challenges and Areas for Action’ (2020) 112 Environmental Science and Policy. 458.
[650] *Ibid.*
[651] EMF, ‘Global Commitment’ https://www.ellenmacarthurfoundation.org/our-work/activities/new-plastics-economy/global-commitment; UNEP, ‘Beat Pollution’ https://www.unep.org/beatpollution/; Clean Seas https://www.cleanseas.org
[652] CIEL, EIA and GAIA, ‘Convention on Plastic Pollution: Towards a New Global Agreement to Address Plastic Pollution’ (2020) 7.
[653] *Ibid.*

country's specific needs and conditions."[654] This would also respect the differences between States in terms of reliance on either formal or informal waste management sectors.[655]

Reporting and monitoring are also crucial aspects of a new treaty.[656] Currently reporting of plastics leakage prevention on the international level is non-existent. To monitor progress and compliance, national reporting based on national action plans is a key factor in a new treaty.[657] A binding, result-oriented, time-bound obligation to increase the proportion of managed plastics wastes has to be paired with reporting and monitoring obligations, which in turn requires harmonized methodologies to produce comparable data between States. The presence of MPP in the (marine) environment should also be subject to monitoring to ensure that as a whole, the new treaty is contributing to environmental protection. Also in this regard, "Parties will need to develop a harmonized environmental monitoring framework outlining what will be monitored, such as seafloor, seawater, shoreline, biota, passively fished waste or other compartments such as freshwater and soils."[658]

To develop monitoring methodologies, to continuously assess progress and to be able to steer precautionary efforts under a new treaty, "a dedicated scientific body could also be considered".[659] At present,

> a broad range of plastic pollution research is being undertaken around the world, and there has been a sharp increase in scientific studies on this issue in recent years. But no system is in place for ensuring that the scientific knowledge is structured, reviewed and presented to states as a basis for action.[660]

Such a body facilitating the science-policy interface could be a subsidiary body to the new treaty, or a stand-alone body. It would have a dual role: to establish a robust science base and summarize the latest state of knowledge on plastics leakage and MPP, and to translate this knowledge in a manner that facilitates decision-making.[661]

To be able increase the proportion of managed plastics, developing countries will need financial and technical assistance with waste management, including connecting port reception facilities in coastal

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[654] S Nils and ML Schulte, 'Stopping Global Plastic Pollution: The Case for an International Convention' (Heinrich Böll Stiftung 2017) 43 Publication Series Ecology. 34; In this regard, Nils and Schulte refer to a selection of legal measures suggested in UNEP, 'Marine Litter Legislation: A Toolkit for Policymakers' (UNEP 2016).
[655] See, D Wilson et al., 'Role of Informal Sector Recycling in Waste Management in Developing Countries' (2006) 30 Habitat International. 798, 806-807.
[656] CIEL, EIA and GAIA, 'Convention on Plastic Pollution: Towards a New Global Agreement to Address Plastic Pollution' (2020) 6.
[657] *Ibid.*
[658] *Ibid.*
[659] WWF, Ellen MacArthur Foundation and Boston Consulting Group, 'Business Case for a UN Treaty on Plastic Pollution' (2020) 22.
[660] *Ibid.*
[661] N Simon et al., 'No More Plastics in the Ocean: Gaps in Global Plastic Governance and Options for a Legally Binding Agreement to Eliminate Marine Plastic Pollution' (adelphi 2018) Discussion Paper. 35.

areas to waste management on land. A new treaty should establish a capacity development support system that can bolster knowledge exchange and technology transfer.[662] Financing for this should come from both the private and public sector, as both contribute to the problems either by producing plastics or by enjoying their benefits.[663] However, in line with extended producer responsibility, plastics companies should be compelled to make a substantial contribution:

> [W]ith US $750 billion in annual turnover, the plastic industry is economically strong enough to contribute a small fraction of their profits to deal with their products' legacy. A mere 0.1% levy on their turnover would lead US $750 million available for capacity development, information sharing, and direct implementing activities.[664]

A funding mechanism would have a key role in providing seed funding to improve and scale up waste management infrastructure, and to support information exchange and technical assistance.[665]

5.4 Preliminary Remarks of the International Plastics Leakage Prevention Measures

Applying existing international law to the issue of transboundary harm from plastics leakage to the marine environment reveals that many treaty and customary law obligations and soft law measures already address downstream activities relating to the problem. The multitude of international legal measures analyzed in Part II well demonstrate the notion that legal measures to address the global plastics problem are fragmented and uncoordinated, and there is a need to establish a coordination mechanism, preferably under a new treaty.

The framing of the problem of plastics leakage as waste management and environmental issues transcends the source-based structure of international pollution prevention. Though the source-based structure may be helpful in systematizing the different sources and which instruments apply to each of them, it can distract from the fact that all plastics leakage issues connect to practices on land. Strict prohibitions are in place to prevent dumping or to discard plastics wastes from vessels, yet leakage from ocean-based sources still happens. The blame can be only partly put on enforcement of these prohibitions, as the root causes for the leakage connect also to inadequate port reception facilities or other disincentives to deal with the wastes on land. This is also one example of the fragmentation phenomenon, as it is beyond the IMO's mandate to address the interlinkage between port reception facilities and national waste management, it can only encourage States to do so. In a similar vein, the

[662] S Nils and ML Schulte, 'Stopping Global Plastic Pollution: The Case for an International Convention' (Heinrich Böll Stiftung 2017) 43 Publication Series Ecology. 36.
[663] *Ibid.* 37.
[664] *Ibid.*
[665] N Simon et al., 'No More Plastics in the Ocean: Gaps in Global Plastic Governance and Options for a Legally Binding Agreement to Eliminate Marine Plastic Pollution' (adelphi 2018) Discussion Paper. 33.

issue of using rivers as dumpsites for plastics wastes falls through the cracks of a fragmented way to regulate different environmental compartments under international law and should be addressed with conscious regime interaction and international cooperation through existing or new institutions.

Historically, waste management has been dealt with (or not dealt with) with national regulation. Yet the scientific modeling of current plastics leakage rates to the oceans indicates that plastics wastes are putting a tremendous pressure on national waste management systems. This happens in particular in developing countries and the issue is exacerbated by the transboundary movement of plastics wastes to these States. Although the GPA and the Honolulu Strategy offer States some guidance in this regard, international law has mostly been silent on how general pollution prevention obligations should be operationalized with national legal measures on waste management. It is therefore pivotal that States would negotiate a new treaty that aims at eliminating plastics leakage to the environment and sets clear obligations and targets regarding what these mean in terms of the proportion of plastics wastes States need to manage. Moreover, a new treaty should provide an international mechanism to support infrastructure and capacity building regarding waste management.

Furthermore, it is clear that by only focusing on short-term strategies to prevent ocean leakage and to deal with plastics wastes by means of burning or landfilling them more safely and efficiently, the problem will merely be transferred to affect the environment on land. It is therefore critical that not all international efforts focus on merely improving the current international legal framework on plastics leakage prevention. The scope of a possible new treaty should take on the challenge to also address the root causes of the global plastics problem, as will be discussed in Part IV.

PART III – PLASTICS POLLUTION IN THE MARINE ENVIRONMENT: INTERNATIONAL LEGAL REMEDIES

CHAPTER 6
– SCIENTIFIC AND LEGAL FOUNDATION TO REMEDY DAMAGE FROM MPP

6.1 Introduction

It is not possible to clean all the existing and accumulated plastics pollution from the oceans. Over 150 million tons of plastics that have already leaked into the marine environment are gradually becoming micro- and nanoplastic particles which are impossible to remove from vast and deep ocean spaces. However, though mitigating existing MPP is the least cost-effective way to approach the global plastics problem, these efforts should not be completely disregarded. MPP causes negative impacts via entanglement, ingestion, habitat damage, chemical contamination, losses at the maritime and tourism sectors and loss of intrinsic value of the environment. MPP is possibly a threat to human health and food safety.[666] Remedies to mitigate or compensate for these negative impacts and threats should therefore be part of the mix of measures under an international legal response. This study applies the law of State responsibility and international liability principles to the issue of marine plastics pollution, as well discusses in detail the feasibility of establishing a civil liability regime as part of a possible new treaty on plastics. It also indicates that establishing a global fund may be the most viable option to contribute to mitigation of MPP by providing funding for cleanup and restoration efforts particularly in the most polluted regions in developing countries.

6.2 Unravelling the Second Sub-Research Question

> When faced with transboundary and global harm caused by marine plastics pollution (MPP), what are the international legal remedies States have at their disposal, and how could the current remedies be further developed and complemented?

The second sub-research question consists of three clauses, each of which will be addressed in Part III. The first clause of the sub-research question depicts the problem, a State is "faced with transboundary and global harm caused by marine plastics pollution". The sub-chapter 6.3, 'Framing the Problem: Plastics Pollution in the Marine Environment', provides a more detailed description of the problem and describes which elements of the global plastics problem Part III deals with.

[666] UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 88, 93, 94, 97.

The second clause of the sub-research question, "what are the international legal remedies States have at their disposal", is the focus of the sub-chapter 6.4, 'International Legal Basis to Remedy Marine Plastics Pollution', and Chapter 7 – Mapping and Analysis of the Current International Legal Framework Applicable to Marine Plastics Pollution. The sub-chapter 6.4 provides an analysis of the sources of international law that form the foundation and justification for remedying marine plastics pollution. Chapter 7 identifies and maps the current international legal framework applicable to marine plastics pollution remedies and analyses how it could be improved. The word "remedies" also reveals the objective of Part III. It focuses only on international means of redress when a State is faced with transboundary harm caused by marine plastics pollution. Any other possible approaches to the problem of plastics that are already in the oceans are not within the scope of the Part III.

The third clause of the sub-research question, "and how could the current remedies be further developed and complemented?" is the focus of Chapter 8 – Further Legal Measures to Remedy Marine Plastics Pollution. Chapter 8 moves beyond what Chapter 7 identifies as the current international legal framework, and discusses further legal measures to add to current toolbox of remedying marine plastics pollution on a global level. Chapter 8 analyses these further legal measures in two phases. First, it analyses the feasibility of developing a new liability mechanism for MPP as part of a new treaty on plastics. Second, it focuses on the idea of establishing a fund to remedy damage from MPP. Chapter 8 also gathers the main findings of Part III as preliminary conclusions, which will then be combined and further developed in Part V – Conclusions.

6.3 Framing the Problem: Plastics Pollution in the Marine Environment

In Part III, the problem definition is marine plastics pollution (MPP), which means that plastics have already leaked into the oceans and become pollution and cause a threat of harm or actual harm to the environment or humans. Defining the problem as plastics pollution in the marine environment signifies that the problem is framed as an environmental and potentially a human health problem. Plastics pollution in the marine environment is a matter of global concern and international law because the situation potentially causes transboundary harm within and beyond national jurisdiction. Part III deals with downstream activities that relate to remedying MPP.

Plastics have accumulated in the marine environment since extensive production started after World War II.[667] The world at large noticed the severity of the situation in the marine environment in the

[667] PE Hagen, 'The International Community Confronts Plastics Pollution from Ships: MARPOL Annex V and the Problem That Won't Go Away' (1990) 5 American University International Law Review 2. 430.

1990s, after Captain Charles Moore discovered the North Pacific Garbage Patch.[668] This is one of the five gyres in the high seas which collect MPP in their midst. The other four are located in the South Pacific Ocean, the North Atlantic Ocean, the South Atlantic Ocean and the Indian Ocean.[669] The mass balance of plastics in the oceans globally is unknown. The highest estimate, based on calculations relating to plastics production since 1950s, is that the oceans already contain over 150 million tons of plastics.[670] Other more modest estimates vary from 27 million tons to 86 million tons.[671] The concentrations of plastics pollution in the gyres in the high seas combined with concerning amounts of plastics already in the marine environment highlight the transboundary and global nature of MPP.

When plastics become marine plastics pollution, chemicals leach out of plastics and plastics also absorb chemicals from the marine environment.[672] The chemical mass balance leaching out of MPP is unknown and much less researched than the mass balance of plastics.[673] HL De Frond et al. estimated that "the total weight of 7 plastic items (bottles, bottle caps, EPS food and drink containers, cutlery, grocery bags, straws or stirrers, and food wrappers) that entered the ocean in 2015 was 87 000 t[ons] and that approximately 190 t[ones] of 20 chemical additives entered the oceans with these plastic items."[674] This study is limited to chemicals from only seven items and 20 chemical additives in one year and is thus an underestimation of the total chemical mass balance.[675] However, it indicates that the combined chemical mass balance from chemicals in plastics in the oceans is likely to be substantial.

The movement and concentrations of plastics in the marine environment depend on multiple factors, such as "the size and demographics of the local populations, including the total population and rural/urban split; the speed and direction of the local currents; the speed and direction of the wind; the occurrence of extreme natural events, such as hurricanes, floods, and tsunamis, and; the nature of

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668 See, CJ Moore et al., 'A Comparison of Plastic and Plankton in the North Pacific Central Gyre' (2001) 42 Marine Pollution Bulletin 12.
669 A Cózar et al., 'Plastic Debris in the Open Ocean' (2014) 111 Proceedings of the National Academy of Sciences of the United States of America 28. 10240-41.
670 Ocean Conservancy and McKinsey Center for Business and Environment, 'Stemming the Tide: Land-Based Strategies for a Plastic-Free Ocean' (2015) 14.
671 Eunomia report, based on sampling studies, estimated that there are 27-66.7 million tons of plastics in the oceans. C Sherrington, 'Plastics in the Marine Environment' Eunomia Research & Consulting Ltd (2016) 8; Jang et al. estimated, based on material flow analysis, that oceans contain 86 million tons of plastics by 2013. Y Jang et al. 'Estimating the Global Inflow and Stock of Plastic Debris Using Material Flow Analysis: a Preliminary Approach' (2015) 86 Journal of the Korean Society for Marine Environment and Energy 4. 266.
672 EL Teuten, 'Transport and Release of Chemicals from Plastics to the Environment and to Wildlife' (2009) 364 Philosophical Transactions of the Royal Society B 1526. 2042; See also, LA Holmes et al., 'Absorption of Trace Metals to Plastic Resin Pellets in the Marine Environment' (2012) 160 Environmental Pollution 1.
673 HL De Frond, 'Estimating the Mass of Chemicals Associated with Ocean Plastic Pollution to Inform Mitigation Efforts' (2019) 15 Integrated Environmental Assessment and Management 4. 596.
674 *Ibid.* 604.
675 *Ibid.* 599.

the marine coastline, with relatively enclosed areas (such as bays, the Mediterranean Sea and the Caribbean Sea) entrapping plastic in the local environment."[676] Once plastics have leaked into the oceans, it is extremely difficult to identify their ultimate source because of their fragmentation and degradation of plastics into small and heterogeneous concentrations.[677] Scientific modeling studies are helpful to evaluate the movement of plastics but do not provide exact evidence of how they are dispersed in the oceans.[678] Development of technology can provide assistance in this regard. For example, the European Space Agency (ESA) is developing a project which assesses "the feasibility of direct optical measurement of seaborne plastic waste from satellites".[679] Such monitoring could provide actual measurements of MPP in the future, and thus assist with establishing causal links between sources and occurring MPP.

Plastics have been found on the seabed of all seas and oceans.[680] Research has shown support for a "hypothesis that the ultimate fate of buoyant microplastics is not at the ocean surface".[681] Depending on the properties of plastics, water currents, and turbulence, these plastic objects float or sink in the oceans.[682] Due to currents, degradation, and biological interactions, plastics move to shallower waters, shores, or down to the seafloor. The estimation is that "of all the plastic entering the ocean since the

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676 As listed in UN Environment, 'Addressing Marine Plastics: A Systematic Approach – Stocktaking Report' (2018) 24. The Listing is based on the following research: DKA Barnes et al., 'Accumulation and Fragmentation of Plastic Debris in Global Environments' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences; M Niaounakis, *Management of Marine Plastic Debris: Prevention, Recycling and Waste Management* (William Andrew Applied Science Publishers 2017) and; F Thevenon et al., 'Plastic Debris in the Ocean: The Characterization of Marine Plastics and their Environmental Impacts' (IUCN 2014) Situation Analysis Report

677 F Thevenon et al., 'Plastic Debris in the Ocean: The Characterization of Marine Plastics and their Environmental Impacts' (IUCN 2014) Situation Analysis Report. 14.

678 See eg, BD Harvesty et al. 'Using Numerical Model Simulations to Improve the Understanding of Micro-Plastic Distribution and Pathways in the Marine Environment' (2017) 4 Marine Pollution: Frontiers in Marine Science; JR Jambeck et al. 'Plastic Waste Inputs from Land into the Ocean' (2015) 347 Science 6223; TOPIOS, 'Tracking of Plastic in Our Oceans' http://topios.org/index.html (A research project led by Erik van Sebille)

679 ESA, 'ESA Investigating Detection of Floating Plastic Litter from Orbit' (19 March 2018) https://www.esa.int/Enabling_Support/Preparing_for_the_Future/Discovery_and_Preparation/ESA_investigating_detection_of_floating_plastic_litter_from_orbit; ESA, 'A Step Forward in Detecting Plastic Marine Litter from Space' (1 July 2020) https://www.esa.int/Enabling_Support/Preparing_for_the_Future/Discovery_and_Preparation/A_step_forward_in_detecting_plastic_marine_litter_from_space

680 DKA Barnes et al., 'Accumulation and Fragmentation of Plastic Debris in Global Environments' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences. 1990.

681 For specific scientific studies on this, see eg, F Galgani et al. 'Distribution and Abundance of Debris on the Continental Shelf of the North-Western Mediterranean Sea' (1995) 30 Marine Pollution Bulletin 11; D Lee et al. 'Distribution Characteristics of Marine Litter on the Seabed of East China Sea and the South Sea of Korea' (2006) 70 Estuarine, Coastal and Shelf Science 1; A Koutsodendris et al. 'Benthic Marine Litter in Four Gulfs in Greece, Eastern Mediterranean; Abundance, Composition and Source Identification' (2008) 77 Estuarine, Coastal and Shelf Science 3; M Eriksen et al., 'Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea' (2014) 9 PLoS ONE 12. 10-11; See also, A Cózar et al. 'Plastic Debris in the Open Ocean' (2014) 11 Proceedings of the National Academy of Sciences of the United States of America 28. 10243.

682 UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 32.

1950s, 98.8 percent is no longer on the surface: most has fragmented and sunk."[683] Recent research has shown that deep sea currents play a role in the creation of seafloor microplastics hotspots.[684] However, research on debris possibly located on the deeper seabed, which forms about half the planet's surface, is restricted due to difficulties in collecting sampling data and costs of such research.[685]

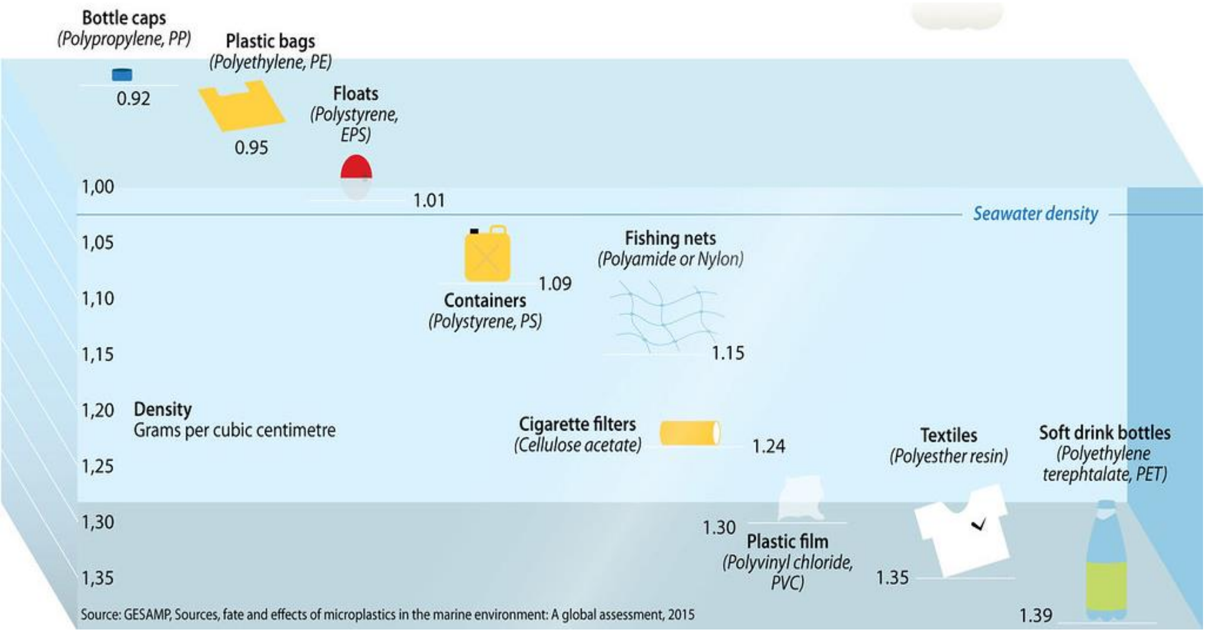

Fig. 9 Which plastics float and which sink in seawater?[686]

Though durability is one of the major advantages of plastics, it becomes one of their most harmful properties once disposed of, particularly in the marine environment.[687] Plastics do not usually biodegrade, and even biodegradable plastics do not biodegrade in the marine environment, but only under certain industrially manufactured conditions.[688] When plastics enter the ocean, the rate of degradation becomes extremely slow or does not appear to happen at all.[689] The longevity of plastics

683 N Ziebarth et al., 'All at Sea' in L Fuhr and M Franklin (eds) *Plastic Atlas: Facts and Figures about the World of Synthetic Polymers* (Heinrich Böll Foundation/Break Free from Plastic 2019) 28.
684 IA Kane et al., 'Seafloor Microplastic Hotspots Controlled by Deep-Sea Circulation' (2020) 368 Science 6495.
685 DKA Barnes et al., 'Accumulation and Fragmentation of Plastic Debris in Global Environments' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences. 1990. Though research on this is scarce, few studies that have found plastics beyond the continental shelf, see eg, F Galgani et al. 'Litter on the Sea Floor along European Coasts' (2000) 40 Marine Pollution Bulletin 6.; F Galgani and F Lecornu 'Debris on the sea floor at "Hausgarten"' (2004) in M Klages and J Thiede, The Expedition ARK XIX/3 of the Research Vessel POLARSTERN in 2003: Reports of Legs 3a, 3b, and 3c. 488 Reports on Polar and Marine Research. 260-262.
686 GRID-Arendal, Which Plastics Float and Which Sink in Seawater' (2016) https://www.grida.no/resources/6930
687 S Nils and ML Schulte, 'Stopping Global Plastic Pollution: The Case for an International Convention' (Heinrich Böll Stiftung 2017) 43 Publication Series Ecology. 15.
688 UNEP, 'Biodegradable Plastics and Marine Litter: Misconceptions, Concerns and Impacts on Marine Environments' (2015) 10, 31.
689 UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 34.

remains unknown, and estimates vary from hundreds to thousands of years.[690] The tendency of plastics to sink and transform into micro- and nanoplastics can make it a challenging task to evaluate the harm they may cause.[691]

There are many properly tested and demonstrated harmful impacts of MPP in marine habitats across all levels of biological organization.[692] The main ecological impacts of MPP include entanglement, ingestion, rafting and habitat damage.[693] The total number of marine species with documented records of entanglement is 557.[694] The main cause for entanglement is ghost fishing, which refers to lost or abandoned fishing gear that continues to trap and kill animals.[695] Also "other anthropogenic material such as ropes, balloons, plastic bags, sheets and six-pack drink holders can cause entanglement."[696]

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690 DKA Barnes et al., 'Accumulation and Fragmentation of Plastic Debris in Global Environments' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences. 1993.
691 See, SAM, 'Environmental and Health Risks of Microplastic Pollution' (Publications Office of the European Union 2019) Group of Scientific Advisors Scientific Opinion 6/2019. 6-9, 18-19.
692 CM Rochman et al., 'The Ecological Impacts of Marine Debris: Unraveling the Demonstrated Evidence from What is Perceived' (2016) 97 Ecology 2. 308.
693 UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 88, 93, 94, 97.
694 S Kühn et al., 'Deletorius Effetcs of Litter on Marine Life' in M Bergmann et al. (eds) *Marine Anthropogenic Litter* (Springer 2015) 96.
695 *Ibid.* 78; See also, PA Breen, 'A Review of Ghost Fishing by Traps and Gillnets' in RS Shomura and ML Godfrey (eds) Proceedings of the Second International Conference of Marine Debris (NOAA Technical Memorandum, NMFS 1990) 571; TP Good et al., 'Derelict Fishing Nets in Puget Sound and the Northwest Straits: Patterns and Threats to Marine Fauna' (2010) 60 Marine Pollution Bulletin 1; MG Pawson, 'The Catching Capacity of Lost Static Fishing Gears: Introduction' (2003) 64 Fisheries Research 2.
696 S Kühn et al., 'Deletorius Effetcs of Litter on Marine Life' in M Bergmann et al. (eds) *Marine Anthropogenic Litter* (Springer 2015) 79.

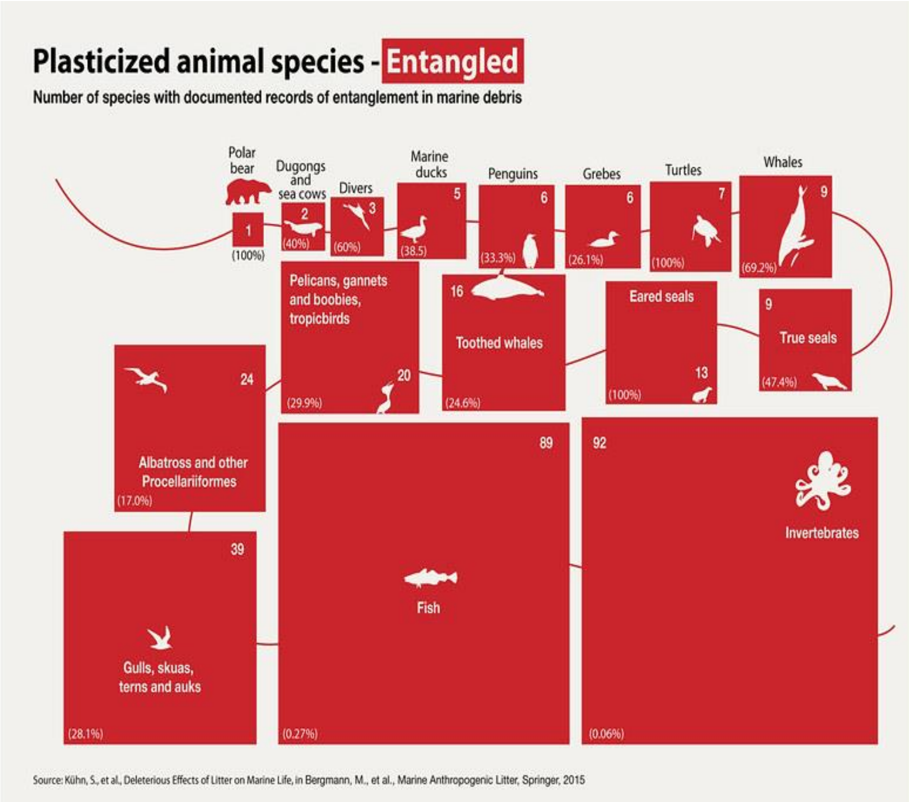

Fig. 10 Plasticized Animal Species – Entanglement.[697]

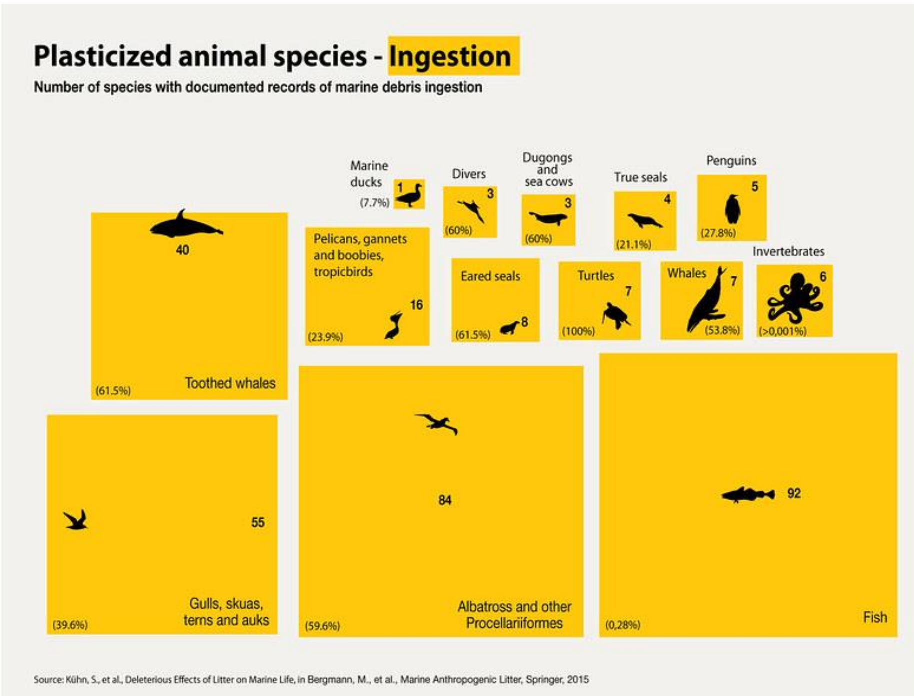

Fig. 11 Plasticized Animal Species – Ingestion.[698]

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697 GRID-Arendal, 'Plasticized Animals Species – Entangled ' (2018) https://www.grida.no/resources/6910
698 GRID-Arendal, 'Plasticized Animal Species – Ingestion' (2018) https://www.grida.no/resources/6927

Another major ecological impact of MPP is ingestion of plastics. The total number of marine species with documented records of ingestion is 233. Plastics ingestion may directly cause mortality or can affect animals by slower physical and chemical effects.[699] Microplastic ingestion by marine zooplankton indicates a risk that plastics ingestion affects species throughout marine food webs.[700] However, despite the recognized impacts of entanglement and ingestion on marine species, accurate modeling of their effects on the size of the populations is still lacking.[701] Floating MPP has also "been suggested to facilitate the spread of invasive species and, in fact, some species have been observed rafting on marine litter beyond their natural distributional limits."[702] In addition, MPP causes habitat damage, particularly affecting the health of coral reefs and mangrove forests.[703]

In addition to the adverse physiological impacts of MPP, "plastics in the marine environment may also pose an additional chemical hazard."[704] Chemicals contained in MPP act both as "a sink and a source for contaminants in the marine environment, including their transfer into marine foodwebs."[705] Chemicals in plastics may leach directly into the guts after ingestion, or leach to the seawater when plastics disintegrate.[706] Chemicals with endocrine disrupting properties (EDCs) are particular concern for the marine environment and even at very low concentrations can impair reproduction, thyroid function, and metabolism, and cause increased incidence and progression of hormone-sensitive cancers, consequently lowering birth rates and causing potential loss of biodiversity.[707] EDCs have been have been measured at high concentrations in plastic fragments sampled both at remote and urban beaches, as well as in those floating in the open ocean.[708] Other

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[699] S Kühn et al., 'Deletorius Effetcs of Litter on Marine Life' in M Bergmann et al. (eds) *Marine Anthropogenic Litter* (Springer 2015) 85, 92.
[700] J-P W Desforges et al., 'Ingestion of Microplastics by Zooplankton in the Northeast Pacific Ocean' (2015) 69 Archives of Environmental Contamination and Toxicology 3. 320.
[701] CM Rochman et al., 'The Ecological Impacts of Marine Debris: Unraveling the Demonstrated Evidence from What is Perceived' (2016) 97 Ecology 2. 309.
[702] T Kiessling et al., 'Marine Litter as Habitat and Dispersal Vector' in M Bergmann et al. (eds) *Anthropogenic Marine Litter* (Springer 2015) 157; MR Gregory, 'Environmental Implications of Marine Debris in Marine Settings-Entanglement, Ingestion, Smothering, Hangers-on, Hitch-Hiking, and Alien Species' (2009) 364 Philosophical Transactions of the Royal Society B. 2018.
[703] JB Lamb et al. 'Plastic Waste Associated with Disease on Coral Reefs' (2018) 359 Science 6374; C Martin et al. 'Mangrove Forests as Traps for Marine Litter' (2019) 247 Environmental Pollution; JA Ivar do Sul et al., 'Plastic Debris Retention and Exportation by a Mangrove Forest Patch' (2014) 78 Marine Pollution Bulletin 1–2.
[704] F Gallo et al., 'Marine Litter Plastics and Microplastics and their Toxic Chemicals Components: the Need for Urgent Preventive Measures' (2018) 30 Environmental Sciences Europe 13. 4.
[705] CM Rochman, 'The Complex Mixture, Fate and Toxicity of Chemicals Associated with Plastic Debris in the Marine Environment' in M Bergmann et al. (eds) *Anthropogenic Marine Litter* (Springer 2015) 133.
[706] *Ibid.* 130, 132.
[707] F Gallo et al., 'Marine Litter Plastics and Microplastics and their Toxic Chemicals Components: the Need for Urgent Preventive Measures' (2018) 30 Environmental Sciences Europe 13. 4.
[708] CG Avio et al., 'Plastics and Microplastics in the Oceans: From Emerging Pollutants to Emerged Threat' (2017) 128 Marine Environmental Research 2. 6; See also, H Hirai et al., 'Organic Micropollutants in Marine Plastic Debris from the Open Ocean and Remote and Urban Beaches (2011) 62 Marine Pollution Bulletin 8.

potential harmful impacts include *inter alia* changes in feeding, immunity and liver toxicity.[709] Plastics ingestion by marine species is one of the reasons why MPP can also be a human health issue.[710] Currently "evidence suggests that human exposure to microplastics via seafood is plausible", though further investigation and more data on chemical and microplastics loads in popular seafood items is required to evaluate the risks for human health.[711]

However, "although the scientific understanding regarding the fate and consequences of this material in the environment is growing, there remain several gaps in our understanding regarding the cocktail of chemicals associated with marine plastic debris."[712] Assessing these hazards associated with MPP is not simple, and "requires knowledge regarding organisms that may be exposed, the exposure concentrations, the types of polymers comprising the debris, the length of time the debris was present in the aquatic environment (affecting the size, shape and fouling) and the locations and transport of the debris during that time period."[713] Challenges with knowledge gaps and the cumulativeness and mixtures of chemicals make it extremely difficult to establish causal relationships between chemicals contained in plastics and their impacts and the significance of these impacts for the marine environment or human health.

Floating macroplastics can also cause risks to humans though navigational hazards. These include "injury or death following loss of power, due to entangled propellers or blocked water intakes or collision with floating or semi-sub-merged objects".[714] Additionally, such incidents can cause economic losses in the shipping sector.[715] MPP also affects the fisheries sector due to damage to fishing vessels and equipment and contamination of the catch with MPP. Impacts can include loss of target species due to ghost fishing, though the extent of this is unknown.[716] It can be argued that "productivity, viability, profitability and safety of the fishing and aquaculture industry is highly

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709 MA Browne et al,, 'Microplastic Moves Pollutants and Additives to Worms, Reducing Functions Linked to Health and Biodiversity' (2013) 23 Current Biology 23. 2391; XB Han et al., 'A Whole Life Cycle Assessment on Effects of Waterborne PBDEs on Gene Expression Profile along the Brain–Pituitary–Gonad Axis and in the Liver of Zebrafish' (2011) 63 Marine Pollution Bulletin 5-12. 164.
710 A Lusher, 'Microplastics in the Marine Environment: Distribution, Interactions and Effects' in M Bergmann et al. (eds) *Anthropogenic Marine Litter* (Springer 2015) 276.
711 M Carbery et al., 'Trophic Trasnfer of Microplastics and Mixed Contaminants in the Marine Food Web and Implications for Human Health' (2018) 115 Environment International. 407; See also, CIEL, 'Plastic & Health: The Hidden Costs of a Plastic Planet' (2019) 54-55.
712 CM Rochman, 'The Complex Mixture, Fate and Toxicity of Chemicals Associated with Plastic Debris in the Marine Environment' in M Bergmann et al. (eds) *Anthropogenic Marine Litter* (Springer 2015) 134.
713 *Ibid.* 133-134.
714 UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 105.
715 *Ibid.*
716 *Ibid.* 108.

vulnerable to the impact of marine plastic."[717] Moreover, MPP affects tourism sector by decreasing "the aesthetic value and attractiveness of beaches and shorelines for recreational purposes."[718] MPP also causes overall loss of intrinsic value of the marine environment.[719]

This sub-chapter has provided an overview of MPP as a problem, incorporating the basics concerning the ocean plastics mass balance, the chemicals' mass balance, accumulation, distribution and behavior of plastics pollution in the marine environment, and the environmental and human health impacts of MPP. These factors provide the scientific basis needed to evaluate the application of international legal remedies to the problem.

6.4 International Legal Basis to Remedy Marine Plastics Pollution

The general international legal foundation to remedy transboundary environmental damage from MPP derives from Principle 22 of the Stockholm Declaration, Principle 13 of the Rio Declaration, the polluter pays principle, the no-harm rule, and general rules of international law on State responsibility and international liability.

In 1972, the Stockholm Declaration addressed the gaps in the field of environmental law regarding international responsibility and liability and stated:[720]

> States shall cooperate to develop further the international law regarding liability and compensation for the victims of pollution and other environmental damage caused by activities within the jurisdiction or control of such States to areas beyond their jurisdiction.[721]

After 20 years and slow progress on the topic, the Principle 13 of the Rio Declaration in 1992 restated:[722]

> States shall develop national law regarding liability and compensation for the victims of pollution and other environmental damage. States shall also co-operate in an expeditious and more determined manner to develop further international law regarding liability and compensation for adverse effects of environmental damage caused by activities within their jurisdiction or control to areas beyond their jurisdiction.[723]

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[717] NJ Beaumont et al., 'Global Ecological, Social and Economic Impacts of Marine Plastic' (2019) 142 Marine Pollution Bulletin. 191.
[718] UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 108; NJ Beaumont et al., 'Global Ecological, Social and Economic Impacts of Marine Plastic' (2019) 142 Marine Pollution Bulletin. 191.
[719] UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 106.
[720] P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 736.
[721] Principle 22, the United Nations Conference on Human Environment, 'Declaration of the United Nations Conference on the Human Environment' (Adopted 16 June 1972) UN Doc A/CONF.48/14/Rev.1 ('Stockholm Declaration')
[722] P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 736.
[723] Principle 13, the United Nations Conference on Environment and Development, 'Rio Declaration on Environment and Development' (Adopted 14 June 1992) UN Doc A/CONF.151/26 (Vol I) ('Rio Declaration').

The role of the non-binding principles of the Stockholm and Rio Declarations is merely to provide a wider context for legal remedies. These principles show that the issue of liability for environmental damage, whether in a national, transboundary or global setting, has been on the agenda of the international community for decades, and the slow progress in operationalizing these principles arguably reflects difficulties in establishing the required mechanisms.

The polluter pays principle provides an underlying rationale for remedying environmental damage. Originally, the polluter pays principle developed from the economic theory of externalities, and it is a rule of cost allocation requiring the polluters to take responsibility for the external costs of the pollution:[724]

> The principle to be used for allocating costs of pollution prevention and control measures to encourage rational use of scarce environmental resources and to avoid distortions in international trade and investment is the so-called "Polluter-Pays Principle". This principle means that the polluter should bear the expenses of carrying out the above-mentioned measures decided by public authorities to ensure that the environment is in an acceptable state.[725]

Internalizing such costs is possible in a multitude of ways.[726] In the context of remedying damage from MPP, the polluter pays principle reinforces the concepts of responsibility/liability by indicating that the polluting party responsible/liable for repairing or compensating for the damage.[727] This is particularly relevant for international civil liability rules, which aim at making the polluting operator liable for environmental damage.

The no-harm rule is not only an important primary, substantive rule to prevent plastics leakage, but also a fundamental principle for remedying transboundary damage from MPP. The no-harm rule has a dual objective: "a compensatory function that provides means for the remediation of harm and a complementary preventive function aimed at potential tortfeasors."[728] Originally, the response of international law to environmental damage was the same as with any other injury: the application of

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[724] N de Sadeleer, *Environmental Principles – From Slogans to Legal Rules* (Oxford University Press 2002) 21.

[725] OECD, 'Recommendation of the Council on Guiding Principles concerning International Economic Aspects of Environmental Policies. Annex Guiding Principles Concerning the International Economic Aspects of Environmental Policies' (OECD 2021) 4, para A(a)(4).

[726] M Landon-Lane suggests that better corporate product stewardship practices can incentivize corporations to adjust their plastic design and manufacturing, thus internalizing product externalities and contributing to reduction of marine plastic pollution. M Landon-Lane, 'Corporate Social Responsibility in Marine Plastic Debris Governance' (2018) 127 Marine Pollution Bulletin. 315; L Monroe advocates product stewardship and extended producer responsibility to incorporate holistically the costs of activities necessary to manage products to reduce marine plastic pollution. L Monroe, ' Tailoring Product Stewardship and Extended Producer Responsibility to Prevent Marine Plastic Pollution' (2014) 27 Tulane Environmental Law Journal 2. 236.

[727] N de Sadeleer, *Environmental Principles – From Slogans to Legal Rules* (Oxford University Press 2002) 15.

[728] L-A Duvic-Paoli, *The Prevention Principle in International Environmental Law* (Cambridge University Press 2018) 19-20; M Hinteregger, 'Tort Law as an instrument for the Prevention and Remediation of Catastrophic Harm' in A Herwig and M Simoncini (eds) *Law and the Management of Disasters: The Challenge of Resilience* (Routledge 2017) 209, as cited by L-A Duvic-Paoli, *The Prevention Principle in International Environmental Law* (Cambridge University Press 2018) 19-20.

the rules on State responsibility. The no-harm rule provided the legal framework for seeking reparation for environmental damage.[729] The objective of the no-harm rule to provide means for a remediation of harm is the foundational element that makes it part of the general legal basis of Part III. As already discussed earlier, the no-harm rule is a well-established rule of customary international law.[730]

Another well-founded principle of international law is that every internationally wrongful act of a State entails the international responsibility of that State.[731] The Permanent Court of International Justice (PCIJ), the ICJ and arbitral tribunals have all affirmed the principle in numerous cases.[732] For example, in *the Corfu Channel Case,* the ICJ stated:

> In fact, nothing was attempted by the Albanian authorities to prevent the disaster. These grave omissions involve the international responsibility of Albania.
>
> The Court therefore reaches the conclusion that Albania is responsible under international law for the explosions which occurred…and for the damage and loss of human life which resulted from them, and that there is a duty upon Albania to pay compensation to the United Kingdom.[733]

These principles provide the international basis for remedying transboundary environmental damage and developing more detailed mechanisms to that end. The current international legal framework lacks a specific global compensation mechanism for transboundary damage resulting from MPP.[734] While it is true that no such mechanism for MPP explicitly exists, this study challenges the view that international law does not provide any existing means to remedy the damage caused by MPP in the marine environment, both within and beyond national jurisdiction.[735] In the absence of a specific global compensation mechanism for MPP, this part applies general rules of State responsibility and international liability to the factual situation where plastics have already leaked into the marine

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729 L-A Duvic-Paoli, *The Prevention Principle in International Environmental Law* (Cambridge University Press 2018) 15.
730 See eg, P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009) 137; and P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 206.
731 P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 737.
732 ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International law Commission (Vol II, Part Two) 32, paras 1, 2; See eg, *Phosphates in Morocco (Italy v France)* (Preliminary Objections) PCIJ Series A/B No 74. 22; *The Corfu Channel Case (UK v Albania)* (Merits) [1949] ICJ Rep 1949. 22; *Case Concerning the Difference between New Zealand and France Concerning the Interpretation or Application of Two Agreements, Concluded on 9 July 1986 between the Two States and Which Related to the Problems Arising from the Rainbow Warrior Affair (New Zealand v France)* [1990] XX UNRIAA. 251, para 75.
733 *The Corfu Channel Case (UK v Albania)* (Merits) [1949] ICJ Reports 1949. 23.
734 UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UN Doc UNEP/EA.3/INF/5. 131.
735 UN Environment identified the gap in UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 13; For critical view of the usefulness of international law in the field of responsibility and liability, see L Cortat Simonetti Goncalves and M Faure, 'International Law Instruments to Address the Plastic Soup' (2019) 43 William Mary Environmental Law and Policy Review 3. 940-941.

environment and are causing, or are at risk of causing, transboundary environmental harm.[736] The aim of this part is not only to study the application of State responsibility and liability to MPP, but also to pinpoint the most crucial difficulties which any potential future endeavors to develop specific mechanisms to remedy damage from plastics pollution in the marine environment should take into account. To date, legal research has not attempted to apply the rules of State responsibility and international liability to marine plastics pollution.

The use of terminology in this part necessitates clarifications as the terms 'responsibility' and 'liability' may cause confusion. In treaties, 'responsibility' usually refers to the obligations of States and 'liability' to the consequences of a breach of these obligations.[737] However, in the sense that the ILC uses these terms, responsibility refers to the secondary rules of State responsibility, that is, bearing responsibility for a wrongful act, whereas liability denotes the duty to make a reparation for acts not prohibited by international law.[738] This study uses the terminology that is present in the work of the ILC. The term 'international liability' refers to compensation for transboundary damage in a situation where no breach of an international obligation has occurred,[739] under which the rules on the channeling of liability affect the determination of the liable party and the form that liability takes. For example, the liable party can be a State (State liability) or private operator (civil liability). The term 'international responsibility' refers to the rules of State responsibility.

To introduce the topic of State responsibility and international liability in the context of MPP may seem problematic. First, the rules of State responsibility evolved in a completely different era and circumstances compared to those that the international community is facing in the second decade of the 21st century, especially regarding global environmental problems such as MPP.[740] Many primary environmental obligations are vague and subject to disagreements between States, which complicates establishing that a breach of an obligation has taken place.[741] This is also the current state of affairs regarding many obligations to prevent plastics leakage, as discussed in Part II. Historically, States have been reluctant to clarify and invoke the law of State responsibility regarding transboundary

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[736] See, RL Johnstone, *Offshore Oil and Gas Development in the Arctic under International Law: Risk and Responsibility* (Koninklijke Brill NV 2015) 191; P Okowa, 'Responsibility for Environmental Damage' in M Fitzmaurice et al. (eds), *The Research Handbook on International Environmental Law* (Edward Elgar Publishing 2010) 303.
[737] LFE Goldie, 'Concepts of Strict and Absolute Liability and the Ranking of Liability in Terms of Relative Exposure to Risk' (1985) 16 Netherlands Yearbook of International Law. 180.
[738] RL Johnstone, *Offshore Oil and Gas Development in the Arctic under International Law: Risk and Responsibility* (Koninklijke Brill NV 2015) 192; J Barboza, *The Environment, Risk and Liability in International Law* (Brill 2017) 22.
[739] J Barboza, *The Environment, Risk and Liability in International Law* (Brill 2017) 3.
[740] P Okowa, 'Responsibility for Environmental Damage' in M Fitzmaurice et al. (eds) *The Research Handbook on International Environmental Law* (Edward Elgar Publishing 2010) 303.
[741] M Fitzmaurice, 'International Responsibility and Liability' in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008) 1017.

environmental damage.[742] Therefore, case law to provide guidance on these primary environmental obligations is not extensive.[743]

Second, the subjects of the law of State responsibility and international liability principles are States which are not the entities directly behind the problem of MPP. Though States are not the direct cause of MPP, customary international law and treaties oblige them to protect the marine environment, as the analysis in Part II shows. The due diligence nature of these obligations signifies that States are not only responsible for their own conduct, but also required to exercise effective control over activities within their jurisdiction.[744] These activities cover those private actors causing MPP. As a breach of a due diligence obligation is within the scope of the rules of State responsibility, it offers the possibility to study whether a State could be held responsible for not exercising its due diligence over private actors whose conduct results in MPP. In cases where a State has exercised due diligence but harm nevertheless occurs, principles of international liability come into play.

While it is true that the origins of State responsibility and international liability stem from an era that did not recognize global environmental problems like MPP, it does not mean that elaboration and development of these rules is impossible.[745] Furthermore, the possibility to apply rules of State responsibility and international liability to MPP could also nudge implementation of plastics leakage prevention instruments and serve as an incentive for compliance.[746]

The main source of the law of State responsibility are the International Law Commission's (ILC) Draft Articles on Responsibility of States for Internationally Wrongful Acts (ARSIWA). Article 1 of the ARSIWA has codified the principle that every internationally wrongful act of a State entails the international responsibility of that State.[747] The ILC worked on the codification of the principles of international law governing State responsibility from 1953 until 2001, and produced the ARSIWA as a result.[748] The law of State responsibility distinguishes between primary and secondary norms.

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742 RL Johnstone, *Offshore Oil and Gas Development in the Arctic under International Law: Risk and Responsibility* (Koninklijke Brill NV 2015) 190; T Scovazzi, 'Some Remarks on International Responsibility in the Field of Environmental Protection' in M Ragazzi (ed) *International Responsibility Today: Essays in Memory of Oscar Schachter* (Brill 2005) 222.

743 M Fitzmaurice, 'International Responsibility and Liability' in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008) 1017.

744 R Pisillo-Mazzeschi, 'The Due Diligence Rule and the Nature of the International Responsibility of States' (1992) 35 German Yearbook of International Law 9. 15.

745 T Scovazzi, 'Some Remarks on International Responsibility in the Field of Environmental Protection' in M Ragazzi (ed) *International Responsibility Today: Essays in Memory of Oscar Schachter* (Brill 2005) 222.

746 P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 736.

747 ILC, 'Report of the International Law Commission on the Work of Its Fifty-Third Session' (23 April – 1 June and 2 July -10 August 2001) UN Doc A/56/10. 26; See also, P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 737.

748 For the mandate to begin the codification, see, UNGA Res 799 (VIII) 'Request for the Codification of the Principles of International Law Governing State Responsibility' (7 December 1953) UN Doc A/RES/799(VIII); For welcoming

Primary rules denote the substantive obligations of States, and secondary rules concern the breach of primary rules and the consequences of a breach.[749] Part II has discussed the substantive, primary prevention obligations of States regarding plastics leakage and Part III focuses on secondary norms, that is, the law of State responsibility. The ARSIWA is "the leading authority on the contemporary state of customary international law" regarding State responsibility though it does not solely reflect customary law.[750]

The main source of international liability is the Draft Principles on Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities (Draft Principles on Allocation of Loss). The ILC worked on the topic of 'international liability for injurious consequences arising out of acts not prohibited by international law' from 1973 until 1997, when it split the topic into two parts: 'prevention of transboundary damage from hazardous activities' and 'international liability in case of loss from transboundary harm arising out of hazardous activities'.[751] The ILC concluded its work on the Draft Articles on Prevention of Transboundary Harm from Hazardous Activities (Draft Articles on Prevention) in 2001,[752] and on the Draft Principles on Allocation of Loss in 2006.[753] International liability principles are themselves primary norms, as no breach of an international obligation is required for their application. The Draft Principles on Allocation of Loss present the progressive development of law.[754]

A vast literature on the topics of State responsibility and international liability exists, and includes a colorful debate on the ILC's choices regarding State responsibility and international liability during the many decades of its work on these efforts of codification, and on the progressive development

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the conclusion of the work, see, UNGA Res 56/82 'Report of the International Law Commission on the Work of Its Fifty-Third Session' (12 December 2001) UN Doc A/RES/65/82.

[749] M Fitzmaurice, 'International Responsibility and Liability' in D Bodansky et al (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008) 1011.

[750] Especially Draft Articles concerning invocation of responsibility and the use of measures and countermeasures remain controversial. (RL Johnstone, *Offshore Oil and Gas Development in the Arctic under International Law: Risk and Responsibility* (Koninklijke Brill NV 2015) 191.)

[751] For the mandate to begin the work, see UNGA Res 3071 (XXVIII) 'Report of the International Law Commission' (30 November 1973) UN Doc A/RES/3071(XXVIII); For the decision to divide the topic, see, UNGA Res 52/156 'Report of the International Law Commission on the Work of Its Forty-Ninth Session' (15 December 1997) UN Doc A/RES/52/156.

[752] For welcoming the conclusion of the Draft Articles, see, UNGA Res 56/82 'Report of the International Law Commission on the Work of Its Fifty-Third Session' (12 December 2001) UN Doc A/RES/65/82.

[753] For welcoming the conclusion of the Draft Principles, see UNGA Res 61/63 'Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities' (4 December 2006) UN Doc A/RES/61/36.

[754] C Foster, 'The ILC Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities' (2005) 14 Review of European, Comparative and International Environmental Law 3. 282; *Responsibilities and Obligations of States with respect to Activities in the Area* (Advisory Opinion) [2011] ITLOS Reports 2011. 66, para 209.

of law.[755] This study does not engage with this debate, but merely investigates the possibilities to apply the ARSIWA and the Draft Principles on Allocation of Loss to the issue of transboundary MPP.

[755] Many scholars have criticized the ILC's choices of separating the topics of State responsibility and liability, as well its approach to international liability. See eg, AE Boyle, 'State Responsibility and International Liability for Injurious Consequences of Acts Not Prohibited by International Law: A Necessary Distinction?' (1990) 39 International and Comparative Law Quarterly 1.

CHAPTER 7 – THE CURRENT INTERNATIONAL LEGAL FRAMEWORK APPLICABLE TO MARINE PLASTICS POLLUTION

7.1 LEX SPECIALIS RULES

The starting point of the mapping and analysis of the current international legal framework applicable to MPP is to examine the relationship between the rules of general international law and the rules in treaties concerning international responsibility and liability. The general international law of State responsibility and international liability are residual in nature.[756] Treaties can thus provide provisions on the conditions and consequences of non-compliance, which overlap with the ARSIWA or the Draft Principles on Allocation of Loss.[757] If a treaty does not expressly state its relationship to other rules,[758] the question of "whether the specific provisions of the treaty were intended to be cumulative with or exclusive of the ARSIWA" arises.[759] Article 55 of the ARSIWA refers to the *lex specialis* principle in relation to such questions:

> These articles do not apply where and to the extent that the conditions for the existence of an internationally wrongful act or the content or implementation of the international responsibility of a State are governed by special rules of international law.

Similarly, the commentary on the Draft Principles on Allocation of Loss state that these principles are residual in character.[760]

The *lex specialis* maxim as an interpretation or conflict-solution technique is widely accepted in public international law and applicable in situations where a general standard and a specific rule regulate the same matter. The maxim of *lex specialis* means that a specific rule takes precedence over the general standard.[761] Therefore, the first matter is to investigate whether the current applicable international legal framework on plastics leakage prevention entails provisions in treaties on international responsibility and liability, which would be *lex specialis* rules in relation to the ARSIWA and the Draft

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756 Art 55, ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two) 140, para 2; ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Activities, with Commentaries' (2006) Yearbook of the International Law Commission (Vol II, Part Two) 69, para 20.
757 J Crawford, *The State Responsibility: The General Part* (Cambridge University Press 2013) 103.
758 ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two) 140, para 1.
759 J Crawford, *The State Responsibility: The General Part* (Cambridge University Press 2013) 103; Though this part focuses on the investigation of *lex specialis* rules, it is also possible to approach the topic by giving priority to the rule that is later in time. See, ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two) 140, para 2.
760 ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Activities, with Commentaries' (2006) Yearbook of the International Law Commission (Vol II, Part Two) 69, para 20.
761 ILC, 'Fragmentation of International Law: Difficulties Arising from the Diversification and Expansion of International Law' (Report of the Study Group of the International Law Commission, 2006) UN Doc A/CN.4/L.682 37.

Principles on Allocations of Loss. These treaty rules would indicate whether a treaty establishes its own mechanism to hold a State responsible for a breach of an obligation or liable for damage, or whether the treaty refers to the residual rules of State responsibility or international liability in this regard.[762] The treaties, which this investigation of possible *lex specialis* rules focuses on, are the ones that establish the primary obligations relevant for the protection of the marine environment from plastic pollution – namely the LOSC, the MARPOL Convention, and the London Dumping Convention and Protocol.

LOSC Article 235 deals with responsibility and liability:

> 1. States are responsible for the fulfilment of their international obligations concerning the protection and preservation of the marine environment. They shall be liable in accordance with international law.
>
> 2. States shall ensure that recourse is available in accordance with their legal systems for prompt and adequate compensation or other relief in respect of damage caused by pollution of the marine environment by natural or juridical persons under their jurisdiction.
>
> 3. With the objective of assuring prompt and adequate compensation in respect of all damage caused by pollution of the marine environment, States shall cooperate in the implementation of existing international law and the further development of international law relating to responsibility and liability for the assessment of and compensation for damage and the settlement of related disputes, as well as, where appropriate, development of criteria and procedures for payment of adequate compensation, such as compulsory insurance or compensation funds.

Article 235(1) refers to the law of state responsibility in the case of a violation of the LOSC. When the LOSC refers to liability in the title of the Article and paragraphs 2 and 3, it is not in the sense of how the ILC uses the terms 'responsibility' and 'liability'. In the LOSC, liability refers to the consequences of a breach pursuant to the law of State responsibility. Thus the LOSC does not establish any *lex specialis* rules, and a violation would be subject to rules of general international law on State responsibility, as codified by the ILC.[763] In cases where a State has complied with its primary obligations to protect the marine environment but damage nevertheless occurs, the Draft Principles on Allocation of Loss can provide legal guidance.[764]

Both the London Convention and Protocol provide articles dealing with violations. Pursuant to the London Convention Article X:

> In accordance with the principles of international law regarding State responsibility for damage to the environment of other States or to any other area of the environment, caused by dumping of wastes

[762] For a similar examination in the context of climate change, see, C Voigt, 'State Responsibility for Climate Change Damages' (2008) 77 Nordic Journal of International Law 1. 3-4.
[763] T Stephens, 'Article 235: Responsibility and Liability' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017) 1588.
[764] *Ibid.* 1589.

> and other matter of all kinds, the Contracting Parties undertake to develop procedures for the assessment of liability and the settlement of disputes regarding dumping.

Article 15 of the London Protocol echoes:

> In accordance with the principles of international law regarding State responsibility for damage to the environment of other States or to any other area of the environment, the Contracting Parties undertake to develop procedures regarding liability arising from the dumping or incineration at sea of wastes or other matter.

Despite the call for developing procedures regarding liability in both these Articles, the Parties to London Convention and/or London Protocol have not yet taken steps to create them.[765] Therefore, no *lex specialis* regarding violations of these treaties exist, and the rules of state responsibility and international liability apply.

The MARPOL Convention does not refer to international responsibility or liability in the treaty text or its Annex V. Article 4 of the MARPOL Convention regulates violations of the treaty and stipulates that it is the responsibility of the Parties to the Convention to establish the procedures and sanctions regarding violations. In the absence of any specific rules on consequences for States in cases where they have not established the required rules under Article 4 of the MARPOL Convention and a violation has occurred, rules of State responsibility could apply as residual rules. However, no practical examples of this exist because "addressing ship-source pollution from the perspective of State responsibility is unusual, since claims for pollution-related damage are usually not directed against states. Questions of responsibility and reparation are normally handled through civil liability."[766]

The LOSC, the London Convention and Protocol and the MARPOL Convention and its Annex provide the most clear-cut treaty-based obligations to prevent plastics leakage. None of these treaties provide their own mechanisms on international responsibility and liability, and therefore no *lex specialis* rules that would override State responsibility or international liability. Thus all plastics that are already in the oceans and cause (significant) transboundary harm are subject to international responsibility or liability rules. However, in practice, it is extremely difficult to establish, which primary rule – the no-harm rule, the LOSC, the London Convention or Protocol, or the MARPOL Annex V – has been violated when transboundary damage from MPP occurs. The next sub-chapters 7.2, State Responsibility and Marine Plastics Pollution, and 7.3, International Liability and Marine Plastics

[765] AB Sielen, 'The New International Rules on Ocean Dumping: Promise and Performance' (2009) 21 Georgetown International Environmental Law Review 2. 499.

[766] H Ringbom, 'Ship-Source Pollution' in A Noellkaemper and I Plakokefalos (eds) *The Practice of Shared Responsibility in International Law* (Cambridge University Press 2017) 265.

Pollution, will dive further into the complexities of applying international responsibility rules and liability principles to damage from MPP.

7.2 State Responsibility and Marine Plastics Pollution

7.2.1 Elements of an Internationally Wrongful Act

7.2.1.1 Attribution

Internationally wrongful acts can arise in bilateral legal relations, but also towards several States or the international community as a whole.[767] Article 2 of the ARSIWA clarifies the constituent elements of an internationally wrongful act.[768] The first element of Article 2, "there is an internationally wrongful act of a State when conduct consisting of an act or omission: (a) is attributable to the State under international law", refers to "organs of government, or of others who have acted under the direction, instigation or control of those organs, i.e., as agents of the State".[769] Articles 4-11 of the ARSIWA contain an exhaustive list of entities a State can bear responsibility for.[770] The internal laws and practice of each State are essential to determining what constitutes a State entity.[771]

The conduct of private persons cannot as such be attributable to the State.[772] However, if a State has failed to "take appropriate measures to prevent or punish the individual's act", i.e. failed to exercise due diligence, it has committed wrongful conduct, which invokes State responsibility.[773] Though this study does not dismiss the theoretical possibility of attributing the responsibility for transboundary harm from marine plastics pollution to a State agent, it is far more likely that a State itself would be held responsible for failure to exercise due diligence regarding private actors. Private actors and individuals are commonly the ones producing, consuming and discarding plastics. Therefore, the

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767 ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two) 33, para 4.

768 Art 2, ILC, 'Report of the International Law Commission on the Work of Its Fifty-Third Session' (23 April – 1 June and 2 July -10 August 2001) UN Doc A/56/10. 26; ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two) 34, para 1.

769 ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two) 38, para 2.

770 ILC, 'Report of the International Law Commission on the Work of Its Fifty-Third Session' (23 April – 1 June and 2 July -10 August 2001) UN Doc A/56/10. 26.

771 ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two) 39, para 6.

772 *Ibid.* 38, para 3.

773 R Ago, 'Second Report on State Responsibility: The Origin of International Responsibility' Yearbook of the International Law Commission (Vol II, 1970) 188, para 35; RL Johnstone, *Offshore Oil and Gas Development in the Arctic under International Law: Risk and Responsibility* (Koninklijke Brill NV, 2015) 197-198.

focus of this study in relation to State responsibility is on States' due diligence obligations with respect to private actors.

7.2.1.2 Breach of an International Obligation

The second element of Article 2 is that "there is an internationally wrongful act of a State when conduct consisting of an action or omission: (b) constitutes a breach of an international obligation of the State."[774] State responsibility arises out of a breach of an international primary obligation, which "depends on the precise term of the obligation, its interpretation and application, taking into account its object and purpose and the facts of the case."[775] The Draft Articles do not intend to specify the content of primary rules regarding a breach.[776] Articles 12-15 merely provide a framework within which it is possible to evaluate the existence of a breach, its timing, and its duration.[777]

Physical damage is not necessary to establish a breach. However, this must be considered in the context of rules. Determining a violation of international environmental law often relies on damage occurring, and as Brunnée notes, the ILC fails to consider this aspect.[778] The primary rules that have the status of customary international law and are relevant to marine plastic pollution are vaguely formulated obligations of due diligence to protect the marine environment and prevent transboundary harm. Treaty-based rules on vessel-source plastics pollution and the dumping of plastics are clear prohibitions not to discard plastics in the marine environment. However, in either case, it would be the occurring transboundary harm from marine plastic pollution that would be the basis for an injured party to invoke State responsibility. Therefore, in this context, it makes sense to focus on situations where both a possible breach of an obligation and the consequent transboundary harm are present. The legal issues relevant for such situations involving transboundary harm from MPP relate to the precise content of the primary rules (particularly due diligence), the definition of damage/harm, the threshold of harm, causality, and historic and cumulative pollution, which will be the subject of the analysis in the next section.

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[774] ILC, 'Report of the International Law Commission on the Work of Its Fifty-Third Session' (23 April – 1 June and 2 July -10 August 2001) UN Doc A/56/10. 26.
[775] ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International law Commission (Vol II, Part Two) UN Doc A/56/10. 54, para 1.
[776] *Ibid.* 54, para 2.
[777] *Ibid.* 54, para 3.
[778] J Brunnée, 'The Responsibility of States for Environmental Harm in a Multinational Context – Problems and Trends' (1993) 34 Les Cahiers de Droit 3. 832-833; Also Boyle makes this perception in AE Boyle, 'State Responsibility and International Liability for Injurious Consequences of Acts Not Prohibited by International Law: A Necessary Distinction?' (1990) 39 International and Comparative Law Quarterly 1. 16-17.

7.2.2 Legal Issues Concerning a Breach of an Obligation

7.2.2.1 Primary Rules Applicable to Marine Plastic Pollution

In the environmental field, the use of natural resources is a balancing act between, on one hand, the principle of State sovereignty over natural resources, and on the other, the no-harm rule. Both the principle of State sovereignty over natural resources and the no-harm rule are part of international customary law,[779] and the need to strike a balance between them was first expressed in Principle 21 of the Stockholm Declaration:

> States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction.

Also the LOSC embraces this approach in Article 193:

> States have the sovereign right to exploit their natural resources pursuant to their environmental policies and in accordance with their duty to protect and preserve the marine environment.

The starting point is the sovereign right of States to exploit their natural resources, and thus the right of States to allow their territory and resources to be used in plastic production and consumption. This covers raw material extraction, whether for fossil fuel or bio-based plastic materials. More broadly, the activities relating to plastics production comprise the production of monomers and polymers, the production of chemical additives used in plastics products, plastic conversion, and the production of plastic products. On a global level, no obligations exist regarding the production phase of plastics, and therefore these activities are lawful.[780] Furthermore, no obligation on a global level exists concerning restrictions on the consumption of plastics, and therefore their usage for multiple

[779] On the legal status of the principle of permanent sovereignty, see: *Case Concerning Armed Activities on the Territory of the Congo (The Democratic Republic of the Congo v. Uganda)* (Judgment) [2005] ICJ Reports 168. 251, para 244; S Hobe, 'Evolution of the Principle on Permanent Sovereignty Over Natural Resources: From Soft Law to a Customary Law Principle?' in M Bungenberg and S Hobe (eds) *Permanent Sovereignty over Natural Resources* (Springer International Publishing Switzerland 2015) 12; On the legal status of the no-harm rule, see: *Arbitration regarding the Iron Rhine Railway (Belgium v The Netherlands)* (Award) [2005] PCA Case No 2003-02. 29, para 59*; Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)* (Judgment) [2010] ICJ Reports 2010. 45, para 101.

[780] G James, 'The Plastics Landscape: Regulations, Policies and Influencers' (UNPRI 2019) 7.

purposes is also lawful.[781] Also activities relating to treatment of plastics wastes remain within the discretion of States as a matter falling under the State sovereignty.[782]

However, these lawful activities are subject to two conditions, which take into account their international and environmental aspects, and bring them within the scope of the law of State responsibility. First, they must not cause transboundary damage. This first condition is an expression of the no-harm rule, and an inherently international condition, as it forms part of international customary law. Second, activities have to be conducted according to national environmental policies. The second condition is national, though it also has an international dimension as national environmental policies are vehicles to implement the international obligations applicable to plastics leakage prevention. Part II analyzed these obligations; the no-harm rule to prevent transboundary harm, the general obligations in Articles 192 and 194(2) of the LOSC, the obligations concerning land-based sources of pollution in Article 207 of the LOSC, and the prohibitions to discharge plastics in the oceans from vessels (the MARPOL Annex V) or by dumping (the London Convention and Protocol).

A breach of due diligence regarding prevention would be enough to invoke State responsibility. Aside from a clear prohibition to dump plastics or discard plastics from vessels, all primary obligations regarding marine plastics pollution are obligations of due diligence. Adoption and enforcement of national environmental policies and legislation are of interest when investigating whether a State has complied with its due diligence obligation of prevention and protection of the marine environment from marine plastics pollution. Investigation of such breach would require a complex analysis of the State of origin's internationally binding commitments as well as its national environmental policies and their enforcement practices. This would determine whether it complied with its due diligence obligations to prevent transboundary harm from marine plastics pollution.

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781 However, on a national and regional level States have established regulations targeting certain aspects of plastic production and consumption, such as bans on microbeads used in cosmetic production and bans on consumption of plastic bags and other single-use plastic items. See, UN Environment, 'Legal Limits on Single-Use Plastics and Microplastics: A Global Review of National Laws and Regulations' (UN Environment 2018). These regulations are part of States' 'environmental policies' as referred to in the Article 193 of the LOSC and Principle 21 of the Stockholm Declaration; For a review of different purposes of using plastics, see eg, AL Andrady and MA Neal, 'Applications and Societal Benefits of Plastics' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences.

782 N Simon and ML Schulte, 'Stopping Global Plastic Pollution: The Case for an International Convention' (adelphi 2017) 43 Heinrich Böll Stiftung Publication Series Ecology. 34.

7.2.2.2 Environmental Harm/Damage, the Threshold of Harm and Causality

The concept of pollution is not interchangeable with environmental damage/harm.[783] The element of harm resulting from marine plastics pollution, for which State responsibility can be invoked, is not necessary to establish a breach. That depends on the primary obligation.

In case of a breach of the prohibition to discard plastics under the MARPOL Annex V or the London Convention or Protocol, the element of harm is not necessary, as the prohibition is absolute and the act of discarding plastics is in itself a violation of the instrument. Article 194 of the LOSC does not refer to damage as an element of the obligation,[784] as its focus is not on responsibility and liability but prevention.[785] However, in practice, such a claim would be based on a wider legal basis than just the LOSC, and would inevitably include the customary no-harm rule, which would bring about considerations of an element of harm.

Article 2 of the ARSIWA defines 'harm' as "harm caused to persons, property or environment". The contemporary concept of harm includes the intrinsic value of the environment.[786] The harm that marine plastics pollution causes can be categorized in multiple ways, e.g., ecological impacts (entanglement, ingestion, population level impacts, habitat damage, rafting), social impacts (human health, food safety, the spread of disease, chemical exposure, risk from injury/death), loss of intrinsic value, and impacts on maritime economic sectors (fisheries and aquaculture, tourism, commercial shipping).[787] These impacts would thus fall within the definition of 'harm' in the ARSIWA.

Though the effects of plastics pollution are currently well established in literature on a general level, it is a very challenging task to identify exactly the harm plastics pollution has caused to an individual State. Some impacts are easier to spot and calculate, such as injuries or deaths of marine life by entanglement, or injuries or deaths of humans related to navigation hazards caused by floating plastic items. In places, where plastics tend to wash up on the coasts repeatedly, loss of intrinsic value of the environment, habitat damage, impact on tourism, or ingestion by animals can be relatively easy to identify by visual observations. However, much of the harm that plastics cause cannot be easily observed or measured, but require complex scientific studies. Furthermore, the impacts can be

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783 P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 741.
784 D Czybulka, 'Article 194: Measures to Prevent, Reduce and Control Pollution of the Marine Environment' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017) 1299.
785 AE Boyle, 'Marine Pollution under the Law of the Sea Convention' (1995) 79 The American Journal of Law 2. 357.
786 M Fitzmaurice, International Responsibility and Liability in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008) 1014.
787 UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 88-110.

cumulative and thus require studies over longer periods. These impacts would include, for example, population level fluctuations, and human health, food safety, or chemical exposure effects.

However, a careful gathering of evidence regarding these adverse (and transboundary) effects of MPP could provide the injured State with the possibility of establishing an element of harm. An injured State could place most weight on those impacts which are easier to identify, and combine these with traces of more cumulative and long-term impacts, calling for a precautionary approach to assessing such evidence. However, as Boyle notes, "contemporary adoption of the precautionary principle cannot mask the obvious legal difficulties likely to confront many potential claims for environmental damage in international law."[788]

Invoking State responsibility based on the no-harm rule in the case of existing MPP triggers investigation of adverse transboundary effects that are above a certain threshold. If a State can successfully establish that harm originating from MPP occurred, the next issue is whether the harm is "wrongful". The threshold of harm is "the level at which transboundary harm becomes impermissible or in the terminology of the law of State responsibility, 'wrongful'".[789] However, to establish an appropriate threshold essentially depends on the facts of each case, and can be practically challenging.[790]

International treaty law and customary law have established a far-reaching consensus that the threshold is "serious environmental damage", and it "covers the emission of substances or particles to such a high degree in which it may become a danger to the health of human beings, the living resources, the ecosystem, as well as the use of environment."[791] Moreover, State practice, decisions of international courts and tribunals and scholarly literature provide guidance for determining the threshold more precisely. The general understanding from these suggests that environmental damage must be "significant", or at least "substantial".[792] Principle 21 of the Stockholm Declaration and Principle 2 of the Rio Declaration do not define a threshold of harm. The first case on the prevention of transboundary harm, the *Trail Smelter Arbitration*, defined the threshold as "serious".[793] The same

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788 AE Boyle, 'Remedying Harm to International Common Spaces and Resources: Compensation and Other Approaches' in P Wetterstein (ed) *Harm to the Environment: the Right to Compensation and the Assessment of Damages* (Oxford University Press 1997) 92.
789 M Fitzmaurice, International Responsibility and Liability in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008).1015.
790 P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 744.
791 R Wolfrum, 'Purposes and Principles of International Environmental Law' (1990) 33 German Yearbook of International Law. 311.
792 P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 743.
793 *Trail Smelter Arbitration (United States v Canada)* (Award of 11 March 1941) III UNRIAA. 1965.

basic premise was repeated in *The Corfu Channel Case*.[794] In the *Lake Lanoux Arbitration*, the Tribunal also referred to "serious" harm.[795] However, in the *Pulp Mills Case* the threshold fell from "serious consequences" to "significant damage".[796] No exact criteria exist under international law to make an evaluation of the seriousness or significance of harm. Examples of what could be used in the evaluation are the respective state of development of technically advanced facilities, the usual degree of pollution, the prior degree of pollution in the area, and restrictions in using the polluted area.[797]

In the *Case Concerning Certain Phosphate Lands in Nauru*, the government of Nauru used irreversibility as part of its arguments regarding the threshold of harm:

> The principle of general international law that a State which is responsible for the administration of territory is under an obligation not to bring about changes in the condition of the territory which will cause *irreparable damage* to, or substantially prejudice, the existing or contingent legal interest of another State in respect of that territory.[798]

The irreversibility of plastics pollution in the marine environment should be accounted for in the evaluation of the threshold of harm. Plastics do not biodegrade but merely fragment into smaller and smaller pieces in the marine environment and become micro- and nanoplastics, which absorb chemicals from the surrounding sea water and may end up in the food chain via ingestion by marine life.[799] The longevity of plastics remains unknown, and estimates vary from hundreds to thousands of years.[800] The cumulative, harmful effects of plastics in the marine environment are irreversible.

However, even if the injured State could establish an element of harm and prove that such harm was serious or significant, the issue of causality remains. In the case of MPP, the question of causality is perhaps the most difficult to establish:

> …all States cause plastics pollution and it will be extremely difficult to show a chain of causation from a specific harm back to plastics pollution from a single State. This makes it very hard to hold any State to account through the laws of State responsibility.[801]

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794 M Fitzmaurice, 'International Responsibility and Liability' in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008) 1013; *The Corfu Channel Case (UK v Albania)* (Merits) [1949] ICJ Reports 1949. 23.
795 *Lake Lanoux Arbitration (France v Spain)* (Award) [1957] 12 RIAA 281. 22, para 9.
796 *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)* (Judgment) [2010] ICJ Reports 2010. 45-46, para 101.
797 R Wolfrum, 'Purposes and Principles of International Environmental Law' (1990) 33 German Yearbook of International Law. 311.
798 *Case Concerning Certain Phosphate Lands in Nauru (Nauru v Australia)* (Preliminary Objections: Judgment) [1992] ICJ Reports 240. 244. (Cursive is mine.)
799 GESAMP, 'Sources, Fate and Effects of Microplastics in the Environment: A Global Assessment' (IMO 2015) 90 Reports and Studies. 18; CM Rochman, 'The Complex Mixture, Fate and Toxicity of Chemicals Associated with Plastic Debris in the Marine Environment' in M Bergmann et al. (eds) *Anthropogenic Marine Litter* (Springer 2015) 117.
800 DKA Barnes et al., 'Accumulation and Fragmentation of Plastic Debris in Global Environments' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences. 1993.
801 EA Kirk and N Popattanachai 'Marine Plastics: Fragmentation, Effectiveness and Legitimacy in International Lawmaking' (2018) 27 Review of European, Comparative and International Environmental Law 3. 223-224.

Local wind and current conditions, coastline geography and urban areas, and trade routes affect the distribution of plastics in the marine environment.[802] Particularly due to ocean currents, plastics can travel far from where they first leaked into the oceans. To establish causality between an injured State and the State of origin would require that such patterns be identified and traced with sufficient certainty to establish a causal relationship with the sources of plastics and the occurring transboundary harm. However, once plastics have leaked into the oceans, it is currently extremely difficult to identify their ultimate sources.[803] Though scientific modeling in this field is used, these efforts remain exactly that – models – rather than exact evidence of how plastics are dispersed in the oceans.[804] At best, scientific modeling could be used as guidance with a request to assess such evidence with the precautionary approach in mind.

Currently, establishing causality remains the biggest challenge, as it requires data that does not yet exist. However, the development of technologies can provide assistance in this regard in the future. For example, the ESA's project on assessing possibilities for direct optical measurement of MPP from satellites is interesting in this regard.[805] Such monitoring would provide actual measurements and important data for States dealing with transboundary environmental harm caused by plastics, both within and beyond areas of national jurisdiction. Scientific developments in MPP research should thus be kept in mind when considering the applicability of State responsibility to the problem, as the most challenging issues regarding evaluation of harm, the threshold of harm, and causality may be possible to overcome in time.

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802 DKA Barnes et al., 'Accumulation and Fragmentation of Plastic Debris in Global Environments' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences. 1988.

803 F Thevenon et al., 'Plastic Debris in the Ocean: The Characterization of Marine Plastics and their Environmental Impacts' (IUCN 2014) Situation Analysis Report. 14.

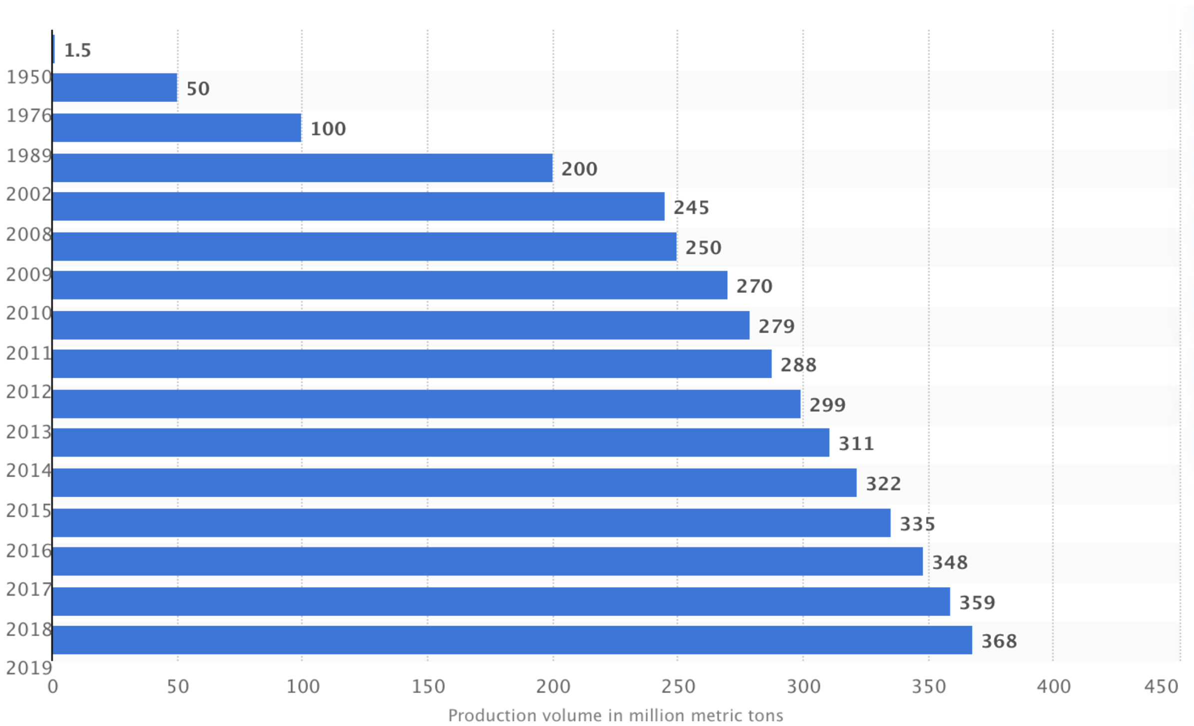
804 See eg, BD Harvesty et al. 'Using Numerical Model Simulations to Improve the Understanding of Micro-Plastic Distribution and Pathways in the Marine Environment' (2017) 4 Marine Pollution: Frontiers in Marine Science; JR Jambeck et al. 'Plastic Waste Inputs from Land into the Ocean' (2015) 347 Science 6223; TOPIOS, 'Tracking of Plastic in Our Oceans' http://topios.org/index.html (A research project led by Erik van Sebille)

805 ESA, 'ESA Investigating Detection of Floating Plastic Litter from Orbit' (19 March 2018) https://www.esa.int/Enabling_Support/Preparing_for_the_Future/Discovery_and_Preparation/ESA_investigating_detection_of_floating_plastic_litter_from_orbit; Through its Open Space Innovation Platform (OSIP), ESA has brought together 26 projects working on monitoring marine plastics pollution from space. ESA, 'A Step Forward in Detecting Plastic Marine Litter from Space' (1 July 2020) https://www.esa.int/Enabling_Support/Preparing_for_the_Future/Discovery_and_Preparation/A_step_forward_in_detecting_plastic_marine_litter_from_space

7.2.2.3 Historic Marine Plastics Pollution as a Stumbling Block for Applying State Responsibility?

Plastics have accumulated in the marine environment since extensive production started after World War II but without the world at large noticing the severity of the situation until the 1990s.[806] The durability, invisibility and accumulation of plastics in the oceans enabled the problem to go unnoticed for decades. This raises the question: "could states be held responsible for environmental damage that in part occurred in the past and before the issues in question had become subject matter of legal regulation?"[807] Article 13 of the ARSIWA clearly states that "an act of a State does not constitute a breach of an international obligation unless the State is bound by the obligation in question at the time the act occurs."

The leakage of plastics to the marine environment has occurred ever since widespread production started after 1945. However, during the first post-war decades, as the figure below shows, production rates remained modest.



[806] See, CJ Moore et al., 'A Comparison of Plastic and Plankton in the North Pacific Central Gyre' (2001) 21 Marine Pollution Bulletin 12.
[807] P Okowa, 'Responsibility for Environmental Damage' in M Fitzmaurice et al. (eds) *The Research Handbook on International Environmental Law* (Edward Elgar Publishing 2010) 303.

Fig. 12 Global Plastics Production 1950-2019.[808]

During the time that the no-harm rule and the duty to protect the marine environment developed into customary international law in the aftermath of the Stockholm Conference (1972), accumulation of historic marine pollution remained low due to the amount of plastic materials available. Because of the short history of plastic materials, historic MPP before the existence of environmental obligations applicable to it does not play a considerable role in this study.

7.2.2.4 CUMULATIVE MARINE PLASTIC POLLUTION – A COMPOSITE ACT?

Though historic marine plastic pollution does not loom large, the cumulative nature of the MPP problem does represent an interesting option to consider. Article 15 of the ARSIWA provides that:

> the breach of an international obligation by a state through a series of actions or omissions defined in aggregate as wrongful occurs when the action or omission occurs which, taken with the other actions or omissions, is sufficient to constitute a wrongful act[.][809]

The ILC makes a distinction between composite obligations and simple obligations breached by a composite act.[810] A composite obligation implies that the obligation itself has a cumulative character and the responsible entity has adopted a systemic policy or practice.[811] An illustrative example of a composite obligation is the prohibition of genocide.[812] A simple obligation can also be breached by continuing breaches, composite acts, but the "position is different, however, where the obligation itself is defined in terms of the cumulative character of the conduct, i.e. where the cumulative conduct constitutes the essence of the wrongful act."[813]

Cumulative pollution, such as MPP, can reach an impermissible level only after a series of individual polluting acts under current international law. However, the obligations of prevention in this context are not as such defined as "a series of acts or omissions defined in aggregate as wrongful".[814] It is clear that original objective of Article 15 is not to cover cumulative pollution. The ILC does not make any reference to the environment in its commentary on Article 15 and thus generally seems to consider

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[808] Statista, 'Global Plastics Production 1950-2019' https://www.statista.com/statistics/282732/global-production-of-plastics-since-1950/. This statistic includes thermoplastics, polyurethanes, thermosets, elastomers, adhesives, coatings and sealants, and polypropylene-fibers. Does not include PET-, PA-, PP- and polyacryl-fibers.
[809] ILC, 'Report of the International Law Commission on the Work of Its Fifty-Third Session' (23 April – 1 June and 2 July -10 August 2001) UN Doc A/56/10. 27.
[810] ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two) 62, para 4.
[811] *Ibid.* 62, para 3.
[812] *Ibid.*
[813] *Ibid.* 63, para 4.
[814] Art 15(1), the ARSIWA. ILC, 'Report of the International Law Commission on the Work of Its Fifty-Third Session' (23 April – 1 June and 2 July -10 August 2001) UN Doc A/56/10. 27.

polluting as continuing breaches, not as a composite act within the meaning of Article 15. However, Nollkaemper and Faure have discussed what constitutes a composite act in an environmental context:

> …one might argue that the emission of carbon dioxide and resultant climate change is a "composite act" that only becomes wrongful after a long series of emissions. The wrongful act occurs when the emissions occur. In the case of climate change it will be impossible to pinpoint that moment, but the effect will be that past emissions will only be subjected to a responsibility regime at the date when they become cumulatively wrongful.[815]

Similarly, MPP can only become subject to the responsibility regime after it has become cumulatively wrongful. As Boyle notes, "it is too often forgotten that much of environmental damage is cumulative, takes place over long periods of time, and in circumstances where few of those involved could realistically have foreseen the consequences".[816] So far, this study has discussed the issue of cumulativeness in relation to the threshold of harm implied by no-harm rule, and found it a challenging question. Such challenges show that historically neither environmental obligations relating to pollution nor the law of State responsibility were developed to tackle cumulative pollution, and therefore the obligations are not formulated in the sense of "series of acts or omissions defined in aggregate as wrongful", and the ILC has not discussed cumulative pollution as a composite act.

The breach of an international obligation can occur either by an act or by an omission. If a state does not exercise its due diligence vigilantly regarding its prevention obligations, the deduction is that a breach occurs due to omissions rather than acts. In the case of cumulative MPP, this essentially signifies a series of omissions by a State in exercising due diligence over private actors. Article 15 also covers the situation of a series of omissions. As the ILC does not provide an exhaustive list of composite obligations, it is possible to add an environmental dimension to the application of Article 15. However, this would require that the primary obligation incorporates an element that such obligation could be considered as a composite obligation.

Currently, no such obligation regarding MPP exists. Yet, in the midst of talks about a possible new treaty tackling the MPP problem, it is worth considering the formulation of primary obligations that includes a composite element, as this would then open the door for applying Article 15 in cases of breaches resulting in cumulative pollution. However, the complications of this approach would include the difficulty of differentiating between historic and new marine plastic pollution, as well as the need to establish some threshold of wrongful cumulativeness. Yet, it could be a way forward in

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[815] MG Faure and A Nollkaemper, 'International Liability as an Instrument to Prevent and Compensate for Climate Change' (2007) 26 Stanford Environmental Law Journal. 171-172.
[816] AE Boyle, 'Remedying Harm to International Common Spaces and Resources: Compensation and Other Approaches' in P Wetterstein (ed) *Harm to the Environment: The Right to Compensation and the Assessment of Damages* (Oxford University Press 1997) 91-92.

developing the law of State responsibility to better tackle cumulative pollution, as well as refining existing means to deal with breaches of environmental obligations instead of developing a new accountability mechanism.

7.2.3 The Issue of Remedies

International law regarding remedies for breaches has not developed in parallel with the expansion of international legal duties to protect the environment.[817] Yet, the obligation to make reparation in a case of a breach of a primary obligation is a well-established principle of general international law. The PCIJ and the ICJ have confirmed this obligation to make reparation in the *Case Concerning the Factory at Chorzów* and in the *Case Concerning the Gabcikovo-Nagymaros Project*.[818] The available remedies that the ARSIWA provides are cessation, assurances and guarantees of non-repetition, and reparation. Reparation can be in the form of restitution, compensation and/or satisfaction. The available remedies vary depending on whether a directly injured State or a not directly injured state invoke State responsibility. Though the Draft Articles on Allocation of Loss apply explicitly also to environmental harm, the ILC has made no attempt to develop forms of reparation specifically adapted to environmental damage.[819]

In the context of MPP, it is worth taking a look first at what is actually possible to remedy. Cleaning up micro- or nanoplastics is not physically possible due to their size and invisibility in the marine environment. Similarly, this study finds no references to any efforts which have been taken or could be taken to decontaminate sea water from the chemicals originating from plastics. Floating (macro)plastics have the benefit of being more visible but cleaning up even floating (macro)plastics is difficult over a large scale in the oceans. However, when (macro)plastics wash up on coastal areas, clean-up efforts are more feasible.[820] Cleaning up sunken plastics over a wide area is not possible. Such work requires expensive submarine equipment in the greater depths, or the manual labor of divers and water depths within the reach of divers.

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817 AE Boyle, 'Reparation for Environmental Damage in International Law: Some Preliminary Problems' in M Bowman and AE Boyle (eds) *Environmental Damage in International and Comparative Law: Problems of Definition and Valuation* (Oxford University Press 2002) 25.
818 *The Case Concerning the Factory at Chorzów (Germany v Poland)* (Judgment) [1927] PCIJ Series A No 9. 21; *Case Concerning the Gabcikovo-Nagymaros Project (Hungary v Slovakia)* (Judgment) [1997] ICJ Reports 1997. 81, para 152.
819 AE Boyle, 'Reparation for Environmental Damage in International Law: Some Preliminary Problems' in M Bowman and AE Boyle (eds) *Environmental Damage in International and Comparative Law: Problems of Definition and Valuation* (Oxford University Press 2002) 22.
820 Citizens around the world engage in voluntary cleanups, one of the biggest of which is Ocean Conservancy's annual International Coastal Cleanup, which in 2019 gathered over one million volunteers, who picked up 23 million pounds of trash. See, Ocean Conservancy and International Coastal Cleanup, 'The Beach and Beyond: 2019 Report' (Ocean Conservancy and International Coastal Cleanup 2019). Additionally, The Ocean Cleanup is known for its efforts to build technology that could clean up trash from the ocean gyres. For more information, see https://theoceancleanup.com/

The only scenario, where cleanup efforts of floating or sunken macroplastics are viable, and thus restitution would be possible to claim, would be in the case of cleaning up shores and the seafloor within national jurisdiction. Furthermore, as the prevention obligations regarding plastics leakage are of a due diligence character and the activities are lawful under international law, it is also questionable whether cessation and assurances and guarantees of non-repetition could be claimed and awarded. However, in the case of absolute prohibitions of dumping plastics or the discharge of plastics wastes from vessels, these could be possible.

A directly injured State is entitled to resort to all means of redress under the ARSIWA, whereas a not-directly injured State is entitled to only part of them. This is because of the requirement pursuant to Article 48(2)(b) that "performance of the obligation of reparation" must be "in the interest of the injured State or of the beneficiaries of the obligation breached". If a not-directly injured state makes a claim to seek reparation on behalf of the international community in relation to the marine environment, it is debatable whether such a State is the beneficiary. In the case of MPP in the high seas and the Area where large-scale cleanup efforts are not viable and there are no activities to cease, the remaining remedies would be compensation or satisfaction. However, if a not-directly injured State cannot be a beneficiary, it would not be entitled to receive compensation, but merely satisfaction in the form of a declaratory judgment.[821]

Therefore, taking into account the realities and restrictions listed above, the remedy that would be available to all States in all situations of a breach would be satisfaction. Though such acknowledgement of a breach would not do any good for the oceans *per se*, it could be significant in clarifying States' obligations regarding prevention of plastics leakage, and providing valuable guidance when evaluating issues such as the threshold of harm or causality with cumulative pollution.

In situations where there is an injured State, the possible remedies would also be restitution and compensation. However, even when MPP has caused adverse effects, defining and evaluating ecological harm remains a complex and controversial matter,[822] which requires, for example, using special non-market evaluation techniques.[823] Assessing damage that MPP causes in monetary terms

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821 AE Boyle, 'Remedying Harm to International Common Spaces and Resources: Compensation and Other Approaches' in P Wetterstein (ed) *Harm to the Environment: The Right to Compensation and the Assessment of Damages* (Oxford University Press 1997) 94.

822 M Fitzmaurice, 'International Responsibility and Liability' in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008) 1015.

823 N Hanley, 'The Economic Value of Environmental Damage' in M Bowman and AE Boyle (eds) *Environmental Damage in International and Comparative Law: Problems of Definition and Valuation* (Oxford University Press 2002) 39.

has been done on a general level.[824] These assessments could provide valuable guidance regarding compensation when considering "financially assessable damage".[825]

7.2.4 Invocation of State Responsibility

7.2.4.1 Injured State

The concept of an injured state is central to the invocation of State responsibility:[826]

> A State is entitled as an injured State to invoke the responsibility of another State if the obligation breached is owed to:
>
> (a) that State individually; or
>
> (b) a group of States including that State, or the international community as a whole,
>
> and the breach of the obligation:
>
> (i) specially affects that State; or
>
> ii) is of such a character as radically to change the position of all the other States to which the obligation is owed with respect to the further performance of the obligation.[827]

With regard to MPP, the most likely situations would be to invoke responsibility under subparagraph 42(a), or 42(b) and 42(i). In these situations, the harm or damage MPP has caused would appear within maritime zones that the injured coastal State has sovereignty over or where it exercises sovereign rights. Pursuant to Article 42(a), the expression "individually" signifies that the performance of the obligation was owed to the injured State.[828] In the case of transboundary MPP, this obligation derives from a multilateral or regional treaty, or a rule of customary international law – namely the no-harm principle. High volumes of plastics are found in coastal waters especially in regions with high coastal populations with inadequate waste collection and management, intensive fisheries and high levels of coastal tourism.[829] In such situations, due to the durability and buoyancy of plastics, they can spread to neighboring states' coastal waters and cause transboundary harm.

As an example of a situation under Article 42(b) and 42(i) relating to the expression "specially affected", the ILC describes that "a case of pollution of the high seas in breach of article 194 of the

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824 See, UNEP, 'Valuing Plastics: The Business Case for Measuring, Managing and Disclosing Plastic Use in the Consumer Goods Industry' (UNEP 2014).
825 Art 3, ILC, 'Report of the International Law Commission on the Work of Its Fifty-Third Session' (23 April – 1 June and 2 July -10 August 2001) UN Doc A/56/10. 26.
826 ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two) 116, para 2.
827 Art, 42, ILC, 'Report of the International Law Commission on the Work of Its Fifty-Third Session' (23 April – 1 June and 2 July -10 August 2001) UN Doc A/56/10. 29.
828 ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two) UN Doc A/56/10. 118, para 6.
829 UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) xviii.

United Nations Convention on the Law of the Sea may particularly impact on one or several States whose beaches may be polluted by toxic residues…In that case, independently of any general interest of the State parties to the Convention in the preservation of the marine environment, those coastal State parties should be considered as injured by the breach."[830] This is a relevant situation also regarding plastics, because they are unevenly dispersed in the oceans, and MPP can move from the high seas to other maritime zones, thus making some States more affected than others and potentially qualifying as "specially affected".

It is possible that the same internationally wrongful act injures several States separately.[831] Also it is possible that several States are separately responsible for the same internationally wrongful act.[832] An injured State can make a claim against the violating States(s) through diplomatic action, international mechanisms when available regarding the subject matter, or international tribunals/courts given that jurisdiction exists.[833]

7.2.4.2 Non-Injured State

Under international law, some unclarity remains as to which entity, if any, is entitled to claim for harm to areas beyond national jurisdiction.[834] Such harm to the global commons refers to situations where no injured State exists and damage concerns the environment *per se*.[835] With regard to marine plastics pollution, this would refer to harm caused by MPP in the high seas and/or the Area. Without an injured State, the question of invoking State responsibility is determined by Article 48(1)(b) of the ARSIWA:

> 1. Any State other than an injured State is entitled to invoke the responsibility of another State in accordance with paragraph 2 if:
>
> (b) the obligation breached is owed to the international community as a whole.

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[830] ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two) UN Doc A/56/10. 119, para 12.
[831] Art. 46, ILC, 'Report of the International Law Commission on the Work of Its Fifty-Third Session' (23 April – 1 June and 2 July -10 August 2001) UN Doc A/56/10. 29.
[832] *Ibid.* Art 47.; This study does not investigate the possibility of shared responsibility for marine plastics pollution further as Part III delimits investigation to whether the basic elements of the law of State responsibility can apply to harm from marine plastics pollution, that is, the issues relating to standing, a breach of an obligation and remedies. For further information on shared responsibility, see A Noellkaemper and I Plakokefalos (eds) *The Practice of Shared Responsibility in International Law* (Cambridge University Press 2017).
[833] MN Shaw*, International Law* (7th edition, Cambridge University Press 2014) 618.
[834] M Fitzmaurice, International Responsibility and Liability in D Bodansky et al (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008). 1015; See also, H Xue, *Transboundary Damage in International Law* (Cambridge University Press 2003) 236-237.
[835] H Xue, *Transboundary Damage in International Law* (Cambridge University Press 2003) 237.

With Article 48, the ILC intends to give effect to the statement of the ICJ in the *Barcelona Traction* case,[836] which provided that "in view of the importance of the rights involved, all States can be held to have a legal interest in their protection; they are obligations *erga omnes*."[837] The ILC does not refer to term *erga omnes*, but merely notes that "the obligations in question are by definition collective obligations protecting the international community". [838] The question then arises of whether protecting the marine environment beyond national jurisdiction could be an obligation owed to the international community as a whole, i.e., an obligation of *erga omnes*? Consequently, could a not-directly injured State have a right to bring a claim on behalf of the international community for a breach of such *erga omnes* obligation?

The ILC commentary does not provide a list of what it considers obligations falling to the category under Article 48(1)(b). However, it does provide examples of obligations which can simultaneously protect interests of individual States and the international community as a whole. One of these is protection of the marine environment, indicating that environmental matters fall within the scope.[839] Some scholars have argued that the duty to protect the marine environment (both within and beyond national jurisdiction) is an *erga omnes* obligation.[840] However, though States generally accept the concept of *erga omnes* obligations, and their duty to protect the world environment, they do not necessarily agree on the content of these responsibilities.[841]

The characterization of issues as 'the common concern of humankind' is important when considering their potential to be viewed as *erga omnes* obligations, because "it places them on the international agenda and declares them to be a legitimate object of international regulation and supervision". For example, the international community considers climate change and biological diversity as common concerns of humankind.[842] It has been suggested, both by UN Environment and in academic

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836 ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two) 127, para 8.

837 *Case Concerning the Barcelona Traction, Light and Power Company, Limited (Belgium v Spain)* (Judgment) [1970] ICJ Reports 3. 32, para 33.

838 ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two) 127, para 10.

839 *Ibid.*; Also Boyle, though hesitantly, considers that protection of the environment could be seen as an *erga omnes* obligation, based on an earlier draft of the ILC's Draft Articles. See, AE Boyle, 'Remedying Harm to International Common Spaces and Resources: Compensation and Other Approaches' in P Wetterstein (ed) *Harm to the Environment: The Right to Compensation and the Assessment of Damages* (Oxford University Press 1997) 94.

840 See, P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009) 234; D Czybulka, 'Article 192 General Obligation' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017) 1285.

841 H Xue, *Transboundary Damage in International Law* (Cambridge University Press 2003) 246.

842 P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009) 131; On the link between 'common concern' and *erga omnes*, see also D Shelton, 'Common Concern of Humanity' (2009) 39 Environmental Policy and Law 2. 83, 86.

literature, that MPP should be seen as a common concern of humankind due to its far-reaching environmental, social and economic impacts.[843]

Article 192 of the LOSC and the no-harm rule provide a strong customary law basis to protect the marine environment as a whole, and the ILC seems to accept protection of the marine environment as one example of an *erga omnes* obligation. Yet, to specifically highlight protection of the marine environment from MPP and invoke State responsibility under Article 48(1)(b) for this purpose, it would be beneficial if MPP was declared 'a common concern of humankind', for example, in the form of a declaration by UNGA or UNEA. This would provide a stronger link between MPP and *erga omnes* obligations.[844] Though *erga omnes* obligations can open the door for invoking State responsibility regarding marine environment in areas beyond national jurisdiction, the objective is still to hold individual State(s) accountable. Therefore, such claim faces similar issues regarding harm, the threshold of harm and causality, as does a claim by a directly injured State. Furthermore, in addition to establishing a right to invoke State responsibility on behalf of the international community for a breach of an *erga omnes* obligation, a non-injured State has to "satisfy the rules of standing of the relevant international court or tribunal."[845]

7.3 International Liability and Marine Plastics Pollution

7.3.1 Introduction

If a State has not committed a wrongful act, it cannot be held liable for transboundary environmental damage under the law of State responsibility.[846] In the light of situations where lawful activities nevertheless cause transboundary environmental harm or damage and a State has not breached its primary obligations, the ILC identified a separate topic of international liability during the course of its work on State responsibility.[847] International liability does not presuppose a breach of an international obligation, and is thus not based on fault.[848] Broadly speaking, "liability is a part of a regime seeking to regulate certain socially useful but hazardous activities so that they continue being

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843 See, UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) x, xii; BK Sidhu and BH Desai, 'Plastics Pollution: A New Common Concern of Humankind?' (2018) 48 Environmental Policy and Law 5. 254.
844 See, AE Boyle, 'Remedying Harm to International Common Spaces and Resources: Compensation and Other Approaches' in P Wetterstein (ed) *Harm to the Environment: the Right to Compensation and the Assessment of Damages* (Oxford University Press 1997) 94.
845 F Ahmadov, *The Right of Actio Popularis before International Courts and Tribunals* (Brill 2018) 31 Queen Mary Studies in International Law. 144.
846 RL Johnstone, *Offshore Oil and Gas Development in the Arctic under International Law: Risk and Responsibility* (Koninklijke Brill NV 2015) 247.
847 *Ibid.* 248; PS Rao, 'International Liability for Transboundary Harm' (2004) 34 Environmental Policy and Law 6. 225.
848 J Barboza, *The Environment, Risk and Liability in International Law* (Brill 2017) 6.

economically viable in spite of the damages they cause – without imposing undue burdens on victims or deteriorating the environment."[849] The primary aim of liability is to provide redress for victims and liability rules "should lead to compensation or to other forms of reparation (such as restitution) that make good for the harm inflicted".[850]

The ILC's Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities (The Draft Principles on Allocation of Loss) are the primary rules on international liability.[851] Originally they were supposed to complement the rules on State responsibility and establish principles governing both residual State liability and civil liability.[852] However, due to the choices of the ILC in its approach to these topics, which resulted in the division of the topic to Draft Articles on Prevention and Draft Principles on Allocation of Loss, residual state liability disappeared in the process.[853] The Draft Principles on Allocation of Loss established a global regime of civil liability for transboundary damage.[854] The purpose of them is twofold: to ensure prompt and adequate compensation to victims and to preserve and protect the environment in the event of transboundary damage.[855]

The Draft Principles on Allocation of Loss do not deal with controversial questions in relation to State liability in the absence of a wrongful act, but focus on expanding States' primary obligations to facilitate remedies for victims of damage.[856] The scope of them is thus primarily the liability of operators, though they recognize that, by agreement or law, other entities could be held liable.[857] However, "the basic understanding is to adopt a scheme of allocation of loss, spreading the loss among multiple actors, including, as appropriate, the State."[858] In this regard, the polluter pays

[849] *Ibid.* 3.
[850] MG Faure and A Noellkaemper, 'International Liability as an Instrument to Prevent and Compensate for Climate Change' (2007) 26 Stanford Environmental Law Journal. 139.
[851] ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out Hazardous Activities, with Commentaries' (2006) Yearbook of the international Law Commission (Vol II, Part Two) 62, para 6.
[852] P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 769.
[853] RL Johnstone, *Offshore Oil and Gas Development in the Arctic under International Law: Risk and Responsibility* (Koninklijke Brill NV 2015) 248.
[854] AE Boyle, 'Globalising Environmental Liability: The Interplay of National and International Law' (2005) 17 Journal of Environmental Law 1. 6.
[855] Principle 3, ILC, 'Report of the International Law Commission: Fifty-Eight Session' (1 May-9 June and 3 July-11 August 2006) UN Doc A/61/10. 107.
[856] RL Johnstone, *Offshore Oil and Gas Development in the Arctic under International Law: Risk and Responsibility* (Koninklijke Brill NV 2015) 248.
[857] ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out Hazardous Activities, with Commentaries' (2006) Yearbook of the international Law Commission (Vol II, Part Two) 60, para 8.
[858] *Ibid.* 60, para 9.

principle underpins the Draft Principles on Allocation of Loss and is an essential component of them.[859]

The Draft Principles on Allocation of Loss represent the progressive development of law and thus are not a codification of customary international law.[860] The ILC characterizes the legal status of the principles as "non-binding declaration of draft principles".[861] The Seabed Disputes Chamber of the ITLOS affirmed this view by stating that, though it is aware of the ILC's work on the topic, "such efforts have not yet resulted in provisions entailing State liability for lawful acts."[862] Therefore, "no specific norm of general international law imposes an obligation to compensate for transboundary damage caused by a non-prohibited hazardous activity",[863] and the general lack of acceptance will remain for as long as a significant number of States oppose such an obligation. However, the general principles of international law, such as territorial sovereignty and the sovereign equality of States support the view that obligation to compensate does exist as a principle, and though not widely applied, does explain some ex-gratia payments.[864]

7.3.2 Does Marine Plastic Pollution Fall within the Scope of the Draft Principles?

Pursuant to Principle 1 of the Draft Principles on Allocation of Loss, they "apply to transboundary damage caused by hazardous activities not prohibited by international law". The four elements it contains are that activities are not prohibited by international law, activities involve a risk of causing significant harm, the harm must be transboundary, and the harm must have physical consequences.[865]

The first requirement – that activities are not prohibited by international law – is the reality regarding the nature of activities resulting in MPP. Private entities and persons are the main actors whose conduct causes MPP, and this category includes a variety of stakeholders: raw material producers, polymer producers, plastic processors, product producers, consumers, waste and waste water

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859 *Ibid.* 61, para 2.

860 T Stephens, 'Article 235: Responsibility and Liability' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017) 1589.

861 ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out Hazardous Activities, with Commentaries' (2006) Yearbook of the international Law Commission (Vol II, Part Two) 60, para 11.

862 *Responsibilities and Obligations of States with respect to Activities in the Area* (Advisory Opinion) [2011] ITLOS Reports 2011. 66, para 209.

863 J Barboza, *The Environment, Risk and Liability in International Law* (Brill 2017) 153; See also, AE Boyle, 'Globalising Environmental Liability: The Interplay of National and International Law' (2005) 17 Journal of Environmental Law 1. 20.

864 J Barboza, *The Environment, Risk and Liability in International Law* (Brill 2017) 153-154. To support for this view, Barboza cites Judge Huber's dictum in *The Islands of Palmas Case (US v The Netherlands)* (Award) [1928] PCA Case No 1925-01. XI UNRIAA. 860; *Trail Smelter Arbitration (United States v Canada)* (Award of 11 March 1941) III UNRIAA.

865 ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out Hazardous Activities, with Commentaries' (2006) Yearbook of the international Law Commission (Vol II, Part Two) 62, para 4.

treatment managers, informal waste sector, transporters, etc.[866] As already mentioned, international law imposes no restrictions on any phases of plastic production, consumption or end-of-life treatment *per se*. Most of these activities are not even subject to transboundary EIA requirements.[867]

The second requirement is that activities involve a risk of causing significant harm. An activity can have a high probability of causing significant harm or a low probability of causing disastrous transboundary harm.[868] Originally, the ILC considered the option of listing activities and situations which would be the scope of the Draft Principles on Allocation of Loss. It abandoned the idea because the list was likely to be under-inclusive and in need of continuous review, and thus the activities within the scope of the Draft Principles are the same as those subject to the Draft Articles on Prevention:[869] "any activity which involves the risk of causing significant transboundary harm through the physical consequences".[870] This requirement is the most problematic when applied to MPP, as the application depends on the meaning of "significant harm" and how to evaluate it. Section 7.3.3 relating to the issues of damage, the threshold of damage and causality will further elaborate on these aspects.

The third requirement is that the damage has to be transboundary. This means, "the activities must be conducted in the territory or otherwise in places within the jurisdiction or control of one State and have an impact in the territory or places within the jurisdiction or control of another State."[871] The transboundary and global nature of MPP is well established.[872] However, this jurisdictional delimitation of the Draft Principles on Allocation of Loss excludes damage to the global commons.

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866 UN Environment, 'Mapping of Global Plastics Value Chain and Plastics Losses to the Environment (with a Particular Focus on Marine Environment) (2018) 10.
867 The relevant activities in the Espoo Convention are "integrated chemical installations and major storage facilities for petroleum, petrochemical and chemical products". See, Convention on Environmental Impact Assessment in a Transboundary Context (adopted 25 February 1991, entered into force 10 September 1997) 1989 UNTS 309 ('Espoo Convention') Appendix I; The relevant activities in the related Protocol are "integrated chemical installations; major storage facilities for petroleum, petrochemical and chemical products; installations for surface treatment of metals and plastic materials using an electrolytic or chemical process; manufacture and assembly of motor vehicles and manufacture of motor-vehicle engines; manufacture and treatment of elastomer-based products; waste-disposal installations (including landfill), as far as not included in annex I; Installations for the incineration or chemical treatment of non-hazardous waste; and waste-water treatment plants". See, Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context (adopted 21 May 2003, entered into force 11 July 2010) 2685 UNTS 140 ('Espoo Protocol') Annex I-II.
868 ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out Hazardous Activities, with Commentaries' (2006) Yearbook of the international Law Commission (Vol II, Part Two) 62, para 2.
869 *Ibid.*
870 ILC, 'Draft Articles on Prevention of Transboundary Harm from Hazardous Activities, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two) 149, para 1.
871 ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out Hazardous Activities, with Commentaries' (2006) Yearbook of the international Law Commission (Vol II, Part Two) 63, para 10.
872 UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 120, 121.

The ILC concluded that this issue required separate treatment due to questions concerning the sources of pollution, the techniques for evaluating the damage, the standing to claims and the identification of the liable respondent. Therefore, it decided that damage to the global commons did not fit the topic of international liability.[873]

Consequently, the Draft Principles on Allocation of Loss only apply to such transboundary MPP, which causes damage in the maritime zones other than the high seas and the Area. This excludes *inter alia* the five gyres in the high seas, which collect MPP in their midst in the North Pacific Ocean, the South Pacific Ocean, the North Atlantic Ocean, the South Atlantic Ocean and the Indian Ocean.[874] Also, the delimitation excludes the Area. Research on debris possibly located on the deeper seabed, which forms about half the planet's surface, is restricted due to difficulties in collecting sampling data and costs of research.[875] However, plastics have been found on the seabed of all seas and oceans,[876] and research has shown support for a "hypothesis that the ultimate fate of buoyant microplastics is not at the ocean surface".[877] Therefore, excluding the global commons represents a significant gap in international liability in the context of damage from MPP.

The fourth requirement is that the harm has to have physical consequences. The harm that marine plastic pollution causes can be categorized in multiple ways, e.g., ecological impacts (entanglement, ingestion, population level impacts, habitat damage, rafting), social impacts (human health, food safety, the spread of disease, chemical exposure), loss of intrinsic value of the environment, and impacts on maritime economic sectors (fisheries and aquaculture, tourism, commercial shipping).[878] All these are physical consequences of the presence of plastics pollution in the marine environment.

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873 PS Rao, 'International Liability for Transboundary Harm' (2004) 34 Environmental Policy and Law. 227.
874 A Cózar et al., 'Plastic Debris in the Open Ocean' (2014) 111 Proceedings of the National Academy of Sciences of the United States of America 28. 10240-41.
875 DKA Barnes et al., 'Accumulation and Fragmentation of Plastic Debris in Global Environments' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences. 1990. Though research on this is scarce, few studies that have found plastics beyond the continental shelf, see eg, F Galgani et al. 'Litter on the Sea Floor along European Coasts' (2000) 40 Marine Pollution Bulletin 6.; F Galgani and F Lecornu 'Debris on the sea floor at "Hausgarten"' (2004) in M Klages and J Thiede, The Expedition ARK XIX/3 of the Research Vessel POLARSTERN in 2003: Reports of Legs 3a, 3b, and 3c. 488 Reports on Polar and Marine Research. 260-262.
876 For specific scientific studies on this, see eg, F Galgani et al. 'Distribution and Abundance of Debris on the Continental Shelf of the North-Western Mediterranean Sea' (1995) 30 Marine Pollution Bulletin 11; D Lee et al. 'Distribution Characteristics of Marine Litter on the Seabed of East China Sea and the South Sea of Korea' (2006) 70 Estuarine, Coastal and Shelf Science 1; A Koutsodendris et al. 'Benthic Marine Litter in Four Gulfs in Greece, Eastern Mediterranean; Abundance, Composition and Source Identification' (2008) 77 Estuarine, Coastal and Shelf Science 3.
877 M Eriksen et al., 'Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea' (2014) 9 PLoS ONE 12. 10-11; See also, A Cózar et al., 'Plastic Debris in the Open Ocean' (2014) 11 Proceedings of the National Academy of Sciences of the United States of America 28. 10243.
878 UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 88-110.

7.3.3 Issues of Damage, The Threshold of Damage and Causality

The Draft Principles on Allocation of Loss define damage as "significant damage caused to persons, property or the environment". These include: loss of life or personal injury; loss of, or damage to property; loss or damage by impairment of the environment; the costs of reasonable measures of reinstating property, or the environment, including natural resources; and the costs of reasonable response measures.[879] The 'environment' is defined to include "natural resources, both abiotic and biotic, such as air, water, soil, fauna and flora and the interaction between the same factors; and the characteristic aspects of the landscape".[880] Damage from MPP and marine environment as part of the definition of the environment falls within the scope of these definitions and thus can be subject to the Draft Principles on Allocation of Loss.

In liability regimes, a vast consensus presides over tolerating harm to some extent.[881] Therefore, and in a similar fashion to State responsibility, fixing a threshold of harm is also relevant for liability.[882] According to the Draft Principles, this threshold is "significant damage":

> The term 'significant' is understood to refer to something more than 'detectable' but need not be at the level of 'serious' or 'substantial'. The harm must lead to a real detrimental effect on matters such as, for example, human health, industry, property, environment or agriculture in other States. Such detrimental effects must be susceptible of being measured by factual and objective standards.[883]

The threshold is thus the same as with the no-harm rule – "significant" – but the Draft Principles on Allocation of Loss refine this requirement by stating that the detrimental effects must be measured by factual and objective standards. Currently no such standards exist regarding MPP.[884] UNEA-3 has recognized this issue by encouraging States to "establish common definitions and harmonized standards and methodologies for the measurement and monitoring of marine litter and microplastics".[885] Furthermore, and more critically, standardized methodologies to assess leakage of

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879 Principle 2, ILC, 'Report of the International Law Commission: Fifty-Eight Session' (1 May-9 June and 3 July-11 August 2006) UN Doc A/61/10. 121-122.
880 ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out Hazardous Activities, with Commentaries' (2006) Yearbook of the international Law Commission (Vol II, Part Two) 64.
881 J Barboza, *The Environment, Risk and Liability in International Law* (Brill 2017) 11.
882 *Ibid.* 10.
883 ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out Hazardous Activities, with Commentaries' (2006) Yearbook of the international Law Commission (Vol II, Part Two) 65, para 2.
884 Within the UN System, organizations are working towards establishing guidance for monitoring SDG Indicator 14.1.1, floating plastic debris density. See, UN Environment, 'Global Manual on Ocean Statistics: Towards a Definition of Indicator Methodologies' (2018)
885 UNEA Res 3/7 'Marine Litter and Microplastics' (4-6 December 2017) UN Doc UNEP/EA.3/Res.7. 2, para 4(b).

plastics into the oceans and to measure their harmful impacts on environment and human health are lacking or in need of improved quality and international harmonization.[886]

Under the international instruments which provide for prevention obligations regarding MPP, no monitoring of it is conducted. However, some regional actors undertake monitoring and use beach litter as an indicator.[887] Beach litter is also the core parameter to track progress in relation to the Sustainable Development Goal Target 14.1 ("Life below water: by 2025, prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris").[888] In the absence of both obligations which specifically target plastics and a global mechanism for monitoring equipped with harmonized standards and methodologies of measurement, it is extremely challenging for a State to provide evidence in the form of factual and objective standards of the detrimental effects that MPP has caused.

The Draft Principles on Allocation of Loss state that transboundary harm which does not involve State responsibility may occur for several reasons. Examples include a situation where preventive measures have been followed but prove inadequate, a risk was not identified at the time of authorization, or where harm occurred gradually over a long period of time.[889] The last situation is particularly relevant regarding MPP, though the ILC goes on to state that such claims are not common due to the problems of establishing a causal link in situations of cumulative damage.[890] To provide evidence in the form of factual and objective standards of the detrimental effects of MPP is even more challenging taking into consideration the cumulative factor, and would require its own set of methodologies of measurement,[891] at least in the absence of data from continuous monitoring.

As with State responsibility, causality remains an issue also with regard to liability. Draft Principle 2(1)(g) defines an operator as "any person in command or control of the activity at the time the

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886 See, J Boucher et al., 'Review of Plastic Footprint Methodologies: Laying the Foundation for the Development of a Standardised Plastic Footprint Measurement Tool' (IUCN 2019) 47; SAPEA, 'A Scientific Perspective on Microplastics in Nature and Society' (SAPEA 2019) Evidence Review Report 4. 11; RC Thompson et al., 'Plastics, the Environment and Human Health: Current Consensus and Future Trends' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences. 2155; GESAMP, 'Guidelines for the Monitoring and Assessment of Plastic Litter and Microplastics in the Ocean' (UNEP 2019) 99 Reports and Studies. 5.
887 UN Environment, 'Global Manual on Ocean Statistics: Towards a Definition of Indicator Methodologies' (2018) 19. Some of these actors use also other indicators. For a more comprehensive review of all indicators used by these regional seas programmes, see Appendix 2 of the Global Manual of Ocean Statistics.
888 UNGA Res 70/1 'Transforming Our World: the 2030 Agenda for Sustainable Development' (25 September 2015) UN Doc A/RES/70/1.
889 ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out Hazardous Activities, with Commentaries' (2006) Yearbook of the international Law Commission (Vol II, Part Two) 63, para 7.
890 *Ibid.*
891 For a review of such methods, see, PG Ryan et al., 'Monitoring the Abundance of Plastic Debris in the Marine Environment' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences. 2002-2003.

incident causing transboundary harm occurs". Plastics leakage can occur throughout the long, complex and global value chains of plastics, which incorporate a range of relevant operators and activities.[892] Each operator along the value chain is in control of its own activity. However, once the plastics from these activities have leaked into the oceans, it is highly unlikely that this pollution and the resulting damage can be traced back to an individual operator.

7.3.4 Prompt and Adequate Compensation and Response Measures

In liability, remedies are not sanctions or secondary obligations, but part of the primary rules.[893] Principle 4 on prompt and adequate compensation is "part of arrangements for permitting hazardous activities within its jurisdiction control, it is widely expected that States would make sure that adequate mechanisms are also available to respond to claims for compensation in case of any damage".[894] The Draft Principles on Allocation of Loss specify that each State should nationally take all necessary measures to ensure prompt and adequate compensation for the victims, and that these measures should include the imposition of liability on the operator or other appropriate person or entity.[895] For these purposes, operators can establish financial securities or national industry-wide funds. If these prove insufficient, a State of origin should nationally make additional financial resources available.[896] The underlying principle is that the party, whether an operator or another person or entity, "with the most effective control of the risk at the time of the accident or with the ability to provide compensation is made primarily liable".[897] Principles 4 and 6 together establish the minimum substantive (channeling of liability, designating liability without proof of fault, limitations or exceptions of liability, and establishment of arrangements financial guarantees or securities) and procedural requirements (non-discriminatory access to justice, availability of legal remedies, as well as recognition and enforcement of foreign judicial and arbitral decision) for States to implement.[898]

Though the Draft Principles on Allocation of Loss are the primary rules on international liability, their objective is to provide a broad and flexible guiding framework for States to implement in further

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892 UN Environment, 'Mapping of Global Plastics Value Chain and Plastics Losses to the Environment (with a Particular Focus on Marine Environment) (2018) 10.
893 J Barboza, *The Environment, Risk and Liability in International Law* (Brill 2017) 6.
894 ILC, 'Report of the International Law Commission: Fifty-Eight Session' (1 May-9 June and 3 July-11 August 2006) UN Doc A/61/10. 152.
895 ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out Hazardous Activities, with Commentaries' (2006) Yearbook of the international Law Commission (Vol II, Part Two) 78, para 10.
896 Principles 4 and 6, ILC, 'Report of the International Law Commission: Fifty-Eight Session' (1 May-9 June and 3 July-11 August 2006) UN Doc A/61/10. 108-109.
897 ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out Hazardous Activities, with Commentaries' (2006) Yearbook of the international Law Commission (Vol II, Part Two) 78, para 10.
898 *Ibid.* 85, para 1.

detail. They do not clarify, codify, or develop international law or provide "any basic obligation to make anything available to claimants".[899] Therefore, it is highly doubtful that the Draft Principles on Allocation of Loss would play much of a role in compensating for damage from MPP as "States remain free to engage in harmful activities without any obligation to provide effective remedies or redress for transboundary damage unless they are themselves at fault".[900]

7.3.5 Development of Specific International Regimes

The Draft Principles on Allocation of Loss encourage States to make every effort to develop specific international regimes "where, in respect of particular categories of hazardous activities, specific global, regional, or bilateral agreements would provide effective arrangements concerning compensation, response measures and international and domestic remedies". These arrangements could include industry or State funds as means of providing supplementary compensation.[901] The idea of a fund to compensate for damage from MPP will be further investigated in the next chapter.

In the field of civil liability in environmental law, "a collection of disjointed and uncoordinated, sector-specific regimes" exist. Of these sector-specific liability regimes, only those regimes relating to nuclear and oil pollution, biosafety and wreck removal are currently in force.[902] Common features of sector-specific regimes are rare but include strict but limited operator liability, usually no State guarantees, and delimiting compensable damage to human costs, and to areas within national jurisdiction.[903]

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[899] AE Boyle, 'Globalising Environmental Liability: The Interplay of National and International Law' (2005) 17 Journal of Environmental Law 1. 19-20.
[900] *Ibid.* 26.
[901] Principle 7, ILC, 'Report of the International Law Commission: Fifty-Eight Session' (1 May-9 June and 3 July-11 August 2006) UN Doc A/61/10. 110.
[902] The 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy (adopted 29 July 1960, entered into force 1 April 1968) 956 UNTS 251 (as amended by 1964 and 1982 Protocols); OECD Agreement Supplementary to the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy (adopted 31 January 1963, entered into force 4 December 1974) 1041 UNTS 358 (as amended by 1964 and 1982 Protocols); the 1963 Vienna Convention IAEA Vienna Convention on Civil Liability for Nuclear Damage (adopted 21 May 1963, entered into force 12 November 1977) 1063 UNTS 251; Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage (adopted 12 September 1997, entered into force 4 October 2003) 36 ILM 1454; Convention on Supplementary Compensation for Nuclear Damage (adopted 12 September 1997, entered into force 15 April 2015) 36 ILM 1473; the Brussels International Convention on Civil Liability for Oil Pollution Damage (adopted 29 November 1969, entered into force 19 June 1975) 973 UNTS 3; the Brussels International Convention on the Establishment of an International Fund for Compensation of Oil Pollution Damage (adopted 18 December 1971, entered into force 16 October 1978) 1110 UNTS 57; the Protocol of 2003 to the international Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (adopted 16 May 2003, entered into force 3 March 2005) IMO Doc: LEG7CONF.14/20; the Cartagena Protocol on Biosafety to the Convention on Biological Diversity (adopted 29 January 2000, entered into force 11 September 2003) 2226 UNTS 208; the 2010 Nagoya-Kuala Lumpur Supplementary Liability Protocol on Liability and Redress to the Cartagena Protocol on Biosafety (adopted 15 October 2015, entered into force 5 March 2018) Conference of Parties, Decision BS-V/11; Nairobi International Convention on the Removal of Wrecks (Adopted 18 May 2007, entered into force 14 April 2015) 46 ILM 694.
[903] RL Johnstone, *Offshore Oil and Gas Development in the Arctic under International Law: Risk and Responsibility* (Koninklijke Brill NV 2015) 259-260.

As part of its recommendation for a "new global architecture with multilayered governance approach" to combat MPP, the UN Environment report promotes a binding agreement that would include a mechanism for liability and compensation.[904] In this regard, the report states that consideration "would need to be given to, at a minimum, the definition of damage, the measure of damage, responsibility, who can claim and what remedial activities can be claimed for".[905] However, negotiating a liability regime for MPP would entail a wide range of issues – as it would also have to deal with complex problems in relation to diffuse sources, cumulative effects, and long time lags – as well as contending with limited knowledge of how long it takes for the harmful changes to manifest.[906] These issues particularly affect the question of causation: how to identify sources of releases and victims of damage; and how to attribute damage to particular substances.[907]

Arguably, any new liability mechanism would seem to confront the same legal issues that have been discussed in relation to both State responsibility and the Draft Principles on Allocation of Loss. Therefore, the critical question is not necessarily about the form of the regime – that is, whether to develop a new specific liability mechanism or make use of the existing instruments. The critical question is how to reconstruct any responsibility or liability mechanism to better face the challenges of damage resulting from cumulative pollution, such as MPP. Facing these challenges will most likely require abandoning the need to make a direct causal link between the polluter and resulting damage, rethinking the currently required threshold of significant damage, and developing harmonized methodologies to measure and assess damage from cumulative pollution. The development of a new a new liability mechanism for plastics will be discussed in further detail in the following chapter.

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904 UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 15.
905 *Ibid.* 141.
906 J Brunnée, 'Of Sense and Sensibility: Reflections on International Liability Regimes as Tools for Environmental Protection' (2004) 53 International and Comparative Law Quarterly 2. 362, 365.
907 *Ibid.* 363.

CHAPTER 8 – FURTHER LEGAL MEASURES TO REMEDY MARINE PLASTICS POLLUTION

8.1 Introduction

With regards to considerations of environmental liability, the general trend has "moved from the limited role of the law of State responsibility to the largely abandoned efforts to develop State liability to the current focus on issue-specific, treaty-based civil liability regimes."[908] In civil liability regimes, the primary liability is channeled to private persons or entities. In the international setting this means that:

> [T]reaties between States provide an international legal framework to those [civil liability] regimes and may establish liability rules common to all States parties: other rules regarding the rights and obligations of private operators or other private parties are left to be regulated by the Member States.[909]

The general trend moving from State responsibility to issue-specific, treaty-based civil liability regimes applies also to the issue at hand with MPP. Would it be feasible to develop a civil liability regime as part of a possible new agreement on plastics? Or would it be wiser to abandon the questions relating to liability and focus on funding cleanup and restoration efforts, for example in the form of a global fund to remedy MPP? This chapter sets out to discuss these issues and their implications.

8.2 The Added Value of a New Treaty: Development of a Specific Civil Liability Mechanism for Marine Plastics Pollution?

8.2.1 A Compensation and Liability Regime for Marine Plastics Pollution – A Viable Option to Develop as Part of a New Treaty?

Though calls for a new treaty on plastics have been growing louder, the discussion of a compensation and liability mechanism as part of it has been limited. The discussion so far can be summarized as follows:

> A gap identified in the current legal and policy framework is the lack of a global compensation mechanism for damage to the environment or damage to human health resulting from marine plastic litter and microplastics. A new agreement provides an opportunity to close this gap by setting the legal basis for the establishment of such a mechanism.[910]

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[908] *Ibid.* 364; See also, U Beyerlin and T Marauhn, *International Environmental Law* (Hart Publishing 2011) 360, 361, 367; FO Vicuna, 'Responsibility and Liability for Environmental Damage under International Law: Issues and Trends' (1998) 10 Georgetown International Environmental Law Review 2. 284, 285, 307.

[909] J Barboza, *The Environment, Risk and Liability in International Law* (Brill 2011) 31.

[910] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UN Doc UNEP/EA.3/INF/5. 131.

The Expert Group has touched upon liability questions in its meetings. The Group includes a liability and compensation mechanism in its recommendations for the new global architecture with a multilayered governance approach.[911] However, this recommendation is not elaborated beyond mentioning a compensation and liability regime. Furthermore, the first report of the Expert Group noted that "issues such as liability and compliance were not a priority at this stage."[912]

This sub-chapter investigates the issue of existing MPP from the viewpoint of a potential new multilateral environmental agreement (MEA) focusing on plastics. Particularly, the focus is on whether a new treaty would bring added value to solving issues relating to existing MPP by developing a specific civil liability mechanism as part of the treaty. The lack of a global compensation mechanism regarding MPP is an evident gap, but developing a liability mechanism should be thoroughly reviewed and assessed in the light of complexities that have been highlighted throughout Part III.

8.2.2 Scope and Coordination: The Applicability of the Basel Protocol

The scope of a new, specific civil liability mechanism on plastics pollution would cover all damage from plastics pollution to the environment and human health, except for damage resulting from transportation of plastics wastes. The Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and Their Disposal ('Basel Protocol') applies to transportation of hazardous waste and is partly applicable to the plastics issue.[913] Due to the so-called 'Plastic Amendments' to the Basel Convention, as of 2021 the classification of plastics wastes is "other wastes", "hazardous wastes" or "plastic waste destined for recycling in an environmentally sound manner". If plastics wastes are identified as 'hazardous wastes' under the new entry of Annex VIII, A3210, the Basel Protocol would apply to their transboundary movements.[914]

However, the Basel Protocol would not apply to plastics wastes traded and transported under entries "other wastes" (Annex II, Y48) or "plastic waste destined for recycling in an environmentally sound manner" (Annex IX, B3011).[915] More advisable than duplicating the model of the Basel Protocol in a potential new liability mechanism for plastics pollution would be to cover these two streams of plastics wastes by amending the Basel Protocol to cover also the entries for other (plastics) wastes

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[911] UNEA, 'Report of the First Meeting of the Ad-Hoc Open-Ended Expert Group on Marine Litter and Microplastics' (19 June 2018) UN Doc UNEP/AHEG/2018/1/6. 4, para 20.
[912] *Ibid.* 16, para 88.
[913] The Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and Their Disposal (adopted 10 December 1999) UN Doc UNEP/CHW.1/WG/1/9/2 ('Basel Protocol')
[914] Fourteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'BC-14/12: Amendments to Annexes II, VIII and IX to the Basel Convention' (10 May 2019) UNEP/CHW.14/CRP.40; Art. 4(1), the Basel Convention.
[915] *Ibid.*

and plastic waste destined for recycling in an environmentally sound manner. However, the Basel Protocol has not yet entered into force.[916]

8.2.3 The General Challenges with and Lessons Learned From Existing Treaty-Based Civil Liability Regimes

The issues with a specific, treaty-based civil liability regime for MPP can be divided in two categories: the general challenges which treaty-based civil liability regimes have faced and the specific challenges that the MPP problem entails in relation to developing a liability regime.

MEAs increasingly embrace strategies that support compliance with commitments as opposed to strategies that seek to allocate blame for breaches of obligations. Generally the role of a specific liability regime within an MEA is to back up the preventive and pro-active efforts.[917] This would also be the function of a liability and compensation mechanism for plastics. Some MEAs and other regimes already have their own liability mechanisms. Therefore, as part of assessing the question whether one should be part of a potential new treaty for plastics, general lessons can be drawn from existing experiences.

Negotiating specific liability mechanisms has proven to be long and burdensome.[918] Of the existing sector-specific liability regimes, only those regimes relating nuclear and oil pollution, biosafety and wreck removal are currently in force.[919] The only regime from which any practical experience has

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916 The Basel Convention, 'Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal' http://www.basel.int/Countries/StatusofRatifications/TheProtocol/tabid/1345/Default.aspx

917 J Brunnée, 'Of Sense and Sensibility: Reflections on International Liability Regimes as Tools for Environmental Protection' (2004) 53 International and Comparative Law Quarterly 2. 352.

918 *Ibid.* 365; A Daniel, 'Civil Liability Regimes as a Complement to Multilateral Environmental Agreements: Sound International Policy or False Comfort? (2003) 12 Review of European, Comparative & International Environmental Law 3. 236.

919 The 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy (adopted 29 July 1960, entered into force 1 April 1968) 956 UNTS 251 (as amended by 1964 and 1982 Protocols); OECD Agreement Supplementary to the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy (adopted 31 January 1963, entered into force 4 December 1974) 1041 UNTS 358 (as amended by 1964 and 1982 Protocols); the 1963 Vienna Convention IAEA Vienna Convention on Civil Liability for Nuclear Damage (adopted 21 May 1963, entered into force 12 November 1977) 1063 UNTS 251; Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage (adopted 12 September 1997, entered into force 4 October 2003) 36 ILM 1454; Convention on Supplementary Compensation for Nuclear Damage (adopted 12 September 1997, entered into force 15 April 2015) 36 ILM 1473; the Brussels International Convention on Civil Liability for Oil Pollution Damage (adopted 29 November 1969, entered into force 19 June 1975) 973 UNTS 3; the Brussels International Convention on the Establishment of an International Fund for Compensation of Oil Pollution Damage (adopted 18 December 1971, entered into force 16 October 1978) 1110 UNTS 57; the Protocol of 2003 to the international Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (adopted 16 May 2003, entered into force 3 March 2005) IMO Doc: LEG7CONF.14/20; the Cartagena Protocol on Biosafety to the Convention on Biological Diversity (adopted 29 January 2000, entered into force 11 September 2003) 2226 UNTS 208; the 2010 Nagoya-Kuala Lumpur Supplementary Liability Protocol on Liability and Redress to the Cartagena Protocol on Biosafety (adopted 15 October 2015, entered into force 5 March 2018) Conference

been gained in compensating victims of environmental harm is the oil-pollution regime.[920] Other international regimes include the above mentioned Basel Protocol, the Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters, the Geneva Convention on Civil Liability for Damage Caused During Carriage of Dangerous Goods by Road, Rail and Inland Navigation Vessels, and the 2010 Protocol to the International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, none of which has yet entered into force.[921] A liability regime has been discussed also under the Stockholm Convention regime but remains to be agreed upon.[922] The intergovernmental negotiating committee has held a workshop on the topic which highlighted many complexities involved in developing a liability and redress mechanism under the Stockholm Convention.[923] Furthermore, as mentioned earlier, despite the call for developing procedures regarding liability under the London Convention and the London Protocol, the Parties have not yet taken steps to create them.[924] The resources required to negotiate a liability instrument, the limited success of liability instruments' entry into force, and the marginal practical experience of actual compensation to victims of environmental harm are major factors to consider when assessing the added value of a compensation and liability regime for plastics as part of a potential new treaty.

Many of the existing regimes have a two- or three tier structure with regard to compensation and/or restitution.[925] The first tier is usually the operator, who is required to have insurance or other financial arrangements to cover their liability, and the second (and third) tier are State-covered supplementary arrangements, usually funds. The options for standard of care in liability regimes include "fault (based upon intention or negligence), strict liability ('essentially a *prima facie* responsibility, and various qualifications or defenses may be available) and absolute liability ('for which there can be no mode of

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of Parties, Decision BS-V/11; Nairobi International Convention on the Removal of Wrecks (adopted 18 May 2007, entered into force 14 April 2015) 46 ILM 694.

920 A Daniel, 'Civil Liability Regimes as a Complement to Multilateral Environmental Agreements: Sound International Policy or False Comfort? (2003) 12 Review of European, Comparative & International Environmental Law 3. 225.

921 United Nations Treaty Collection, 'Depositary: Status of Treaties' https://treaties.un.org/Pages/ParticipationStatus.aspx?clang=_en

922 UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 140.

923 Intergovernmental Negotiating Committee for an International Legally Binding Instrument for Implementing Interactional Action on Certain Persistent Pollutants, 'Workshop on Liability and Redress Held in the Context of the Stockholm Convention on Persistent Organic Pollutants in Vienna from 19 to 21 September 2002: Report of the Co-Chairs' (2003) UN Doc UNEP/POPS/INC.7/INF/6.

924 AB Sielen, 'The New International Rules on Ocean Dumping: Promise and Performance' (2009) 21 Georgetown International Environmental Law Review 2. 499.

925 The compensation and liability regimes for oil pollution and nuclear energy accidents are good examples of multilayered structures.

exculpation')".[926] The standard of care can also be a combination of fault-based and strict liability. For example, the Basel Protocol could be used as a model, as it has adopted an approach where the main rule is strict liability, but fault-based liability is applied to any person "for damage caused or contributed to by his lack of compliance with the provisions implementing the Convention or by his wrongful intentional, reckless or negligent acts or omissions."[927]

Determining the standard of care in a possible new liability mechanism for plastics is tricky due to the nature of the activities involved. On the one hand, for "general industrial and other activities that are not ultrahazardous or dangerous, it is less easy to argue for a standard of care based upon strict or absolute liability". [928] Arguably, activities related to plastics production, use or end-of-life management do not qualify as ultrahazardous or dangerous when compared to, for example, nuclear accidents or major oil spills. On the other hand, fault-based liability with regard to MPP would involve complex issues with determining fault that could undermine any possibilities to establish liability.

8.2.4 The Specific Challenges and Possibilities of a Specific Compensation and Liability Regime for Marine Plastics Pollution

Regarding challenges that are specific to MPP, both the analysis from Chapter 7 and the Expert Group's inconclusive views "reflect serious conceptual difficulties in the design of an appropriate liability and compensation regime in relation to plastic pollution."[929] These conceptual difficulties include:

> As with any instrument dealing with liability and compensation, consideration in the context of marine plastic litter and microplastics would need to be given to, at a minimum, the definition of damage, the measure of damage, responsibility, who can claim and what remedial activities can be claimed for.[930]

Of all the existing efforts regarding liability mechanisms, the problem with persistent organic pollutants (POPs) has most similarities with the problem of MPP. Many of the specific challenges

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[926] P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 746; Ian Brownlie, *System of the Law of Nations: State Responsibility, Part I* (Oxford University Press 1983) 44.
[927] Arts 4 and 5, The Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and Their Disposal (Adopted 10 December 1999) UN Doc UNEP/CHW.1/WG/1/9/2 ('Basel Protocol')
[928] P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 747.
[929] S Maljean-Dubois and B Mayer, 'Liability and Compensation for Marine Plastic Pollution: Conceptual Issues and Possible Ways Forward' (2020) Symposium on Global Plastic Pollution. 114 American Journal of International Law. 207. See also, F Oosterhuis et al., 'Economic Instruments and Marine Litter Control' (2014) 102 Ocean & Coastal Management. 52; M Landon-Lane, 'Corporate Social Responsibility in Marine Plastic Debris Governance' (2018) 127 Marine Pollution Bulletin. 312.
[930] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UN Doc UNEP/EA.3/INF/5. 141.

relating to damage from MPP are similar to those of damage from POPs, as listed by a workshop on liability under the Stockholm Convention:

> Among the general considerations identified by the groups were the need to take into account the time-lag between release of POPs and the manifestation of damage; the variety of POPs sources and their cumulative effects; the difficulties in establishing a causal link between a particular source and a specific damage; the definition of damage caused by POPs and who is to be regarded as having suffered damage; and whether the activities were undertaken, or the effects felt, by States or by individuals. Furthermore, it was discussed which damages could be covered by a potential liability regime, and whether or not liability could be applied retroactively where damage had been caused before the entry into force of such a regime. (No precedent was cited for retroactive application of a liability regime in either international or domestic law.)[931]

The development of a liability mechanism under the Stockholm Convention has not moved forward, and the applicability and appropriateness of a liability mechanism for POPS was already questioned during the workshop due to the complexity of the issues and technical difficulties involved.[932] It should be taken into account when evaluating whether a potential new treaty on plastics should have a liability mechanism that remedying MPP faces similar issues and technical difficulties, which remain unresolved under the Stockholm Convention regime.

A new liability mechanism would have to define what constitutes damage from (marine) plastics pollution. To specify the types of damage included, a similar definition to the Draft Principles on Allocation of Loss could be used (Draft Principle 2(1)(a)).[933] The definition should include transboundary damage (Draft Principle 2(1)(e)), and the definition should be broadened to include damage to areas beyond national jurisdiction.

A compensation and liability mechanism should also determine its own threshold for what constitutes damage that triggers liability. It is evident from earlier analysis in Chapter 7 that the approach – which is adopted in both the State responsibility regime and in the Draft Principles on Allocation of Loss – determines that the threshold of harm needs to be significant, and does not function well with evaluating harm from MPP. The threshold of harm with regard to MPP is difficult to reduce to one word, but should be based on criteria that take into account a wider set of factors, which could be streamlined with the monitoring requirements established under a new treaty. Inspiration for determining these factors could be drawn from the way the EU seeks to determine good

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[931] Intergovernmental Negotiating Committee for an International Legally Binding Instrument for Implementing Interactional Action on Certain Persistent Pollutants, 'Workshop on Liability and Redress Held in the Context of the Stockholm Convention on Persistent Organic Pollutants in Vienna from 19 to 21 September 2002: Report of the Co-Chairs' (2003) UN Doc UNEP/POPS/INC.7/INF/6. 5, para. 10.
[932] *Ibid.* 5, para. 12.
[933] Principle 2, ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out Hazardous Activities, with Commentaries' (2006) Yearbook of the international Law Commission (Vol II, Part Two) 64.

environmental status of its marine waters regarding marine litter within the Marine Strategy Framework Directive: the amount of litter on the coastline, the water column, and on the seabed; the amount of micro-litter on the coastline, the water column, and on the seabed sediment, and the amount of litter and micro-litter ingested by marine animals.[934] These components would require harmonized measurement methods and a set of baseline measures, according to which a combined threshold of harm could be established. Furthermore, impacts of chemicals leaking from or absorbed by MPP, and impacts of MPP on human health should be incorporated, although developing measurement methods and baseline measures regarding these remains highly challenging.

With damage from MPP, the concepts of channeling liability, causality and the standard of care are inherently linked and need to be discussed in relation to each other. In most treaties with liability mechanisms, the first tier of liability is assigned to the operator of an activity. In addition, some treaties have fixed limits on the operator's liability and include second and third tiers of liability to ensure adequate compensation to victims.[935]

As already touched upon earlier both with State responsibility rules and international liability principles, also other "[r]egimes establishing liability for hazardous activities – especially with regard to the environment –, are forced to address an issue that is particularly uncomfortable for lawyers: the complexity and uncertainty inherent in causal links."[936] To overcome challenges related to issues of channeling liability and causality, it is likely that a liability regime for plastics would have to embrace some novel ideas. In a civil liability mechanism for plastics, one of the most difficult tasks would be to determine the channeling of liability within the first tier. Plastics leakage can occur throughout long, complex and global value chains of plastics, which incorporate multiple relevant operators and activities.[937] Once plastics from these activities have leaked into the (ocean) environment, it is very unlikely that pollution and the resulting damage can be traced back to an individual operator. Therefore, a compensation and liability mechanism for plastics would have to transcend the option of channeling liability to a single operator.

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934 Council Directive 2008/56/EC of 17 June 2008 Establishing a Framework for Community Action in the Field of Marine Environmental Policy [2008] OJ L164; Commission Decision (EU) 2017/848 of 17 May 2017 Laying Down Criteria and Methodological Standards on Good Environmental Status of Marine Waters and Specifications and Standardised Methods for Monitoring and Assessment, and Repealing Decision 2010/477/EU [2017] OJ L125.

935 J Barboza, *The Environment, Risk and Liability in International Law* (Brill 2011) 32-33.

936 *Ibid.* 33.

937 UN Environment, 'Mapping of Global Plastics Value Chain and Plastics Losses to the Environment (with a Particular Focus on Marine Environment) (2018) 10.

Regarding the issue of causality, Teubner criticizes the presumption that it is merely a technical evidential problem and argues for the need of legal reconstruction of ecological liability.[938] Such a need stems from the ecological complexities, which make it a challenging task for lawyers to construct causal links between individual actions and ecological damage.[939] Therefore, these causal links should be loosened and the dominant actor perspective should be replaced with a systemic perspective.[940]

As for how this could be done in practice, Teubner discusses forms of collective responsibility, where the membership in a class of risk-bearers, rather than action itself, determines liability.[941] A systematic perspective to ecological liability, based on membership, could be valuable for developing a liability mechanism for MPP. Instead of treating each operator and activity separately, they would be placed under a wider umbrella, such as an industry or market. Such mechanism would circumvent the issue of having to establish direct causal links between one operator and physical damages from MPP. The theory of collective responsibility could be developed even further than determining a liable industry or market. Particularly in ecological chains, "typical hazards can only be identified if one takes different stages into account: raw material delivery, production, distribution, consumption, and waste disposal".[942] Rather than treating each of these stages separately, Teubner suggests building a vertical liability chain between the operators in a whole production chain.[943] As MPP is a result of activities along the whole value chain, such an approach could also provide an option for considerations on how to channel liability within the first tier in a new liability mechanism. However, this signifies that such mechanism would essentially start resembling more of a fund-based arrangement.

The victims of MPP could be defined similarly to the Draft Principles on Allocation of Loss: "any natural or legal person or State that suffers damage".[944] However, in practice, determining a victim – even if a legal definition existed – would require that the situation also met the definition of "damage" from MPP, and that a causal link existed between the victim and the polluter. Due to these challenges, it has even been argued that "[a] liability regime focused on the provision of compensation would not be an appropriate solution to MPP because it is far from clear who should receive compensation."[945] Furthermore, if damage to the global commons was included in the definition of damage within a

[938] G Teubner, 'The Invisible Cupola: From Causal to Collective Attribution in Ecological Liability' (1994) 16 Cardozo Law Review 2. 430, 432.
[939] *Ibid.* 430.
[940] *Ibid.* 431.
[941] *Ibid.* 433.
[942] *Ibid.* 445.
[943] *Ibid.* 445.
[944] ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out Hazardous Activities, with Commentaries' (2006) Yearbook of the international Law Commission (Vol II, Part Two) 64.
[945] S Maljean-Dubois and B Mayer, 'Liability and Compensation for Marine Plastic Pollution: Conceptual Issues and Possible Ways Forward' (2020) Symposium on Global Plastic Pollution. 114 American Journal of International Law. 210.

compensation and liability regime for plastics, it would be even more difficult to determine who would be entitled to claim compensation as a victim of damage that MPP causes in areas beyond national jurisdiction.

A new compensation and liability mechanism would also need to establish an obligation to provide prompt and adequate remedies for the victims. The available remedies should be adjusted to the needs of a MPP-specific compensation and liability regime. As already discussed in Chapter 7 with regards to remedies within State responsibility rules, the possible remedies for victims would be restitution and compensation. However, even when MPP has caused adverse effects, defining and evaluating ecological harms remain a complex and controversial matter,[946] which requires, for example, using special non-market evaluation techniques to estimate them.[947] Even more challenging would be to evaluate, in the light of current scientific knowledge, damage to human health from plastics pollution.

8.2.5 Concluding Thoughts: A Way Forward?

Addressing the problem of existing MPP with a specific international compensation and liability mechanism as part of a new treaty would bring added value only if it managed to solve many controversial issues and technical problems. Negotiating a specific liability regime for MPP as part of a new treaty would be riven with both general and MPP-specific challenges. Should negotiations of a new treaty begin, it is recommended that the efforts should be focused primarily on preventing plastics leakage and promoting a CE of plastics. However, the question could be left to mature and a potential treaty could include a provision on the possibility of developing a liability mechanism later on should the level of scientific knowledge of impacts on human health develop, along with methods to better assess the damage from MPP. Such an approach was taken for example in the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. Article 12 stipulates:

> The Parties shall co-operate with a view to adopting, as soon as practicable, a protocol setting out appropriate rules and procedures in the field of liability and compensation for damage resulting from the transboundary movement and disposal of hazardous wastes and other wastes.

A similar provision could be added to a potential new treaty on plastics, and mirroring the development of the Basel Protocol, the task of developing a liability mechanism could be continued after the actual treaty negotiations.

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946 M Fitzmaurice, 'International Responsibility and Liability' in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008) 1015.
947 N Hanley, 'The Economic Value of Environmental Damage' in M Bowman and AE Boyle (eds) *Environmental Damage in International and Comparative Law: Problems of Definition and Valuation* (Oxford University Press 2002) 39.

Due to the complicated and burdensome issues with establishing a specific civil liability regime for remedying MPP, a way forward to operationalize the polluter pays principle has to be sought elsewhere. One option is an international fund:

> …the idea of international funds, constituted by non-government actors, may be an appropriate tool for situations where substantial harm can occur to one jurisdiction in circumstances where it may not be possible to attribute fault to a State or to any legal entity. Governments could play a role in constructing international fund schemes constituted by the private sector and administered by an international body.[948]

8.3 A Global Fund as A Remedy for Marine Plastics Pollution

8.3.1 The Idea of a Global Fund in Relation to the Marine Plastics Pollution Problem

The previous chapter demonstrated the possibilities and complexities involved in holding a State or operator responsible or liable for causing transboundary harm from marine plastics pollution under current rules and principles of international law. However, even if such processes turn out to be successful, they can take a long time, allowing the MPP situation to worsen. Therefore, this sub-chapter discusses the idea of a global fund as a new remedy for MPP. Compensation funds can prove particularly useful in situations

> where it is not possible to identify the enterprise which caused the harm. Since there is no individual who is liable, there will logically also be no insurer who will be bound to compensate. Such a situation could arise, for example, in relation to the deterioration of a specific habitat through acid rain. A compensation fund should be considered for these specific cases where no individual injurer can be found. However, the compensation fund should only be limited to these situations, so that liability rules and insurance can still exercise their preventive effects in all the other cases where an injurer can be found.[949]

Marine plastics pollution, like acid rain, is a good example of a situation where it is difficult to find one liable entity and a fund could provide a useful solution.

A problem on the scale of MPP "cannot be tackled without viable, consistent sources of funding for cleanup efforts."[950] Lack of funding is also one of the main barriers for implementing measures to tackle MPP in other ways.[951] As a response to these difficulties, the idea of establishing a fund to

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948 A Daniel, 'Civil Liability Regimes as a Complement to Multilateral Environmental Agreements: Sound International Policy or False Comfort? (2003) 12 Review of European, Comparative & International Environmental Law 3. 240.
949 MG Faure and T Hartlief, 'Compensation Funds versus Liability and Insurance for Remedying Environmental Damage' (1996) 5 Review of Comparative, European & International Environmental Law 4. 325.
950 M Gold et al., 'Stemming the Tide of Plastic Marine Litter: A Global Action Agenda' (2014) 27 Tulane Environmental Law Journal 2. 200.
951 K Raubenheimer, 'Towards an Improved Framework to Prevent Marine Plastic Debris, (Doctor of Philosophy Thesis, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong 2016) 333.

finance efforts to tackle MPP has been brought up in the literature.[952] Raubenheimer and McIlgorm have argued that a global fund to deal with MPP does not necessarily require a new international legally binding instrument.[953] Furthermore, Kirk and Popattanachai have suggested that a global fund should be established to particularly deal with legacy plastics and "used to support the costs of capturing, removing and recycling plastics found in the ocean".[954] Kandziora et al. have noted the key role a global fund could play in coordinating efforts amongst a myriad of actors.[955] Building on these premises, the possibility of a new global fund for MPP is discussed primarily as a stand-alone measure to deal with plastics that are already in the oceans.

8.3.2 International Legal Support for Specific Compensation Funds

The legal support to remedy harm caused by pollution of the marine environment with specific compensation funds is well-established under international law. Also for this reason, a new treaty on plastics is not a necessity for establishing a specific fund in relation to MPP. Legal support for specific funds can be found from the LOSC, the ITLOS Advisory Opinion, and the Draft Principles on Allocation of Loss. Article 235(3) of the LOSC provides:

> With the objective of assuring prompt and adequate compensation in respect of all damage caused by pollution of the marine environment, States shall cooperate in the implementation of existing international law and the further development of international law relating to responsibility and liability for the assessment of and compensation for damage and the settlement of related disputes, as well as, where appropriate, development of criteria and procedures for payment of adequate compensation, such as compulsory insurance or *compensation funds.*[956]

The ITLOS specifically referred to this Article 235(3) of the LOSC in its Advisory Opinion:

> Taking into account that…situations may arise where a contractor does not meet its liability in full while the sponsoring State is not liable…the Authority may wish to consider the establishment of a

[952] K Raubenheimer and A McIlgorm, 'Can a Global Fund Help Solve the Global Marine Plastic Debris Problem?' (2018) 5 Journal of Ocean and Coastal Economics 1; EA Kirk, 'The Montreal Protocol or the Paris Agreement as a Model for a Plastics Treaty?' (2020) Symposium on Global Plastic Pollution. 114 American Journal of International Law. 215-216; S Maljean-Dubois and B Mayer, 'Liability and Compensation for Marine Plastic Pollution: Conceptual Issues and Possible Ways Forward' (2020) Symposium on Global Plastic Pollution. 114 American Journal of International Law. 210; L Cortat Simonetti Goncalves, 'Legal Remedies Against the Plastic Pollution of the Oceans: An Analysis of the Attempts from Public International Law and Private Initiatives to Face the Plastic Soup' (2020) 53, 135; JH Kandziora et al., 'The Important Role of Marine Debris Networks to Prevent and Reduce Ocean Plastic Pollution' (2019) 141 Marine Pollution Bulletin. 660.

[953] K Raubenheimer and A McIlgorm, 'Can a Global Fund Help Solve the Global Marine Plastic Debris Problem?' (2018) 5 Journal of Ocean and Coastal Economics 1. 4. Raubenheimer and McIlgorm explicitly mention the Global Fund for AIDS, Tuberculosis and Malaria as an example of such fund.

[954] EA Kirk and N Popattanachai 'Marine Plastics: Fragmentation, Effectiveness and Legitimacy in International Lawmaking' (2018) 27 Review of European, Comparative and International Environmental Law 3. 233.

[955] JH Kandziora et al., 'The Important Role of Marine Debris Networks to Prevent and Reduce Ocean Plastic Pollution' (2019) 141 Marine Pollution Bulletin. 660.

[956] Cursive is mine.

> trust fund to compensate for the damage not covered. The Chamber draws attention to article 235, paragraph 3, of the Convention which refers to such possibility.[957]

The situations that the ITLOS refers to have interesting analogies with the situation with MPP:

> … if the sponsoring State has not failed to meet its obligations, there is no room for its liability… even if activities of the sponsored contractor have resulted in damage. A gap in liability which might occur in such a situation cannot be closed by having recourse to liability of the sponsoring State under customary international law. The Chamber is aware of the efforts made by the International Law Commission to address the issue of damages resulting from acts not prohibited under international law. However, such efforts have not yet resulted in provisions entailing State liability for lawful acts. Here again (see paragraph 205) the Chamber draws the attention of the Authority to the option of establishing a trust fund to cover such damages not covered otherwise.[958]

It is possible that harm from MPP occurs from activities relating to plastics production, usage or plastics wastes management even when a State has complied with its due diligence obligations. In such situations, a fund could be a practical option to address such gaps in international environmental governance.[959] In relation to environmental damage in the Area in such situations, the ITLOS recommended establishing a trust fund, and it can be argued that a similar analogy could function also with damage from MPP.

Furthermore, the Draft Principles on Allocation of Loss discuss funds as a supplementary measure for prompt and adequate compensation.[960] At the international level, States should act in accordance with Principle 7 which recommends "arrangements for industry and/or State funds to provide supplementary compensation in the event that the financial resources of the operator, including financial security measures, are insufficient to cover the damage suffered as a result of an incident. Any such funds may be designed to supplement or replace national industry-based funds."[961] This refers "to the need for States to enter into specific arrangements and tailor them to particular circumstances of individual hazardous activities".[962] A global fund to compensate and finance cleanups with respect to damage from MPP would be a potential option for such a tailored specific arrangement that the Draft Principles refer to.

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957 *Responsibilities and Obligations of States with respect to Activities in the Area* (Advisory Opinion) [2011] ITLOS Reports 2011. 65, para 205.
958 *Ibid.* 66, para 209.
959 T Stephens, 'Article 235: Responsibility and Liability' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017) 1590.
960 ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Activities, with Commentaries' (2006) Yearbook of the International Law Commission (Vol II, Part Two) 82, para 36; 83, para 37.
961 Principle 7, ILC, 'Report of the International Law Commission: Fifty-Eight Session' (1 May-9 June and 3 July-11 August 2006) UN Doc A/61/10. 110.
962 ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Activities, with Commentaries' (2006) Yearbook of the International Law Commission (Vol II, Part Two) 89, para 2.

International legal support for establishing a global fund to finance efforts to tackle MPP is thus established with the LOSC, the analogy from the ITLOS Advisory Opinion and Principle 7 of the Draft Principles on Allocation of Loss. The idea of a global fund with regards to MPP specifically is also supported by the literature on marine plastics pollution. However, both the relevant sources of international law and the literature leave many questions unanswered relating to a global fund, such as the architecture of the fund and how the funds should be collected and allocated. They also vary in their suggestions regarding the fund's purpose. In addition to promoting the idea of establishing a global fund for MPP, the purpose of this sub-chapter is to draw inspiration from the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) to provide some ideas for the unresolved or open questions.

8.3.3 The Purpose of a New Global Fund for Marine Plastics Pollution

Before presenting how the GFATM functions and applying the relevant analogies from GFATM to a new global fund for MPP, the purpose of such a fund needs to be discussed and clarified. The issue of funding affects all the factual situations discussed in this dissertation: plastics leakage to the marine environment; plastics pollution already in the oceans; and promotion of CE practices to reduce plastics wastes generation. Therefore, establishing a new fund in relation to plastics could be recommended as a new measure to tackle any or all of these problems.

However, it is suggested here that the purpose of a new global fund should be primarily to reduce plastics pollution already in the marine and riverine environments. The reasons for this are several. First, the current international legal framework and its ability to address plastics pollution in the oceans is weakest in this area – compared to responses to the plastics leakage prevention or even promoting a CE of plastics, the topic of Part IV. Based on the analysis of the previous chapter on State responsibility and international liability, it is highly unlikely that the funds for cleanups or other compensation could be acquired via these routes. Second, the momentum for action on the issue with plastics and their impacts on environmental and human health is high. This is evidenced by the focus of UN Environment Assembly resolutions on the topic, governmental action, engagement of private sector in a multitude of initiatives, NGO involvement, as well as citizens' concern around the world, all of which are fueled by massive media attention on the problem. A new global fund could have the potential to harness this momentum quicker than a new treaty. And third, this suggestion is based on methodological choices of this dissertation. Each main part aspires to bring forth different elements and measures for an international legal response, and the idea of a new fund was placed in this part because the options to address plastics pollution already in the oceans are more limited than those that deal with plastics leakage or a global CE of plastics. Such limitation does not mean, however, that components of other approaches could not be combined with MPP mitigation, as long as this element is at the core of proposals. For example, in addition to cleanups, it would be advisable that a fund also include options on how to treat collected plastics wastes safely, or possibilities for how they could be used in a the CE. In this way, the purpose of the fund could be broadened while taking care of the existing damage.

Furthermore, apart from the Ocean Cleanup,[963] mitigation of existing MPP has not attracted as much attention and funding as developing solutions upstream. Upstream solutions in particular have already caught the attention of the private sector and attracted funding. For example, Singapore-based Circulate Capital Ocean Fund has raised $106 million to invest in solutions to the issue, and investors include major actors like Coca-Cola, Dow Chemicals, PepsiCo, Danone, Unilever, Procter & Gamble and Chevron Phillips Chemical.[964] Another good example is the EMF and UN Environment initiative, the 'Global Commitment', which "has already mobilised over 500 signatories that are determined to start building a circular economy for plastic".[965] Funding to develop a CE of plastics is paramount, but based on these recent trends the problem with already existing MPP and its mitigation will not likely mobilize similar resources without an international intervention and a new fund could thus be a viable option for the purpose of reducing harm in MPP hotspots.[966]

8.3.4 The Model of the Global Fund to Fight AIDS, Tuberculosis and Malaria

Regarding the architecture and collection and allocation of funding of a new global fund for MPP, inspiration can be drawn from GFATM. This was also recognized in the Governance Report, which noted that GFATM "was established independently of any international agreement".[967]

The idea of a Global Fund was initiated by UN Secretary General Kofi Annan, who called for "the creation of a Global Fund, dedicated to the battle against HIV/AIDS and other infectious diseases."[968] The idea of GFATM was discussed in the G8 summit in 2000, followed by more serious commitments at the African Summit in 2001, and the UNGA Special Session on the topic later that

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963 The Ocean Cleanup, 'FAQ' https://theoceancleanup.com/faq/
964 P Guest, 'Singapore Fund Raises $106 Million to Tackle Plastic Pollution' (Nikkei Asian Review, 4 December 2019) https://asia.nikkei.com/Spotlight/Environment/Singapore-fund-raises-106-million-to-tackle-plastic-pollution
965 EMF, 'Global Commitment' https://www.ellenmacarthurfoundation.org/our-work/activities/new-plastics-economy/global-commitment
966 K Raubenheimer and A McIlgorm, 'Can a Global Fund Help Solve the Global Marine Plastic Debris Problem?' (2018) 5 Journal of Ocean and Coastal Economics 1. 10.
967 UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UN Doc UNEP/EA.3/INF/5. 138.
968 Press Release, 'Secretary-General, Secretary-General Proposes Global Fund for Fight Against HIV-AIDS and other Infectious Diseases at African Leaders Summit' (26 April 2001) UN Doc SG/SM/7779/Rev.1

year. It was endorsed by another G8 summit in 2001. A Transitional Working Group was then gathered to establish the specific principles and governance structures of the new organization, and GFATM was officially launched in 2002.[969] GFATM is an independent legal entity, which allows it "to enter into legally enforceable contracts in the ordinary course of business", promote public confidence in the institution, and "enable the Fund to receive contributions from both public and private sources".[970] The legal form of GFATM is a unique combination of a non-profit foundation and some characteristics of an international organization.[971]

GFATM was established with a Framework Document that sets out its title, purpose, principles and scope.[972] GFATM is "a financial instrument, not an implementing entity".[973] It is based on a voluntary public-private partnership, with 92% of the total funding coming from the public sector and the rest coming from the private sector, private foundations and innovative financing initiatives. The funding is raised and invested in three-year replenishment periods.[974] Simply put, the funding model is that "in each funding period, the Global Fund allocates donor funds to eligible countries. Countries then apply for their funding after engaging in an inclusive consultation at the country level. After technical review and approval, countries implement their grants. Evaluation and oversight continues throughout implementation to monitor progress and performance."[975]

GFATM has established detailed criteria to determine the eligibility of funding proposals, and for a proposal review process, as well as for monitoring and evaluation.[976] The work of GFATM is governed by a board, to which the Secretariat, the Technical Evaluation Reference Group, the Technical Review Panel and the Office of the Inspector General report to. The Board operates through three committees (Audit and Finance Committee, Ethics and Governance Committee, and the Strategy Committee) and a Coordinating Group.[977]

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969 The Global Fund, 'Global Fund Overview' https://www.theglobalfund.org/en/overview/
970 A Triponel, 'Global Fund to Fight AIDS, Tuberculosis and Malaria: A New Legal and Conceptual Framework for Providing International Development Aid' (2009) 35 North Carolina Journal of International Law & Commercial Regulation 1. 183; First Meeting of the Transitional Working Group to establish a Global Fund to fight AIDS, Tuberculosis, and Malaria, 'Final Report' (11-12 October 2001) 5; Second Meeting of the Transitional Working Group to establish a Global Fund to fight AIDS, Tuberculosis, and Malaria, 'Final Report Draft' (22-24 November 2001) 4.
971 Art 1, The Global Fund, 'Bylaws of the Global Fund to Fight AIDS, Tuberculosis and Malaria' (2016)
972 The Global Fund to Fight AIDS, Tuberculosis and Malaria, 'The Framework Document' (2001) 91-93.
973 *Ibid.*.
974 The Global Fund, 'Resource Mobilization' https://www.theglobalfund.org/en/replenishment/
975 The Global Fund, 'Funding Model' https://www.theglobalfund.org/en/funding-model/
976 The Global Fund to Fight AIDS, Tuberculosis and Malaria, 'The Framework Document' (2001) 96-103.
977 The Global Fund, 'Board' https://www.theglobalfund.org/en/board/

GFATM is not an implementation body. To access and utilize the funds, it requires that "government and non-government stakeholders at the country, regional level and sub-national levels, as appropriate, define a clear mechanism for the coordination of their joint efforts"[978] and "the novelty of the CCM [Country Coordinating Mechanism] is that it attempts to bring together, within one single structure, all actors working on AIDS, tuberculosis, and malaria at the country level."[979] GFATM sets out the principles and requirements for Coordinating Mechanisms (CMs), which include primarily Country Coordinating Mechanisms, Regional Coordinating Mechanisms, and in certain cases non-country Coordinating Mechanisms and Regional Organizations.[980] The core principles of GFATM apply also to CMs and include national ownership and respect for country-led implementation processes; focus on partnerships among all relevant stakeholders within a country and all sectors of society; strengthening the participation of communities and people, particularly those affected by the three diseases; eliminating stigmatization of and discrimination of those infected and affected by the diseases with particular focus on vulnerable groups; building on, complementing and coordinating existing regional and national programs in support of national policies, priorities and partnerships; and promoting transparency and accountability.[981]

The achievements of GFATM include becoming established and operational quickly, raising awareness about the three diseases globally, attracting participation from a wide group of stakeholders, showing flexibility and adaptability with its financing arrangements, and achieving tangible progress in recipient States in saving lives and fighting the diseases in other ways.[982] By 2018, "health programs supported by the Global Fund partnership have saved 38 million lives…Overall, the number of deaths caused by AIDS, TB and malaria each year has been reduced by 50% since the peak of the epidemics in countries where the Global Fund invests".[983]

8.3.5 Applying the Model of GFATM to a Global Fund for MPP

The GFATM provides a model for an architecture and organization of an international private fund targeting a global problem. A global fund for MPP would function as a financial instrument that would make additional financial resources available to combat MPP but leave implementation to

978 The Global Fund, 'Country Coordinating Mechanism Policy Including Principles and Requirements' (2018) 2.
979 A Triponel, 'Global Fund to Fight AIDS, Tuberculosis and Malaria: A New Legal and Conceptual Framework for Providing International Development Aid' (2009) 35 North Carolina Journal of International Law & Commercial Regulation 1. 197.
980 The Global Fund, 'Country Coordinating Mechanism Policy Including Principles and Requirements' (2018) 1.
981 *Ibid.* 1-2.
982 S Radelet, 'The Global Fund to Fight AIDS, Tuberculosis and Malaria: Progress, Potential, and Challenges for the Future' (Center for Global Development 2004) 11-12.
983 The Global Fund, 'Results Report 2019' 11.

States and/or regional actors. The general principles guiding the work of GFATM would also resonate with a new global fund for MPP and should reflect national ownership of programs and respect country-led formulation and implementation processes, balance interventions in different regions, evaluate proposals through an independent review process, and use existing international mechanisms to function cost-effectively and in a simplified manner.

The approach of GFATM to implementation through its national and regional Coordination Mechanism could also offer a viable template for many issues with combating MPP. The MPP problem has mobilized a multitude of initiatives all around the world, including regional, governmental, local and NGO action. It is widely recognized that coordination amongst these initiatives is highly fragmented.[984] A similar Coordination Mechanism within a global fund for MPP could push different actors to become more organized nationally and regionally and co-coordinate their projects, thus enhancing their chances of funding via a new global fund for MPP. However, it would be advisable to expand from the eligibility criteria of GFATM. In the GFATM system regional organizations are eligible only under specific conditions, whereas in the context of MPP, regional seas organisations or river basin organizations are important actors that should be included as default eligible recipients.

Though mitigating existing damage is not the ultimate solution to the problem and does not solve any of the root causes of such damage, it is nevertheless an important part of the overall picture. The global plastics problem requires multiple different responses with different time spans. A new global fund for MPP would provide short-term responses by financing efforts to mitigate existing damage. A new fund for MPP could be established and become operational relatively quickly in just a few years, whereas if the fund was part of new treaty negotiations it could take much longer. Furthermore, GFATM has shown that despite challenges, such an organization has been able to attract continuous funding and tangible results. Though the problems that GFATM and a global fund for MPP target are completely different, some features of the solutions are common, such as raising awareness of the problem and involving wide multisectoral stakeholder participation. GFATM has proven successful in these areas and thus can provide a promising model for a global fund for MPP. The biggest challenge of a global fund for MPP modeled after GFATM, and intended as a substitute for a liability mechanism, would be to attract adequate and continuous financing.[985]

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[984] JH Kandziora et al., 'The Important Role of Marine Debris Networks to Prevent and Reduce Ocean Plastic Pollution' (2019) 141 Marine Pollution Bulletin. 661.

[985] See, MG Faure and T Hartlief, 'Compensation Funds versus Liability and Insurance for Remedying Environmental Damage' (1996) 5 Review of Comparative, European & International Environmental Law 4. 322.

8.4 Preliminary Remarks of the International Legal Remedies for Damage from MPP

The characteristics of (transboundary) harm from MPP challenge all the existing models of remedies under international law. The law of State responsibility, harmonizing national legislation by using the Draft Principles on Allocation of Loss, or developing a new compensation and liability regime as part of a potential new treaty all face similar issues due to the nature of the MPP problem. Though all of these options are theoretically applicable, it would be extremely difficult at present to use these mechanisms in practice. The most pressing issues in the interface of the MPP problem and international law on remedies relate to defining the damage and threshold of damage, defining both the polluter and the victim, establishing the required causal links between activity and damage, and defining the negative impacts and assessing the damage in a manner that enables providing a remedy.

The plastics mass balance in the oceans, and likely also the chemical mass balance in the oceans originating from MPP, are both significant or substantial and their cumulative impacts have raised calls for defining MPP as "common concern of humankind". However, with current methods, or due to the lack of them, it is difficult to define and assess the damage and its impacts in specific cases with MPP. The current construction of defining the threshold of harm as 'significant' under the rules of State responsibility or the Draft Principles of Allocation of Loss is not fit to evaluate damage from MPP. In any case the threshold of significant harm is almost impossible to reach due to how plastics are dispersed in the oceans and the scientific gaps that still remain in assessing the harm they cause, for example, on population levels or human health. A new compensation and liability regime would only be useful if it incorporated a set of harmonized methodologies and baseline measurements to evaluate harm to the environment and human health from MPP.

Furthermore, the myriad of diffuse sources of MPP, the accumulating nature of MPP in the oceans, the movement of plastics in the marine environment and the fragmentation of macroplastics into microplastics make establishing the polluter, the victim, and causal links between them, extremely challenging. The technology to trace MPP in the oceans is not – at least not yet – on a level that it could be used in specific legal cases to assist in establishing causal links. In any of the options discussed in Part III, establishing causal links is necessary for providing remedies. Under the law of State responsibility, one would have to be able to prove a breach of a due diligence obligation of a specific State, and under the Draft Principles on Allocation of Loss, one would have to establish who is the victim of damage, who is the liable operator, and a causal link between a specific instance of damage and an operator or operators causing it. A new compensation and liability regime would also need to establish a causal link between a polluter and a victim.

Additionally, the scientific gaps in knowledge of harm from MPP regarding human health via ingestion, the chemical hazards of plastics in the marine environment, and overall impacts on population levels and habitats affect evaluating the impacts of harm and consequently evaluating legal remedies for such harm. Furthermore, such evaluations should be based on transparent methods, which are currently lacking both within the scientific and legal fields with regard to harm from MPP.

Of the options available under current international law, only under the law of State responsibility would it be at least theoretically possible to remedy harm to areas beyond national jurisdiction. Yet, it is possible that the Area functions as a final sink for the majority of MPP and the five gyres collecting MPP in their midst are all located in the high seas. Though collectively this poses a threat to the health of the marine environment and can indirectly and negatively affect the marine environment within national jurisdiction, the current legal structures on remedies are not fit to deal with this issue. Even under the rules of State responsibility, the only remedy available would be judgment in the form of satisfaction.

There are alternative options that could help overcome challenges with applying existing legal remedies to MPP and the absence of a compensation and liability mechanism. It is advisable and likely more efficient to address the damage from MPP rather through a new global fund for MPP which could allocate funds for restoration and cleanups to undo as far as possible existing harm without dealing with the complexities of establishing a compensation and liability mechanism. The importance of reducing existing MPP can be justified based on precautionary principle due to the scientific uncertainties regarding ecological and human health effects, based economic losses MPP causes or simply to restore the intrinsic value of the environment to the extent possible.

PART IV – EXTENSIVE PLASTICS WASTES GENERATION: PROMOTING A GLOBAL CIRCULAR ECONOMY OF PLASTICS

CHAPTER 9 – SCIENTIFIC AND LEGAL FOUNDATION TO REDUCE EXTENSIVE PLASTICS WASTES GENERATION

9.1 Introduction

How would a global CE of plastics look like? Envisioning a globally functional CE that maximizes use of plastics wastes as resources and ultimately aims at substantial reduction in plastics wastes generation is an enormous undertaking. The CE is a cluster concept comprising multiple fields of study and represents a new paradigm toward "an industrial system that is restorative or regenerative by intention and design".[986] Though one the main instruments for implementation of CE is law[987] and the plastics production and consumption patterns are essentially global, the idea of global CE of plastics and the role of international law in strengthening the market for this purpose have remained largely unexplored. Furthermore, even in the CE literature, debates regarding the level at which the CE should function are ongoing. Taking a global perspective is thus challenging as no consensus exists that CE should be also promoted at the international level. Furthermore, as most plastics are currently fossil-fuel based, and the CE tends to promote usage of renewable natural resources, there is an inherent contradiction in promoting CE practices for fossil-fuel based plastics that are, on top of this, mixed with many potentially hazardous additive chemicals. Yet disregarding current plastics wastes generation as an opportunity for the CE could have serious consequences as the current waste management systems are already and evidently under overwhelming pressure to deal with these wastes.

Part IV takes on the challenge to discuss these issues and seeks to identify and analyze core elements of a global CE of plastics. It first outlines the theoretical underpinnings and limits of the CE to create common understanding of the basics of the CE and the features that are relevant for promoting the CE with international law in the global plastics problem context. Building on this, rest of the analysis reveals the limited extent to which IEL currently promotes CE and identifies further opportunities for international law to develop a global CE of plastics. These include updating international customs instruments, developing new international technical standards, scaling up globally EPR practices and

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[986] EMF, 'Towards the Circular Economy Vol. 1: Economic and Business Rationale for an Accelerated Transition' (2013) 7.
[987] B Suárez-Eiroa et al., 'Operational Principles of Circular Economy for Sustainable Development: Linking Theory and Practice' (2019) 214 Journal of Cleaner Production. 955; A de Jesus et al., 'Eco-Innovation in the Transition to a Circular Economy: An Analytical Literature' (2018) 172 Journal of Cleaner Production. 3012.

creating a new binding international agreement as a pioneering instrument that seeks to reduce plastics wastes generation according to a new CE paradigm.

9.2 Unravelling the Third Sub-Research Question

> To reduce extensive plastics wastes generation, how do international law and international technical standards promote a global circular economy (CE) of plastics, and how could these efforts be further developed and complemented?

The third sub-research question consists of three clauses, each of which will be addressed in Part IV. The first clause refers the problem; "extensive plastics wastes generation". The sub-chapter 9.3, 'Framing the Problem: Extensive Plastic Waste Generation and Not Using Plastics Wastes as Resources', provides a description of the problem that Part IV targets. It describes which elements of the global plastics problem Part IV deals with to align the legal measures which address or have the potential to address the described part of the problem.

The first clause also delineates the objective of the sub-research question, "to reduce extensive plastics wastes generation". The objective embraces the principles and ideas of the CE as means to achieve the reduction. Chapter 10 – Theoretical Underpinnings and the Limits of the Circular Economy – delves into the interdisciplinary basics of the CE and the role of law in it, which is essential for studying the legal and technical measures seeking to promote a global CE of plastics.

The second clause of the sub-research question, "how do international law and international technical standards promote a global circular economy (CE) of plastics", is the focus of sub-chapter 9.4, 'International Legal Basis to Reduce Extensive Plastic Waste Generation', and Chapter 11 – Mapping and Analysis of the Current International Legal Framework and Technical Standards Applicable to Promoting a Global Circular Economy of Plastics. Sub-chapter 9.4 provides an analysis of the sources of international law that form the foundation and justification for promoting a global CE of plastics described in Part IV. Chapter 11 identifies and maps the current international legal and technical standard framework applicable to promoting a global CE of plastics and evaluates it.

The third clause of the sub-research question, "and how could these efforts be further developed and complemented?" is the focus of Chapter 12 – Further Legal Measures to Promote a Global Circular Economy of Plastics. Chapter 12 moves beyond what Chapter 11 identifies as the current international legal and technical standards framework, and discusses further legal and standardization measures to add to current means of promoting a global CE of plastics. Chapter 12 analyses these further measures in two phases. First, it focuses on harmonization of classifications in international trade, harmonization of international technical standards, and global EPR. Second, it analyses what would be the added value of a new treaty on plastics with regards to promoting a global CE of plastics to reduce extensive waste generation and to use plastics wastes as resources. Chapter 12 also gathers the main findings of Part IV as preliminary conclusions, which will then be combined and further developed in Part V – Conclusions.

9.3 Framing the Problem: Extensive Plastic Waste Generation

In Part IV, the problem is defined as extensive plastics waste generation. It signifies that the problem is framed as an issue of the linear 'take-make-dispose' pattern of production and consumption of plastics.[988] Eliminating extensive plastics waste generation and treating plastics wastes as resources in a CE is a matter of global concern and international law for two main reasons. First, environmental pressures from steeply increasing global plastics production pose a significant risk of plastics leakage and transboundary harm from MPP within and beyond national jurisdiction. Second, plastics are produced, transported, consumed, and discarded globally, and therefore international law and standards should have a role in promoting the elimination of extensive plastics wastes generation. Part IV deals with upstream activities that relate to reducing waste generation and improving the lifecycle of plastics, which can subsequently reduce plastics leakage and MPP in the long run. This sub-chapter identifies the most relevant factors that contribute to extensive plastics wastes generation, or are otherwise important background elements to the problem and need to be taken into account to promote a global CE of plastics.

Throughout its evolution and diversification, the industrial economy has never moved beyond one fundamental characteristic established in the early days of industrialization: a linear model of resource consumption that follows a 'take-make-dispose' pattern. Companies extract materials, apply energy and labor to manufacture a product, and sell it to an end consumer, who then discards it when it no longer serves its purpose.[989] While great strides have been made in improving resource efficiency, any system based on consumption and disposal rather than on the restorative use of resources entails significant losses all along the value chain.[990] The plastics industry, too, relies heavily on a linear model of production. In plastics production, raw materials are first extracted, then transformed into industrial chemicals and resins, and these components – along with added chemicals – are then used

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[988] See eg, R Merli et al., 'How Do Scholars Approach the Circular Economy? A Systematic Literature Review' (2018) 178 Journal of Cleaner Production. 704.
[989] EMF, 'Towards the Circular Economy Vol. 1 – Economic and Business Rationale for an Accelerated Transition' (2013) 14.
[990] *Ibid.*; E Maitre-Ekern, 'The Choice of Regulatory Instruments for a Circular Economy' in K Mathis and BR Huber (eds) *Environmental Law and Economics* (Springer 2017) Economic Analysis of Law in European Legal Scholarship 4. 306-307.

to manufacture a myriad of plastics items for consumption. After the plastic product has reached the end of its life, it is discarded. Single-use plastics and plastic packaging, in particular, are designed to have a very short lifespan. The linear model of producing plastics is problematic because it considers natural resources and waste to be free inputs and outputs to the economic system.[991] The plastics industry's dependency on non-renewable natural resources contributes to their depletion on Earth, and the generation of plastics wastes results in degradation of the environment in the form of pollution. The current linear system of producing plastics, which demands constant growth of production and consumption at the expense of the environment, is highly unsustainable.[992] Transforming linear plastics production and consumption into a circular process is thus the main interest and guiding theme of this Part IV.

However, constructing a more circular system necessitates strengthening the market to encourage practices such as reuse, repair, refurbishing, remanufacturing and recycling of plastics items and wastes.[993] The recycling rates for plastics are significantly lower, globally, than for other internationally traded commodities, such as steel, metals and paper.[994] The key challenges in markets for recycled plastics are the profitability of sorting and recycling activities, and the uncertainty about the availability and quality of recycled plastics.[995] Arguably, the same issues apply to other CE activities such as reuse, repair, refurbishing and remanufacturing. Both suppliers and buyers would benefit from larger and more liquid markets. However, neither party has strong incentives to act alone.[996] Globally, approaches and initiatives to promote the CE and its support infrastructure seem to be absent, and plastics, in particular, are less studied.[997] Strengthening the market to better serve a global CE of plastics is the main focus of this Part.

Creating a global CE of plastics and strengthening the market for secondary plastics materials and products is closely linked to international trade.[998] The main reason is that the value chains of plastics

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[991] E Maitre-Ekern, 'The Choice of Regulatory Instruments for a Circular Economy' in K Mathis and BR Huber (eds) *Environmental Law and Economics* (Springer 2017) Economic Analysis of Law in European Legal Scholarship 4. 306.
[992] *Ibid.* 307-308.
[993] OECD, 'Improving Plastics Management: Trends, Policy Responses, and the Role of International Co-operation and Trade' (2018) 12 OECD Environment Policy Papers. 7; IRP, 'Redefining Value. The Manufacturing Revolution. Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy' (2018) 195.
[994] OECD, 'Improving Plastics Management: Trends, Policy Responses, and the Role of International Co-operation and Trade' (2018) 12 OECD Environment Policy Papers. 7.
[995] *Ibid.* 12.
[996] *Ibid.* 13.
[997] M Lieder and A Rashid, 'Towards Circular Economy Implementation: A Comprehensive Review in Context of Manufacturing Industry' (2016) 115 Journal of Cleaner Production. 47; K Winans et al., 'The History and Current Applications of the Circular Economy Concept' (2017) 68 Renewable and Sustainable Energy Reviews 1. 830.
[998] IRP, 'Redefining Value. The Manufacturing Revolution. Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy' (2018) 28; S Yamaguchi, 'International Trade and the Transition to a More Resource Efficient and Circular Economy: A Concept Paper' (OECD Publishing 2018) OECD Trade and Environment Working Papers. 6.

are long, complex, and essentially global. Products and their components move across borders, as do products that have reached their end-of-life and are traded as secondary goods, secondary materials, or as wastes.[999] International trade thus has the potential to reconcile variations in supply and demand between countries by facilitating the use of secondary materials as a resource.[1000] For example, recovered steel, metals and paper are all traded via global supply chains.[1001] Steel scrap used in crude steel production is around 36%.[1002] The recycling rates for 18 of 60 studied metals is over 50%,[1003] and the global paper recycling rate to recovered and recycled fiber is 59.3%.[1004]

Some States and regions, such as China and the EU, have already taken significant steps in their domestic and regional policies toward a CE of plastics, but mainstreaming and scaling up these policies globally are still in their infancy and the role of international trade as a potential enabler of these efforts is yet to be explored more broadly. Taking international trade into consideration in CE discussions from the beginning is important, because purely national efforts to shift toward CE have raised concerns about creating unnecessary trade barriers and have already led to disputes between trade partners.[1005] Figure 13 below demonstrates all the phases of product life in a CE, and their links to international trade:

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[999] S Yamaguchi, 'International Trade and the Transition to a More Resource Efficient and Circular Economy: A Concept Paper' (OECD Publishing 2018) OECD Trade and Environment Working Papers. 7.

[1000] R Grace et al., 'Secondary Materials and International Trade' (1978) 5 Journal of Environmental Economics and Management 5. 184.

[1001] *Ibid.* 172; M Sell and N Pajunen, 'The Circular Economy – What's Trade Got to Do with It? (14 September 2018) International Centre for Trade and Sustainable Development. https://ictsd.iisd.org/opinion/the-circular-economy-

[1002] BIR Ferrous Division, 'World Steel Recycling in Figures 2013-2017: Steel Scrap – a Raw Material for Steelmaking' (BIR 2018) 5.

[1003] UNEP, 'Recycling Rates of Metals – A Status Report' (2011) A Report of the Working Group on the Global Metal Flows to the International Resource Panel. 18-19.

[1004] International Council of Forest & Paper Associations, 'Sustainability Progress Report' (2019) 3.

[1005] S Yamaguchi, 'International Trade and the Transition to a More Resource Efficient and Circular Economy: A Concept Paper' (OECD Publishing 2018) OECD Trade and Environment Working Papers. 10; WTO, *Russian Federation – Recycling Fee on Motor Vehicles*, DS462-DS463. Both disputes are pending final decisions. https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds462_e.htm

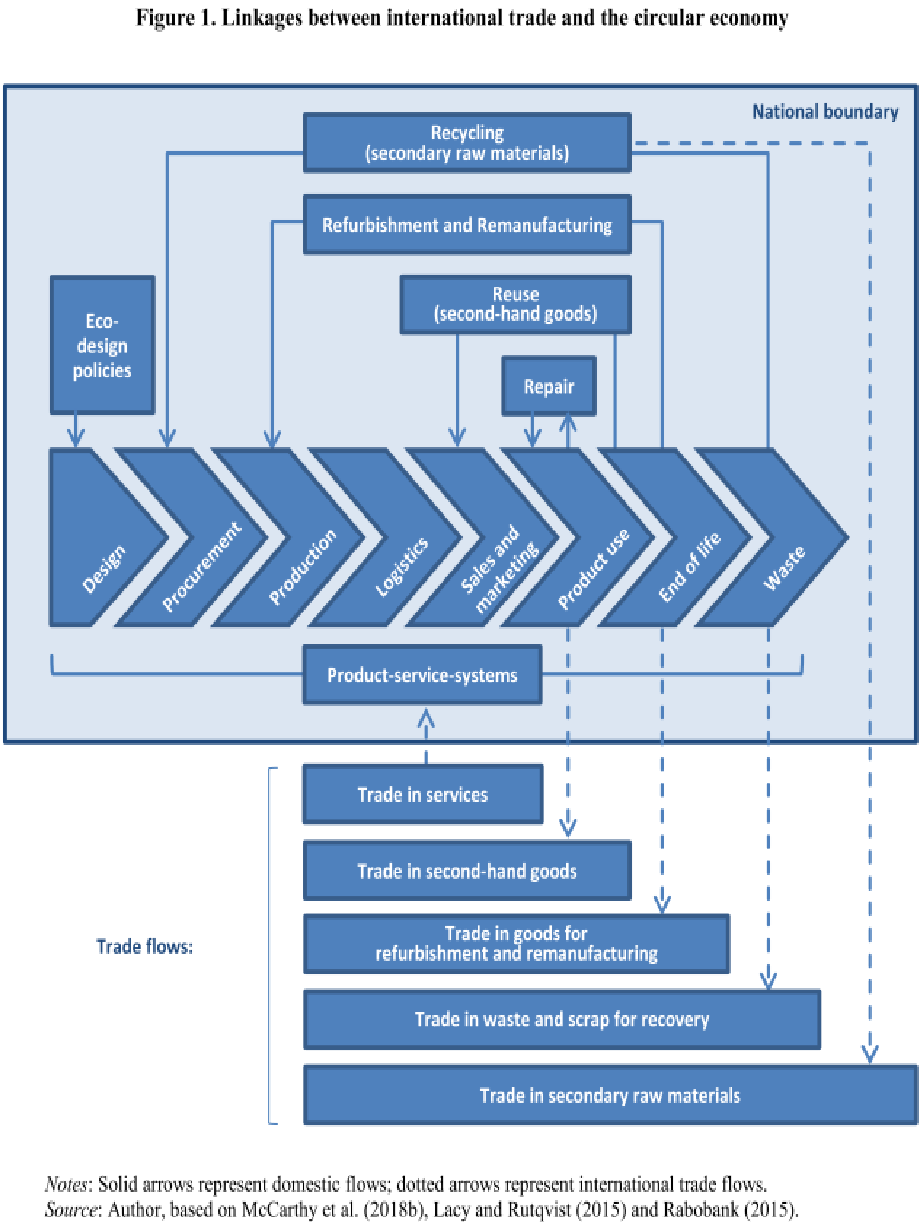

Fig. 13 Linkages between international trade and the circular economy.[1006]

Recently high-level representatives from the Organization for Economic Co-operation and Development (OECD) and the WTO have stressed the issues of trade rules and barriers, and the need for harmonizing classifications and standards to facilitate international trade in relation to the CE.[1007] Furthermore, the legal definitions and classifications of waste and scrap, secondary materials,

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[1006] S Yamaguchi, 'International Trade and the Transition to a More Resource Efficient and Circular Economy: A Concept Paper' (OECD Publishing 2018) OECD Trade and Environment Working Papers. 9.
[1007] World Circular Economy Forum (WCEF), 'Circularity in Global Value Chains' (Yokohama, Japan 23.10.2018) https://www.sitra.fi/en/articles/circularity-global-value-chains/; World Circular Economy Forum (WCEF), 'International Trade in Circular Economy Goods and Services' (Helsinki, Finland 4.6.2019) https://www.youtube.com/watch?v=B6dhmfm5wpI&feature=youtu.be

second-hand goods, and refurbishment and remanufacturing vary or are lacking, complicating their trade between countries.[1008] Facilitating the interface between national boundaries and international trade flows requires alignment of legal and policy measures and international co-operation.[1009] These aspects to international trade are essential for evaluating and developing the international legal and standardization framework for the global CE of plastics.

Not all plastics are equally suitable for the CE however. Recovering either primary or secondary microplastics which have leaked into the environment is practically possible from the viewpoint of the CE.[1010] Therefore, the focus of this Part is on macroplastics wastes. Another distinction is between thermoplastics and thermoset plastics.[1011] Thermoplastics can be molded repeatedly, and all the most common plastics used belong to this group. Thermosets can only be shaped once, and stay solid after that.[1012] Subsequently, generally only thermoplastics can be used in the CE and are the main focus in this Part, whereas all thermosets plastics wastes belong to the sphere of Part II, as the main means of disposal currently available are energy recovery or landfill.[1013]

From 1950 to 2018, yearly plastics production grew from 2 Mt to over 400 Mt. Since the onset of production in the 1950s, 8300 Mt of plastics have been produced in total.[1014] Global plastics production is still growing exponentially and is expected to reach the 500 Mt yearly production by 2025 in a business-as-usual scenario.[1015] Of the 8300 Mt of produced plastics, 6300 Mt has become waste. Only 9% of the produced plastics have been recycled, the rest are in use or have been incinerated, or have ended up either in landfills or in the environment.[1016] These figures show

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1008 S Yamaguchi, 'International Trade and the Transition to a More Resource Efficient and Circular Economy: A Concept Paper' (OECD Publishing 2018) OECD Trade and Environment Working Papers. 13, 16, 17.

1009 A Cox (Deputy Director of the Environment Directorate, OECD), 'International Trade in Circular Economy Goods and Services' (Helsinki 4.6.2019) World Circular Economy Forum (WCEF) https://www.youtube.com/watch?v=B6dhmfm5wpI&feature=youtu.be

1010 For example, The Ocean Cleanup systems will be able to catch centimeter-sized plastics at most, and these are not microplastics. The Ocean Cleanup, 'FAQ' https://theoceancleanup.com/faq/

1011 GM Scheutz et al., 'Adaptable Crosslinks in Polymeric Materials: Resolving the Intersection of Thermoplastics and Thermosets' (2019) 141 Journal of the American Chemical Society. 16181.

1012 *Ibid.*; UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 26.

1013 Recycling options for thermosets are under development, see eg, Recycling Today, 'Process Aims to Recycle Thermoset Plastic Scrap' (27 October 2020) https://www.recyclingtoday.com/article/process-aims-to-recycle-thermoset-plastic-scrap/

1014 R Geyer et al., 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances 7. 2.

1015 GESAMP, 'Pollution in the Open Oceans 2009-2013 – A Report by a GESAMP Task Team' (2015) 91 GESAMP Reports and Studies. 39; P Dauvergne, 'Why is the Global Governance of Plastic Failing the Oceans? (2018) 51 Global Environmental Change. 24. Dauvergne has extrapolated these figures from data in R Geyer et al., 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances 7.

1016 R Geyer et al., 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances 7. 2-3.

significant potential to increase the recycling rates and other value retention processes (VRPs) for plastics wastes.

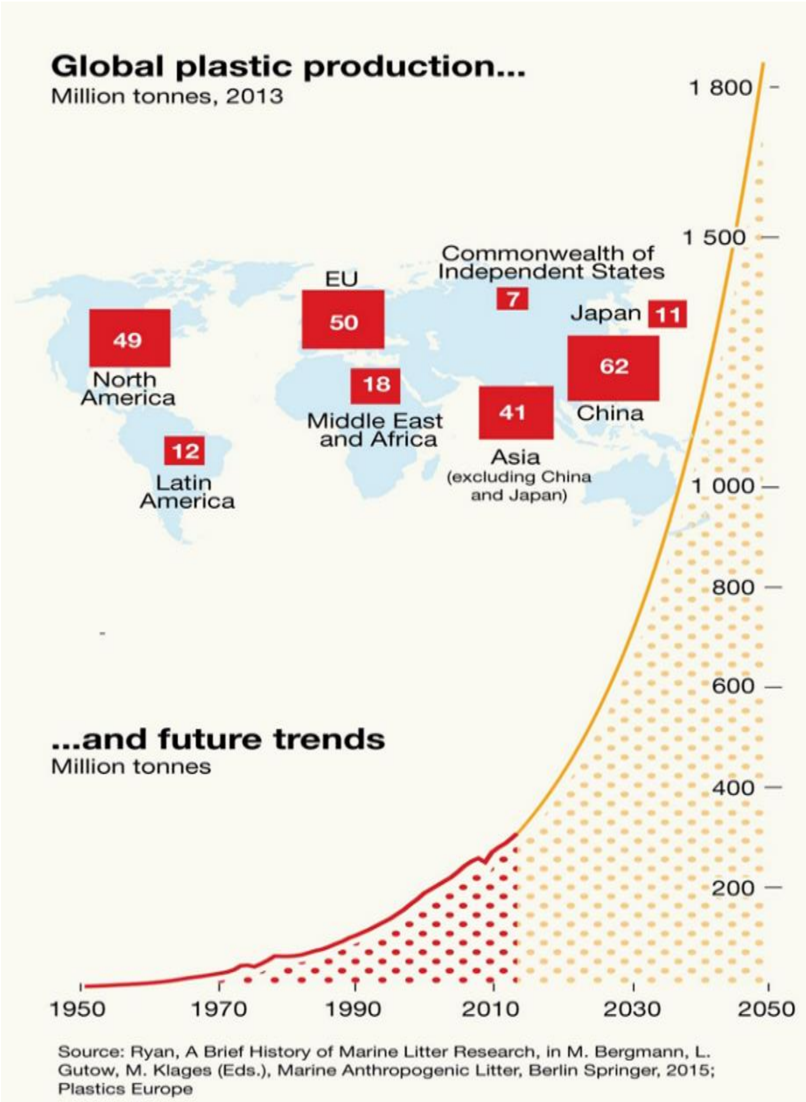

Fig. 14 Global Plastic Production and Future Trends.[1017]

The majority of plastics (99%) derive from fossil fuels.[1018] An "overwhelming majority of plastics can be traced to product streams of just two industrial chemicals: ethylene and propylene."[1019] Ethylene and propylene are both produced from natural gas liquids (a by-product of natural gas exploration) or from naphtha (a product of crude oil refining), though propylene is also produced directly. For polyethylene (PE), polyvinyl chloride (PVC), polyethylene terephthalate (PET), and polystyrene (PS),

[1017] GRID-Arendal, 'Global Plastic Production and Future Trends' (2018) <http://www.grida.no/resources/6923>
[1018] CIEL, 'Fossils, Plastics & Petrochemical Feedstocks' (CIEL 2017) Fueling Plastics – Series. 1.
[1019] *Ibid.* 2; The Greatest Engineering Achievements, 'Petroleum Technology History Part 2 – Refining Byproducts' http://greatachievements.org/?id=3679

ethylene is the most critical raw material, whereas for polypropylene (PP) it is propylene.[1020] Plastics are a way for fossil fuel companies to make money out of their waste streams. Natural gas liquids from gas development and naphtha from oil refining are abundant because of the demand for the other components of gas and oil. For example, naphtha presents only between one sixth and one third of the total production from an oil refinery.[1021] Currently 4-8% of global oil production is used to make plastics, but if the business-as-usual model to produce plastics continues, the plastics industry will use 20% of global oil by 2050.[1022] Bio-based or biodegradable plastics form only a small fraction of global production capacity.[1023] Promoting CE practices for fossil fuel-based plastics is thus the main interest of this section of the study.

China, the rest of Asia, Europe and North America are the four regions in the world which dominate production, as shown above in Figure 14.[1024] The companies producing plastics are multiple transnational corporations.[1025] The biggest companies in the plastic industry in 2018 included DowDuPont (US), LyondellBasell (US, UK and the Netherlands), ExxonMobil (US), SABIC (Saudi-Arabia), BASF (Germany), LG Chemicals (South Korea), Borouge (Singapore and UAE), Lanxess (Germany), Formosa Plastics Corp (Taiwan), and Alpla (Australia).[1026] Furthermore, the largest companies when looking at both the fossil fuel and plastics industries, are integrated companies that produce both fossil fuels and plastics: DowDuPont, ExxonMobil, Shell, Chevron, BP, and Sinopec.[1027] Therefore, "understanding these linkages and their role in driving plastics production and investment, is key to identifying the role corporate actors can play in contributing to solutions."[1028] This aspect is particularly relevant for harmonization and development of international technical standards in cooperation with States and the relevant industries.

Polyethylene (PE, 36%), polypropylene (PP, 21 %) and polyvinyl chloride (PVC, 12 %) are the three main types of plastics that dominate the market. Also the market shares of polyethylene terephthalate

1020 CIEL, 'How Fracked Gas, Cheap Oil and Unburnable Coal Are Driving the Plastics Boom' (CIEL 2017) Fueling Plastics – Series. 2-3.
1021 CIEL, 'Untested Assumptions and Unanswered Questions in the Plastics Boom' (CIEL 2018) Fueling Plastics – Series. 4.
1022 *Ibid.* 5.
1023 CIEL, 'Fossils, Plastics & Petrochemical Feedstocks' (CIEL 2017) Fueling Plastics – Series. 1; CIEL, 'Untested Assumptions and Unanswered Questions in the Plastics Boom' (CIEL 2018) Fueling Plastics – Series. 2.
1024 UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 26.
1025 P Dauvergne, 'Why is the Global Governance of Plastic Failing the Oceans? (2018) 51 Global Environmental Change. 24.
1026 The Daily Records, 'Top 10 Best Plastic Companies in the World' (2 January 2019) http://www.thedailyrecords.com/2018-2019-2020-2021/world-famous-top-10-list/highest-selling-brands-products-companies-reviews/best-plastic-companies-world-largest-manufacturing/6843/
1027 CIEL, 'Fossils, Plastics & Petrochemical Feedstocks' (CIEL 2017) Fueling Plastics – Series. 3-4.
1028 *Ibid.* 4.

(PET, <10%), polystyrene (PS, <10%) and polyurethane (PUR, <10%) are noticeable. Polyester, which consists mostly of PET, accounts for 70% of all polyester, polyamide and acrylic (PP&A) fiber production. These seven groups, PE, PP, PVC, PET, PS, PUR and polyester, account for 92% of all plastics ever made.[1029] This provides clear guidance as for which plastics types to particularly target with CE practices.

As the polymer material science has developed, plastics materials have proliferated and become highly complex.[1030] The industries involved in plastics produce hundreds of other polymers in addition to the most common types, and hundreds of thousands of different products.[1031] Additives make matters even more complex. Plastics contain generally 93% polymer resin and 7% additives.[1032] However, the additives can make up a more significant share of the plastic material, in some cases even up to 60% of the weight.[1033] Several thousand different additives exist for plastic polymers and the use of additives is not evenly distributed among the different plastics types. For example, "PVC requires by far the most additives of all plastics types, alone accounting for 73% of the world production of additives by volume."[1034] Another example is propylene which can be used with approximately 900 additives.[1035] Managing the complexity of chemicals associated with plastics production and their end-of-life management is one of the biggest challenges concerning the CE of plastics.

Just three market sectors account for 76% of total polymer resin production. Packaging has used 45%, building and construction 19%, and consumer and institutional products 12% of all non-fiber plastics. Packaging is mainly composed of PE, PP and PET.[1036] Packaging is thus globally the largest plastics sector, and appears as food-wrappings, milk cartons, shopping bags, and water bottles, which are all incorporated into the daily routines of life.[1037] Ethylene and propylene have a crucial role in the

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1029 R Geyer et al., 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances 7. 1; The percentages vary slightly depending on the source. See for comparison eg, PlasticsEurope, 'The World Plastics Production 1950-2015' https://committee.iso.org/files/live/sites/tc61/files/The%20Plastic%20Industry%20Berlin%20Aug%202016%20-%20Copy.pdf :polyethylene (34.4%), polypropylene (24.2%), polyvinyl chloride (16.5%), polyethylene terephthalate (7.7%), and polystyrene (7.3%).

1030 EMF, 'Towards the Circular Economy Vol. 3: Accelerating the Scale-up across Global Supply Chains' (2013) 39, 43.

1031 P Dauvergne, 'Why is the Global Governance of Plastic Failing the Oceans? (2018) 51 Global Environmental Change. 24.

1032 R Geyer et al., 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances 7. 1.

1033 L van Oers et al., 'Addtives in the Plastics Industry' in B Bilitewski et al. (eds) *Global Risk-Based Management of Chemical Additives I: Production, Usage and Environmental Occurrence* (Springer 2012) 18 The Handbook of Environmental Chemistry. 141.

1034 D Lithner et al., 'Environmental and Health Hazard Ranking and Assessment of Plastic Polymers Based on Chemical Composition' (2011) 409 The Science of Total Environment 18. 3322.

1035 EMF, 'Towards the Circular Economy Vol. 3: Accelerating the Scale-up across Global Supply Chains' (2013) 43.

1036 R Geyer et al., 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances 7. Table S2. Share of total polymer resin production according to polymer type and industrial use sector calculated from data for Europe, the United States, China, and India covering the period 2002–2014.

1037 S Nils and ML Schulte, 'Stopping Global Plastic Pollution: The Case for an International Convention' (Heinrich Böll Stiftung 2017) 43 Publication Series Ecology. 15.

production of plastics packaging.[1038] Building and construction have used 69% of all PVC, and consumer and institutional products mostly consist of PE, PP and PS.[1039] Addressing these three sectors and the most common plastics types they use with CE practices could have significant and far reaching benefits globally and should be the first priority, particularly packaging. Additionally, as this research ultimately aims at protecting the marine environment, also targeting the circularity of fishing gear is paramount. Fishing gear is largely composed of plastics, such as a nylon, polyethylene and polypropylene, with potential for repair, reuse and recycling.[1040]

These trends show that the majority of the generated plastics wastes are fossil-fuel-based and therefore dealing with these fossil-fuel based legacy wastes needs to be assessed in relation to CE practices. Such progress could also affect the current trajectory of increasing use of new fossil fuel resources in plastics production. The current complexity of plastics materials and products significantly complicates their treatment as a resource. Adding to the complexity, the chemicals contained in products and plastics wastes also need to be considered. The intricacy highlights the need for harmonized international technical standards as a means to provide more simplified, globally scalable solutions. Knowledge of differences between the linear and circular economy, international trade links to the CE, global plastics production trajectories, markets for virgin and secondary raw materials and products, disposal and recycling rates, raw materials, material properties, the most common polluting types and usage sectors, and the most influential producers are essential to understanding the overall problem space. The following analysis of the CE, international law and standardization is constructed on the premises presented in this sub-chapter.

9.4 The International Legal Basis to Reduce Extensive Plastics Wastes Generation

As responses to the problems of linear plastics production and consumption, plastics leakage prevention and remedying harm from MPP are not fit-for-purpose. The circular economy, as opposed to the linear economy, provides a new paradigm on which Part IV builds a legal response focused on upstream activities. These upstream activities relate to the three most favorable waste hierarchy elements of reduction, reuse and recycling, as well as to other value retention options, such as refurbishment or remanufacturing. The analysis of a general legal foundation to promote a global

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1038 CIEL, 'Fossils, Plastics & Petrochemical Feedstocks' (CIEL 2017) Fueling Plastics – Series 2.
1039 R Geyer et al., 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances 7. 1, Table S2. Share of total polymer resin production according to polymer type and industrial use sector calculated from data for Europe, the United States, China, and India covering the period 2002–2014.
1040 AT Pruter, 'Sources, Quantities, and Distribution of Persistent Plastics in the Marine Environment' (1987) 18 Marine Pollution Bulletin 6B. 307.

CE of plastics for the purposes of protecting the marine environment anchors to those elements of international environmental law that support the paradigm shift to the CE.

Significant evidence of MPP's negative impact in the oceans is already available. A causal link thus clearly exists between plastics and environmental harm and the principles of prevention and the no-harm rule apply.[1041] As already discussed in the previous parts, the standard of due diligence is essential for determining what kind of effort to prevent plastics leakage a State is required to take under the no-harm rule, the prevention principle, and the general obligations to protect the marine environment. Here, the analysis of due diligence concerns its evolving character in the context of the 'best environmental practices' (BEP), and to some – although lesser – extent the 'best available technology' (BAT). Moreover, some uncertainties with regard to impacts of MPP remain which means that the precautionary principle/approach is also needed. And finally, the intergenerational equity principle is also relevant due to the long-term impacts of MPP on future generations. These principles form the international legal basis for the approach of Part IV regarding reducing extensive plastics wastes generation and using plastics wastes as resources in a CE.

The level and standard of due diligence are constantly evolving. Therefore, "there is a need to explore an evolving standard of due diligence, which can take account of changes of technology and environmental knowledge over time."[1042] Particularly important concepts in this exploration are BAT and BEP.[1043] These terms appear in a multitude of instruments from the national to the global level and do not have one agreed definition. One of the most recent multilateral environmental agreements, the Minamata Convention regulating mercury, provides the following definitions, which serve the purposes of this sub-chapter in providing an understanding of the concepts:

> "Best environmental practices" means the application of the most appropriate combination of environmental control measures and strategies.[1044]
>
> "Best available techniques" means those techniques that are the most effective to prevent and reduce emissions and releases…to air, water and land and the impact of such emissions and releases on the environment as a whole, taking into account economic and technical considerations for a given Party or a given facility within the territory of that Party.[1045]

1041 Ocean Conservancy and McKinsey Center for Business and Environment, 'Stemming the Tide: Land-Based Strategies for a Plastic-Free Ocean' (2015) 11-12; JR Jambeck et al., 'Plastic Waste Inputs from Land into the Ocean' (2015) 347 Science 6223; See, e.g., UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 88-110.
1042 Y Tanaka, 'Reflections on Time Elements in the International Law of the Environment' (2013) 73 Heidelberg Journal of International Law. 161.
1043 *Ibid.*
1044 Art 2, Minamata Convention on Mercury (Adopted 10 October 2013, entered into force 16 August 2017) ('Minamata Convention'); Appendix 1 of the OSPAR Convention provides the exact same definition of BEP.
1045 Art 2, the Minamata Convention.

BEP and BAT require States "to review and update their technology and practice concerning environmental protection in the light of technological and scientific advances."[1046] If a State fails to apply BEP and BAT and activities within its territory cause serious (transboundary) environmental damage, that State would find it difficult to claim it had exercised due diligence. Therefore, "it can be argued that the obligation to use BAT and BEP allows for the evolving standard of due diligence to change as technology develop[s] with time."[1047] The ITLOS has also reinforced the connection between the obligation of due diligence and the obligation to apply BEP:[1048]

> [I]n light of the advancement in scientific knowledge, member States of the [International Seabed] Authority have become convinced of the need for sponsoring States to apply 'best environmental practices' in general terms so that they may be seen to have become enshrined in the sponsoring States' obligation of due diligence.[1049]

With regards to using BEP as part of evaluating due diligence in marine environmental protection, Article 194(1) of the LOSC stipulates that:

> States shall take, individually or jointly as appropriate, all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment from any source, using for this purpose *the best practicable means at their disposal* and in accordance with their capabilities, and they shall endeavour to harmonize their policies in this connection.[1050]

The LOSC refers to "the best practicable means", which differs slightly from the wording of BEP. Literature provides some guidance as to the significance of the different wording. Birnie et al. use these terms interchangeably:

> …due diligence entails an evolving standard of technology and regulation. This is commonly expressed by reference to the use of 'best available techniques', 'best practicable means', or 'best environmental practices'.[1051]

Moreover, Czybulka notes that "[o]n a regional level, this provision [194(1)] may become meaningless if principles of best available technology (BAT) and/or best environmental practices (BEP) are normatively established."[1052] This indicates that BAT and/or BEP either take precedence over 'best practicable means' as more precise concepts, or that, in essence, BAT and/or BEP and the 'best

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[1046] Y Tanaka, 'Reflections on Time Elements in the International Law of the Environment' (2013) 73 Heidelberg Journal of International Law. 174.
[1047] *Ibid.* 162-163.
[1048] *Ibid.* 163.
[1049] *Responsibilities and Obligations of States with respect to Activities in the Area* (Advisory Opinion) [2011] ITLOS Reports 2011. 48, para 136.
[1050] Cursive is mine.
[1051] P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009) 148.
[1052] D Czybulka, 'Article 194: Measures to Prevent, Reduce and Control Pollution of the Marine Environment' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017) 1304.

practicable means' have the same meaning.[1053] The nuances between BAT and BEP, and the best practicable means are subject to debate. It suffices here that these concepts are very similar, and that the language of the LOSC seems to entail BAT and BEP, which makes them relevant for marine environmental protection.

The question that follows, then, is whether a CE of plastics could be considered as a BEP to protect the oceans in the future from irreversible damage. As the CE involves much more than just technologies – as Chapter 10 will demonstrate – the focus is mostly on BEP. IEL does not provide a checklist concerning what qualifies as BEP at any given time. Therefore, any indication that the CE of plastics qualifies as a BEP to tackle the global plastics problem has to be sought elsewhere. Major actors in the international sphere have made contributions in combining the CE and plastics leakage prevention. Though they have not used the principle of BEP in their vocabulary, these contributions are valuable as evidence of state-of-art combinations of environmental control measures and strategies to tackle MPP with CE practices.

The EU has been a frontrunner in developing and adopting the CE regionally and also applying this approach to plastics. The EU considers that "promoting the global uptake of the EU's circular economy approach to plastics has the potential of considerably reducing the overall impacts of plastics on the environment (both land and seas)."[1054] The EU's first Circular Economy Action Plan showed the potential to address plastics leakage through CE practices such as product design, production processes, consumption, waste management, turning waste into resource, innovation, investment, monitoring, and the role of a CE of plastics as a route to achieving the Sustainable Development Goals (SDGs).[1055] An essential part of the EU's CE package is its Plastics Strategy. The Plastics Strategy promotes measures to improve product design, boost recycled content, improve separate collection of plastics waste, reduce single-use plastics, tackle sea-based sources of marine litter, monitor marine litter, develop compostable and biodegradable plastics, curb microplastics pollution, promote investment and innovation in the value chain, and to spark global action relating to the international trade aspects of the CE.[1056] The new Circular Economy Action Plan has reinforced the

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[1053] See, N Giannopoulos, 'Global Environmental Regulation of Offshore Energy Production: Searching for Legal Standards in Ocean Governance' (2019) 28 Review of European, Comparative and International Environmental Law 3. 12.
[1054] EC, 'Leading the Way to a Global Circular Economy: State of Play and Outlook' (2020) Commission Staff Document SWD(2020) 100 Final. 21.
[1055] P ten Brink et al.,, 'Plastics Marine Litter and Circular Economy' (2016) A Briefing by IEEP for the MAVA Foundation. 12.
[1056] EC, 'Annexes to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A European Strategy for Plastics in a Circular Economy' (2018) COM(2018) 28 Final. Annex 1.

EU's commitment to a CE of plastics and its links to marine environmental protection.[1057] In the EU, a variety of CE measures and strategies have become an inherent and instrumental part of curbing MPP, and the combination of measures can be seen as BEP in relation to the issue.

Also according to the United Nations Industrial Development Organization (UNIDO), "the problem of marine plastic litter can be addressed inter alia through implementing CE practices."[1058] In its recommendations, UNIDO addresses CE practices in the product design stage, production stage, service sectors, use stage, at the end of the first life stage, and final disposal, concluding that:

> Product design, renewable and bio-degradable plastics, reverse logistics and innovative business models for product-life extension, sharing platforms, resource recovery, product as service and circular supplies could act as main drivers for unlocking economic value of plastic materials and prevent their escape to the oceans.[1059]

Furthermore, though not in a binding part of the treaty, the Preamble to the London Convention affirms that:

> Marine pollution originates in many sources, such as dumping and discharges through the atmosphere, rivers, estuaries, outfalls and pipelines, and it is important that states use the best practicable means to prevent such pollution and develop products and processes which will reduce the amount of harmful wastes to be disposed of.

When the Preamble of the London Convention was being drafted, the CE was not as well-known a concept so it could not be referred to as such. However, the idea in the Preamble of promoting waste-reducing product and production processes in essence refers to CE practices. Also the Fourth United Nations Environment Assembly (UNEA-4) made an explicit link between various CE practices and curbing plastics leakage and MPP in five Resolutions, which will be further investigated in section 11.3.3, 'UNEA Resolutions'.

Promoting a global CE of plastics to protect the marine environment requires *inter alia* an appropriate combination of environmental control measures and strategies. Though CE practices regarding plastics are a relatively recent collection of measures to be used as tools for marine environmental protection, they have in recent years mainstreamed in policy documents and literature as the most promising way to deal with upstream activities concerning plastics as well. Furthermore, the policy documents and literature explicitly make the connection between MPP and the potential of CE practices to reduce marine plastics pollution over the long term. These measures are still fragmented

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[1057] EC, 'A New Circular Economy Action Plan for a Cleaner and More Competitive Europe' (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM(2020) 98 Final. 9, 10.

[1058] UNIDO, 'Addressing the challenge of Marine Plastic Litter using Circular Economy Methods: Relevant Considerations' (2019) A Working Paper. 1.

[1059] *Ibid.* 42.

and scattered in the international sphere and do not form a comprehensive policy program for promoting the global CE of plastics. Nevertheless, they provide strong evidence for arguing that CE practices should be considered an integral part of BEP in the fight against increasing MPP. Furthermore, the EU, as a frontrunner for developing a regional policy program and concrete legal measures for promoting the CE of plastics, has already showcased how these measures can be used as BEP. The evolving and flexible standard of due diligence, which is currently the main yardstick for evaluating whether Sates are taking the necessary measures to prevent land-based plastics leakage, is designed to be able to take into account new practices and technologies. CE practices for plastics are highly relevant in this regard and should increasingly be incorporated as BEP and BAT when evaluating the standard of due diligence regarding protection of the marine environment. This is particularly relevant for developed States that have the capacity to implement them, but should also be included in capacity building efforts in developing States.

Though the impacts of MPP to date are well-established and preventive action warranted, a number of uncertain risks remain and thus call for a precautionary approach. Particularly, the effect of chemicals in plastics and their impact on both the marine environment and human health remains unclear.[1060] Principle 15 of the Rio Declaration defines the precautionary principle in the following manner:

> In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Principle 15 reflects most analyses of the precautionary principle, which reduce it to two main components: "preventive action in the face of uncertainty and reversing the burden of proof (i.e., that those who create risks should have an obligation to understand them and demonstrate safety)."[1061] Applying this to plastics, the precautionary approach is particularly apposite when developing global governance of chemicals used in plastics.[1062] The absence of full scientific certainty regarding the impact of chemicals in plastics on human health and the marine environment should not prevent action being taking. In time, this would facilitate the safe use of chemicals in a CE of plastics.

1060 UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 152.
1061 JA Tickner and K Geiser, 'The Precautionary Principle Stimulus for Solutions and Alternatives-Based Environmental Policy' (2004) 24 Environmental Impact Assessment Review 7-8. 803.
1062 UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 107.

However, "more recent statements of the precautionary principle … have suggested an additional component that is critical to the effective implementation of the precautionary principle: assessment of alternatives. Alternatives assessment, also referred to as options analysis, facility planning, source reduction planning, and pollution prevention planning, redirects environmental science and policy debates from describing problems to identifying solutions."[1063] Therefore, it can be argued that the precautionary approach should be used to assess risks stemming from the projected increase in linear production of plastics more broadly, and to promote CE practices as potential responses to these threats. This means that "rather than solely focusing on the back-end of the production process, after a technology has been developed and risk assessments are being conducted, similar energies need to be placed at the front end of the process, before a technology has been mass produced."[1064] A precautionary approach could encourage, for example, sustainable design to integrate reflections of the long-term impacts of products and services, and "contribute to a change in direction of the current state of affairs and not in the slowing down of the rate of degradation."[1065] Though such interpretation of the precautionary principle may seem progressive, it was actually the objective of the original German concept of precaution, from which the precautionary principle developed. The original aims of the German concept included elements such as promotion of clean production, and innovation and a cooperative approach between stakeholders to solve common problems.[1066]

The intergenerational equity principle "links successive generations to environmental issues."[1067] The intergenerational equity principle has a clear temporal dimension far into the future, which takes into consideration all future generations.[1068] According to Brown Weiss, the principle has three dimensions: depletion of resources, degradation in the quality of resources, and discriminatory access

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[1063] JA Tickner and K Geiser, 'The Precautionary Principle Stimulus for Solutions- and Alternatives-Based Environmental Policy (2004) 24 Environmental Impact Assessment Review 7-8. 803.

[1064] MS Carolan, 'The Precautionary Principle and Traditional Risk Assessment: Rethinking How We Assess and Mitigate Environmental Threats' (2007) 20 Organization & Environment 1. 16.

[1065] C Cucuzzella and P De Coninck, 'The Precautionary Principle as a Framework for Sustainable Design: Attempts to Counter the Rebound Effects of Production and Consumption' (2008) First International Conference on Economic De-growth for Ecological Sustainability and Social Equity. 2, 6. https://www.researchgate.net/profile/Carmela_Cucuzzella/publication/237613196_The_Precautionary_Principle_as_a_Framework_for_Sustainable_Design_Attempts_to_Counter_the_Rebound_Effects_of_Production_and_Consumption/links/0deec529e09fc02b9d000000/The-Precautionary-Principle-as-a-Framework-for-Sustainable-Design-Attempts-to-Counter-the-Rebound-Effects-of-Production-and-Consumption.pdf

[1066] P Harremoes et al., *The Precautionary Principle in the 20th Century: Late Lessons from Early Warnings* (Taylor & Francis Group 2002) 4; See also, S Boehmer-Christiansen, 'The Precautionary Principle in Germany-Enabling Government' in T O'Riordan and J Cameron (eds) *Interpreting on the Precautionary Principle* (EarthScan 1994)

[1067] M Fitzmaurice, 'Whaling and Inter- and Intra-Generational Equity' in M Bowman et al. (eds) *Research Handbook on Biodiversity and Law* (Edward Elgar Publishing 2016) 312.

[1068] E Brown Weiss, 'Intergenerational Equity: a Legal Framework for Global Environmental Change' in E Brown Weiss (ed) *Environmental Change and International Law: New Challenges and Dimensions* (United Nations University Press 1992) 1, 16. http://intergenlaw.com/wp-content/uploads/2015/02/Brown-Weiss-Intergenerational-equity-UN2.pdf to use and benefit from resources.[1069] Current plastics production depletes non-renewable resources as almost all production is virgin fossil fuel-based. MPP also degrades the quality of resources. Conservation of quality means that every generation should maintain the quality of the natural environment to be able to pass it on to future generations in no worse condition than it was inherited from past generations.[1070] MPP harms the environment irreversibly, possibly for hundreds of years, or even longer. The quality of the (marine) environment is already compromised by plastics pollution, and the intergenerational equity principle stipulates that this generation should, at a minimum, bequeath its existing quality to future generations and not worsen the situation. To be able to do that and create a more positive trajectory, as opposed to the current trajectory of growth in virgin fossil-fuel plastics production, this generation should start developing a scalable CE of plastics, not only for its own sake but also in order that the future generations are able to enjoy quality of the marine environment.

[1069] E Brown Weiss, 'Implementing Intergenerational Equity' in M Fitzmaurice et al. (eds) *Research Handbook on International Environmental Law* (Edward Elgar Publishing 2010) 100.
[1070] *Ibid.* 103.

CHAPTER 10 – THEORETICAL UNDERPINNINGS AND LIMITS OF THE CIRCULAR ECONOMY

10.1 Introduction

The interpretation and application of the CE have been diverse.[1071] During the negotiations on the Resolution on Sustainable Production and Consumption at the Fourth United Nations Environment Assembly (UNEA-4), the delegates were "complaining that concepts such as resource efficiency, circular economy, sustainable materials management and 3Rs (Reuse, Reduce, Recycle) did not necessarily have agreed definitions" and that the negotiations had to first focus on discussing "the philosophical understanding" of these concepts.[1072] Ambiguity around the basics of the CE evidently hampers discussions on a global level, and developing a shared vocabulary and common understanding of the concept of the CE and its principles is crucial. Furthermore, also "from a scholarly position, the conceptual discussions on circular economy are still in their infancy and the literature is only emerging. Consequently, there is a need for deeper analysis of the concept, its units of analysis as well as the theoretical basis that underpins it".[1073] To respond to these challenges, Chapter 10 seeks to review the basics of the CE to understand the contributions to the CE from different fields of study regarding the principles of CE, systemic change and the role of law. It also describes the limits of the CE, and discusses the role of international law in particular in advancing the CE.

10.1.1 Definitions of the Circular Economy

The CE developed over a long period of time and multiple different fields have studied CE from their respective angles. CE is of interest to a wide variety of stakeholders, such as policymakers, businesses, researchers, consumers etc. Consequently, a myriad of definitions exist and settling on a single universal definition has proved challenging.[1074] Korhonen et al. argue that it would "always exclude some interests" and it could be counterproductive as the concept is dynamic and evolving.[1075]

1071 Rizos et al. 'The Circular Economy: A Review of Definitions, Processes and Impacts' (CEPS Research Report 2017) 7.
1072 IISD Reporting Services, 'UNEA-4 Highlights' (13 March 2019) 16 Earth Negotiations Bulletin 150. http://enb.iisd.org/unep/oecpr4-unea4/
1073 J Korhonen et al., 'Circular Economy as an Essentially Contested Concept' (2018) 175 Journal of Cleaner Production. 545; These views have also been contested, for example by M Esposito et al., who state that "While it [CE] is rich in concepts and approaches, examination of pragmatic steps toward implementation often falls short." M Esposito et al., 'Introducing Circular Economy: New Thinking with New Managerial and Policy Implications' (2018) 60 California Management Review 3. 7.
1074 R Merli et al., 'How Do Scholars Approach the Circular Economy?' (2017) 178 Journal of Cleaner Production. 704; Rizos et al. 'The Circular Economy: A Review of Definitions, Processes and Impacts' (CEPS Research Report 2017) 6.
1075 J Korhonen et al., 'Circular Economy as an Essentially Contested Concept' (2018) 175 Journal of Cleaner Production. 548.

Therefore, this dissertation does not attempt to formulate its own a definition for the CE and does not place undue weight on an exact definition of the CE concept. The exact wording is not as crucial for this Part IV as creating common understanding of the origins, the content of the concept, and the principles guiding the CE. Nonetheless, to demonstrate the general idea of CE, the three following definitions from literature can be cited. The two first definitions are based on scholarly research, whereas the third is the EMF's definition, which has gained prominence amongst various stakeholders and is also frequently referred to in academic papers.

Literature analyzing the definition of the CE is emerging rapidly.[1076] Kircherr et al., for example, reviewed 114 different definitions of the CE in their research.[1077] Based on their study of the concept, the definition reads:

> A circular economy describes an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations.[1078]

Korhonen et al. have argued that the CE is an "essentially contested concept".[1079] This means that a concept "is liable to be contested for reasons better or worse; but whatever the strength of the reasons they usually carry with them an assumption of agreement, as to the kind of use that is appropriate to the concept in question, between its user and anyone who contests his particular use of it".[1080] This "assumption of agreement" that different definitions share is the transformation from linear to circular production and consumption to reduce the amount of waste, as demonstrated by the three definition examples given in this sub-chapter. Korhonen et al. reason that the CE fulfills all the seven properties required from an essentially contested concept: value accredited to the concept, internal complexity, various ways of describing it, openness, aggressive and defensive uses, references to an authority, and progressive competition.[1081] These attributes support the earlier statement about the

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1076 See eg, J Kircherr et al. 'Conceptualizing the Circular Economy: An Analysis of 114 Definitions' (2017) 127 Resources, Conservation & Recycling; J Korhonen et al., 'Circular Economy as an Essentially Contested Concept' (2018) 175 Journal of Cleaner Production; S Geisendorf and P Pietrulla, 'The Circular Economy and Circular Economy Concepts – A Literature Analysis and Redefinition' (2018) 60 Thunderbird International Business Review.

1077 J Kircherr et al. 'Conceptualizing the Circular Economy: An Analysis of 114 Definitions' (2017) 127 Resources, Conservation & Recycling.

1078 *Ibid.* 224-225.

1079 J Korhonen et al., 'Circular Economy as an Essentially Contested Concept' (2018) 175 Journal of Cleaner Production. 548.

1080 WB Gallie, 'Essentially Contested Concepts' (1956) 56 Proceedings of the Aristotelian Society 1. 167.

1081 J Korhonen et al., 'Circular Economy as an Essentially Contested Concept' (2018) 175 Journal of Cleaner Production. 548, 549; WB Gallie, 'Essentially Contested Concepts' (1956) 56 Proceedings of the Aristotelian Society 1. 171, 172, 180.

impracticability of a single universal definition of CE. Based on their research of the concept as an "essentially contested" one, Korhonen et al. provide one possible formulation of the CE concept:

> …a sustainable development initiative with the objective of reducing the societal production-consumption systems' linear material and energy throughput flows by applying materials cycles, renewable and cascade-type energy flows to the linear system. CE promotes high value material cycles alongside more traditional recycling and develops systems approaches to the cooperation of producers, consumers and other societal actors in sustainable development work.[1082]

Kircherr et al. concluded that amongst the 114 definitions they studied, the most prominent and most employed definition of the CE is from the EMF.[1083] Similarly, Geisendorf and Pietrulla state that the definition of the EMF is "one of the currently most recognized definitions of the CE":[1084]

> …an industrial system that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models.[1085]

10.1.2 A Paradigm Shift to the Circular Economy

The advocates of the CE argue that the CE is, or needs to become, a paradigm shift, to change the prevalent and traditional linear model of the economic system.[1086] Paradigms are "universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners".[1087] They are underlying worldviews through which the world is understood and interpreted.[1088] A paradigm shift is essentially a reconstruction of the field, which "changes some of the most elementary theoretical generalizations as well as many of its paradigm methods and applications".[1089] Consequently, a thorough paradigm shift requires that a new

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[1082] J Korhonen et al., 'Circular Economy as an Essentially Contested Concept' (2018) 175 Journal of Cleaner Production. 547.

[1083] J Kircherr et al. 'Conceptualizing the Circular Economy: An Analysis of 114 Definitions' (2017) 127 Resources, Conservation & Recycling. 226.

[1084] S Geisendorf and P Pietrulla, 'The Circular Economy and Circular Economy Concepts – A Literature Analysis and Redefinition' (2018) 60 Thunderbird International Business Review. 772.

[1085] Ellen MacArthur Foundation, 'Towards the Circular Economy Vol. 1: Economic and Business Rationale for an Accelerated Transition' (2013) 7.

[1086] See eg, J Korhonen et al., 'Circular Economy as an Essentially Contested Concept' (2018) 175 Journal of Cleaner Production. 544, 549, 550; E Maitre-Ekern, 'The Choice of Regulatory Instruments for a Circular Economy' in K Mathis and BR Huber (eds) *Environmental Law and Economics* (Springer 2017) Economic Analysis of Law in European Legal Scholarship 4) 306, 310; M Esposito et al., 'Introducing Circular Economy: New Thinking with New Managerial and Policy Implications' (2018) 60 California Management Review 3. 6; F Preston, 'A Global Redesign? Shaping the Circular Economy' (2012) Chatham House Briefing Paper. 2; M Jesús Ávila-Gutiérrez et al., 'Standardization Framework for Sustainability from Circular Economy 4.0' (2019) 11 Sustainability 22. 2.

[1087] TS Kuhn, *The Structure of Scientific Revolutions* (2nd edn, The University of Chicago Press 1962) viii.

[1088] J Korhonen et al., 'Circular Economy as an Essentially Contested Concept' (2018) 175 Journal of Cleaner Production. 550.

[1089] TS Kuhn, *The Structure of Scientific Revolutions* (2nd edn, The University of Chicago Press 1962) 85.

underlying worldview is incorporated into everyday lives.[1090] The CE disrupts the current paradigm because it aspires to change the prevailing linear production and consumption model.[1091] It can be argued that the CE has "the potential to become a paradigm shift in which industrial production and consumption will change in a fundamental manner."[1092] A paradigm shift to the CE requires "putting sustainability and closed-looped thinking at the heart of business models and industrial organization".[1093]

Part IV applies the idea of two-stage requirement for a paradigm shift. It requires that the current paradigm has to undergo a transition in two interdependent stages. The first stage is paradigmatic, metaphoric and normative. Visions, concepts and norms are central on this level of the paradigm shift.[1094] This chapter deals with the first stage. The purpose is to contribute to a common theoretical understanding of the CE. Chapter 10 looks into the origins of the concept, identifies the relevant research fields for CE, gathers principles that can guide CE, discusses systemic change and systems thinking, the role of law in promoting the CE, and its limits. This discussion of the first stage of a paradigm shift will provide the theoretical background for the discussion of the second stage in Chapters 11 and 12. The second stage is more descriptive, positive, and analytic, and on this level the normal practice stage, metrics, tools, instruments and practical measures are crucial.[1095] Chapters 11 and 12 look into international law and standardization as tools to promote the CE in practice on a global scale in the plastics sector.

10.1.3 The Relationship Between a Global Circular Economy of Plastics and Sustainable Development

The relationship between the CE and sustainable development remains unclear and unrefined.[1096] This is due to ambiguity around both concepts, their objectives, the manner in which the objectives are to be reached, and the relationships these concepts have to economic growth.[1097] This section

1090 J Korhonen et al., 'Circular Economy as an Essentially Contested Concept' (2018) 175 Journal of Cleaner Production. 549; JR Ehrenfeld, 'Industrial Ecology – Paradigm Shift or Normal Science? (2000) 44 American Behavioral 2. 235.
1091 M Esposito et al., 'Introducing Circular Economy: New Thinking with New Managerial and Policy Implications' (2018) 60 California Management Review 3. 6.
1092 J Korhonen et al., 'Circular Economy as an Essentially Contested Concept' (2018) 175 Journal of Cleaner Production. 550.
1093 F Preston, 'A Global Redesign? Shaping the Circular Economy' (2012) Chatham House Briefing Paper. 2.
1094 J Korhonen et al., 'Circular Economy as an Essentially Contested Concept' (2018) 175 Journal of Cleaner Production. 550.
1095 *Ibid.*
1096 B Suárez-Eiroa et al., 'Operational Principles of Circular Economy for Sustainable Development: Linking Theory and Practice' (2019) 214 Journal of Cleaner Production. 955; N Millar et al, 'The Circular Economy: Swings and Roundabouts?' (2019) 158 Ecological Economics. 11.
1097 N Millar et al, 'The Circular Economy: Swings and Roundabouts?' (2019) 158 Ecological Economics. 17.

attempts to unpack the relationship between the CE and sustainable development and its application in the plastics context.

The most common definition for the concept of sustainable development stems from the Brundtland Report: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".[1098] The definition has acquired a quasi-official status due to frequent citing.[1099] However, as no official definition or agreement of its content exists, the concept has attracted "a wide divergence of views on the goals, routes and the methods of moving towards sustainable development".[1100] Sustainable development comprises four core elements, though also variations exist between authors regarding these.[1101] First, the principle of intergenerational equity (as discussed in subchapter 9.3) requires the needs of present and future generations must be taken into account.[1102] Second, the principle of sustainable use asserts that exploitation of natural resources should be done in a manner that remains sustainable and protects the environment to a significant degree.[1103] Third, the principle of intragenerational equity prioritizes the needs of the world's poor and states that abject poverty must be eliminated.[1104] And fourth, the principle of integration calls for incorporating social, environmental and economic aspects in sustainable development.[1105] Sustainable development "sets broad inter-generational objectives and although it is often associated with the internalization of externalities and a set of policy instruments to do so in practice, the core concept of sustainable development stays silent on the manner to reach sustainability."[1106]

The core issues in the relationship between sustainable development and the CE concern the manner with which to reach sustainable development, their respective takes on economic growth, and inclusion of the social dimension of sustainable development in the CE. Some critics of sustainable development argue that it is "a set of initiatives that have been implemented within a linear

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1098 WCED, 'Our Common Future' (1987) UN Doc A/42/427. ('Brundtland Report') Para 27.

1099 D Barstow Magraw and LD Hawke, Sustainable Development' in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008) 618.

1100 B Hopwood et al., 'Sustainable Development: Mapping Different Approaches' (2005) 13 Sustainable Development. 41, 47; See also, S Connelly, 'Mapping Sustainable Development as a Contested Concept' (2007) 12 Local Environment 3. 259; SM Lélé, 'Sustainable Development: A Critical Review' (1991) 19 World Development 6. 618.

1101 See eg, G Haughton, 'Environmental Justice and the Sustainable City' (1999) 18 Journal of Planning Education and Research. 235, 236.

1102 P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2012) 219; D Barstow Magraw and LD Hawke, Sustainable Development' in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008) 620.

1103 *Ibid.*

1104 *Ibid.*

1105 *Ibid.*

1106 S Sauvé et al., 'Environmental Sciences, Sustainable Development and Circular Economy: Alternative Concepts for Trans-Disciplinary Research' (2016) 17 Environmental Development. 54.

thinking".[1107] Consequently, sustainable development is perceived as a failure and the CE offers an alternative solution.[1108]

> …it is commonly accepted that the linear or "take, make, dispose" economy, the current dominant material and energy flow model, where raw materials are extracted, manufactured, used and then discarded to induce economic growth, cannot lead to Sustainable Development due its damage to the environment and its inability to promote global social equity.[1109]

Another form of approaching linear economy in the context of sustainable development is to argue that the CE can be used as a tool to reach sustainable development.[1110] This line of argument asserts that the CE can be used to promote and implement sustainable development.[1111] In this regard, "sustainable development establishes goals to be achieved in order to solve the problems and their consequences, whereas CE is a tool to address some of the causes of these problems."[1112]

Regarding economic growth, the Brundtland Report considers it is an essential part of sustainable development. However, the report does not elaborate how it should be measured and presumes that is possible to attain economic growth that can "sustain and expand the Earth's resource base."[1113] The relationship between economic growth, sustainable development and the CE has sparked criticism:

> Sustained economic growth based on a linear production model is not feasible in a planet with finite resources and a limited capacity to absorb wastes.[1114]

The notion of economic growth in the CE context is complex and comes with its own set of theories from degrowth to steady-state-economics to promoting economic growth within the limits of planet's carrying capacity.[1115] No consensus exists on the CE's relationship to economic growth.

[1107] *Ibid.*
[1108] *Ibid.*
[1109] N Millar et al, 'The Circular Economy: Swings and Roundabouts?' (2019) 158 Ecological Economics. 13; RA Frosch and NE Gallopoulos, 'Strategies for Manufacturing' (1989) 261 Scientific American 3. 144; MS Andersen, 'An Introductory Note on the Environmental Economics of Circular Economy' (2007) 2 Sustainability Science. 139.
[1110] N Millar et al, 'The Circular Economy: Swings and Roundabouts?' (2019) 158 Ecological Economics. 14; B Xue et al., 'Survey of Official's Awareness on Circular Economy Development in China: Based on Municipal and County Level' (2010) 54 Resources, Conservation & Recycling. 1296; P Schroeder et al., 'The Relevance of Circular Economy Practices to the Sustainable Development Goals' (2019) 23 Journal of Industrial Ecology 1. 92.
[1111] J Kircherr et al. 'Conceptualizing the Circular Economy: An Analysis of 114 Definitions' (2017) 127 Resources, Conservation & Recycling. 227; J Korhonen et al., 'Circular Economy as an Essentially Contested Concept' (2018) 175 Journal of Cleaner Production. 544;.
[1112] B Suárez-Eiroa et al., 'Operational Principles of Circular Economy for Sustainable Development: Linking Theory and Practice' (2019) 214 Journal of Cleaner Production. 955.
[1113] WCED, 'Our Common Future' (1987) UN Doc A/42/427. ('Brundtland Report') Para 3.
[1114] B Suárez-Eiroa et al., 'Operational Principles of Circular Economy for Sustainable Development: Linking Theory and Practice' (2019) 214 Journal of Cleaner Production. 953; F Bonciu, 'The European Economy: From a Linear to a Circular Economy' (2014) 14 Romanian Journal of European Affairs 4. 78.
[1115] See eg, P Næss and KG Høyer, The Emperor's Green Clothes: Growth, Decoupling, and Capitalism' (2009) 20 Capitalism Nature Socialism 3. 75; P Schröder et al. 'Degrowth within: Aligning Circular Economy and Strong Sustainability Narratives' (2019) 146 Resources, Conservation & Recycling. 190, 191; P Ghisellini et al., 'A Review on

Shifting the paradigm toward a global CE of plastics is a process. Most plastics wastes and the energy supply for processing them in a more circular manner are still fossil fuel-based and plastics wastes involve thousands of chemicals the impacts of which remain uncertain. Therefore, it is pertinent to ask when global CE of plastics could be considered to contribute to sustainable development and to what extent. The current manner and future trajectory of linear global plastics production and consumption are harmful to the environment and possibly also to human health. It can thus be argued that linear plastics production and consumption patterns do not represent and contribute to "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".[1116] It can also be argued that a CE of plastics on a global scale has definite potential to reduce environmental and health pressures from plastics. Yet this remains a hypothesis and no guarantee exists that a CE of plastics would bring about sustainable development, and even if it could how long that process would take.

However, from a pragmatic point of view it can be argued that plastics are indispensable in a myriad of applications worldwide and it is therefore necessary to make a transformation from linear to circular plastics production and consumption to mitigate negative impacts, whether or not it constitutes sustainable development. It should be stressed, however, that production and use of all non-essential applications of plastics, such as a variety of single-use plastics, should be reduced altogether in line with the first R of the 3R principle. Therefore, the CE of plastics can be seen as a tool toward achieving overall sustainable development and it has the potential to contribute to reaching broader goals. However, evaluation of that depends on the content and indicators that are given to the CE and sustainable development concepts, as well as their implementation at a larger scale. Furthermore, this dissertation has limited in-depth reviews of economic theories and human rights/social justice issues outside its scope and has opted for investigating the global plastics problem merely from an environmental perspective. Therefore, it would also be outside the scope to evaluate achieving sustainable development as two of the three objectives it seeks to reconcile are not subject to research.

Circular Economy: The Expected Transition to a Balanced Interplay of Environmental and Economic Systems' (2006) 114 Journal of Cleaner Production. 17; WCED, 'Our Common Future' (1987) UN Doc A/42/427. ('Brundtland Report') Para 3.

[1116] WCED, 'Our Common Future' (1987) UN Doc A/42/427. ('Brundtland Report') Para 27.

10.2 Origins of the Circular Economy

10.2.1 Schools of Thought

The idea of CE is ancient. Practices such as repairing, recycling, refurbishing, and repurposing were used already in Paleolithic and Neolithic times, and during the Bronze Age, when bronze was even shipped from France to be recycled in Britain.[1117] CE practices were disrupted by the Industrial Revolution, which favored a linear system that largely ignored the environmental impacts of economic activities.[1118]

The CE has gained growing attention particularly during the last few decades. The CE is rooted in various theoretical backgrounds, which approach the concept of the CE from their distinctive disciplinary angles. These fields of research include ecological economics, environmental economics, industrial ecology, industrial metabolism, industrial symbioses, cleaner production, product-service systems, performance economy, eco-efficiency, cradle-to-cradle, biomimicry, etc.[1119] The list is not exhaustive, and different authors' lists vary as no single comprehensive catalogue of disciplines of the CE exists. In addition, fields which were not part of the CE development originally, such as supply chain management, business management, sustainability science, law etc. are highly useful in the development of CE.[1120] This chapter focuses and investigates the various fields of research from which the concept has originated. In CE literature, these are fields are generally referred to as "schools of thought".[1121]

The schools of thought in this chapter are categorized under economics, industrial processes, design, and product-service systems. These categories highlight the different angles the CE can be approached from, and they represent the most mainstream theoretical backgrounds for CE in the literature. To provide a well-rounded picture of the theoretical underpinnings, it was essential to present ideas from different fields of study in a balanced manner. Thus under each category one or two main schools of thought are introduced. These categories and delimitations have been chosen

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1117 M Kuijpers, 'Circular Economy: Ancient Populations Pioneered the Idea of Recycling Waste' (The Conversation, 9 January 2019) http://theconversation.com/circular-economy-ancient-populations-pioneered-the-idea-of-recycling-waste-107332

1118 E Maitre-Ekern, 'The Choice of Regulatory Instruments for a Circular Economy' in K Mathis and BR Huber (eds) *Environmental Law and Economics* (Springer 2017) Economic Analysis of Law in European Legal Scholarship 4. 306.

1119 See eg, P Ghisellini et al., A Review on Circular Economy: The Expected Transition to a Balanced Interplay of Environmental and Economic Systems' (2006) 114 Journal of Cleaner Production. 24; AS Homrich et al., 'The Circular Economy Umbrella: Trends and Gaps on Integrating Pathways' (2018) 175 Journal of Cleaner Production. 527.

1120 M Lieder and A Rashid, 'Towards Circular Economy Implementation: A Comprehensive Review in Context of Manufacturing Industry' (2016) 115 Journal of Cleaner Production. 38.

1121 See eg, AS Homrich et al., 'The Circular Economy Umbrella: Trends and Gaps on Integrating Pathways' (2018) 175 Journal of Cleaner Production. 527; EMF, 'Schools of Thought' https://www.ellenmacarthurfoundation.org/circular-economy/concept/schools-of-thought based on the literature and how extensively the different approaches are presented in CE research, as well as how well they fit with promoting a CE of plastics.[1122] However, presentation of the schools of thought is not exhaustive.

10.2.2 Economics: Ecological Economics and Environmental Economics

Ecological economics see the human economy as part of a larger whole. Its domain is to provide a general and comprehensive framework to study the entire web of interactions between economic and ecological sectors.[1123] Ecological economics view ecological systems as our best current models of sustainable systems, as all waste and by-products are recycled and used, or harmlessly dispersed in the system. In a similar manner, sustainable economic systems should close the cycle and find economic uses and ways to recycle pollution, rather than burden existing and future ecosystems with it.[1124]

Ecological economist Kenneth E Boulding's vision of "spaceship earth" is frequently regarded as a starting point for modern discussions about the CE:[1125]

> The closed earth of the future requires economic principles which are somewhat different from those of the open earth of the past. For the sake of picturesqueness, I am tempted to call the open economy the "cowboy economy," the cowboy being symbolic of the illimitable plains and also associated with reckless, exploitative, romantic, and violent behavior, which is characteristic of open societies. The closed economy of the future might similarly be called the "spaceman" economy, in which the earth has become a single spaceship, without unlimited reservoirs of anything, either for extraction or for pollution, and in which, therefore, man must find his place in a cyclical ecological system which is capable of continuous reproduction of material form even though it cannot escape having inputs of energy. The difference between the two types of economy becomes most apparent in the attitude towards consumption.[1126]

In Boulding's vision, "the cowboy economy" refers to a linear economy, in which nature is perceived as a limitless resource, but also affected by environmental and social impacts, such as pollution and exploitative behavior.[1127] "The spaceship economy", on the other hand, refers to the CE. Boulding

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1122 These schools of thought and their fundamental ideas, though they have evolved with time and further research, are still strongly personified around their founders. This explains referencing to relatively few authors in these parts.

1123 A Bruel et al, 'Linking Industrial Ecology and Ecological Economics - A Theoretical and Empirical Foundation for the Circular Economy' (2019) 23 Journal of Industrial Ecology 1. 14, 16.

1124 R Costanza, 'Ecological Economics: A Research Agenda' (1991) 2 Structural Change and Economic Dynamics 2. 341.

1125 T Wautelet, 'The Concept of Circular Economy: Its Origins and Its Evolution' (2018) Working Paper, ResearchGate. 2; A Murray et al., 'The Circular Economy: An Interdisciplinary Exploration of the Concept and Its Application in a Global Context' (2017 140 Journal of Business Ethics 3. 372; P Ghisellini et al., 'A Review on Circular Economy: The Expected Transition to a Balanced Interplay of Environmental and Economic Systems' (2006) 114 Journal of Cleaner Production. 14.

1126 KE Boulding, 'The Economics of the Coming Spaceship Earth' in H Jarrett (ed) *Environmental Quality in a Growing Economy* (Johns Hopkins University Press 1966) 7-8. (Boulding first presented this at the Sixth Resources for the Future Forum on Environmental Quality in a Growing Economy in Washington, D.C. on March 8 1966.) http://arachnid.biosci.utexas.edu/courses/THOC/Readings/Boulding_SpaceshipEarth.pdf

1127 T Wautelet, 'The Concept of Circular Economy: Its Origins and Its Evolution' (2018) Working Paper, ResearchGate. 2.

argued that Earth is a closed system, which means that "the outputs of all parts of the system are linked to the inputs of other parts".[1128] Therefore, the economy and the environment should have a circular relationship.[1129]

Environmental economists David Pearce and R Kerry Turner built on Boulding's vision and first introduced the term CE to the discussion in 1990.[1130] Environmental economics offer an analytical frame within which it is possible to identify "which material streams and recycling options provide most significant benefits for the economy in the light of circular economy principles"; to understand and describe the environmental consequences of various choices; and to provide "a basis for introducing 'externality adders' to market prices" to make the prices reflect the true situation.[1131] Environmental economics perceives MPP, like any other waste or pollution problems, as arising from a market failure.[1132] Pollution, and its mitigation, prevention and mediation are thus the domain of environmental economics.[1133]

From environmental economics perspective, the CE is based on a material balance principle, which means that all material flows need to be accounted for and economic values guide their management.[1134] The conventional open-ended economy is converted toward a CE by rethinking the relationship between resource use and waste residuals.[1135] In environmental economics, the functions of the environment are investigated from the viewpoint of economics. The environment has four functions in relation to its utility for humans and the economic welfare it provides: amenity values; a resource base for the economy; a sink for residual flows; and a life support system. Pearce and Turner presented these four functions and their interlinkages in the context of the CE. Using the environment as a sink for residual flows causes harm to the environment, affects the amenity values and the life-support system, and causes losses for the economic system. The CE, on the other hand,

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1128 KE Boulding, 'The Economics of the Coming Spaceship Earth' in H Jarrett (ed) *Environmental Quality in a Growing Economy* (Johns Hopkins University Press 1966) 2. http://arachnid.biosci.utexas.edu/courses/THOC/Readings/Boulding_SpaceshipEarth.pdf

1129 T Wautelet, 'The Concept of Circular Economy: Its Origins and Its Evolution' (2018) Working Paper, ResearchGate. 3.

1130 M Lieder and A Rashid, 'Towards Circular Economy Implementation: A Comprehensive Review in Context of Manufacturing Industry' (2016) 115 Journal of Cleaner Production. 43; DW Pearce and RK Turner, *Economics of Natural Resources and the Environment* (Johns Hopkins University Press 1990) 29-42.

1131 MS Andersen, 'An Introductory Note on the Environmental Economics of Circular Economy' (2007) 2 Sustainability Science. 134.

1132 S Newman et al., 'The Economics of Marine Litter' in M Bergmann et al. (eds) *Marine Anthropogenic Litter* (Springer 2015) 377.

1133 R Costanza, 'Ecological Economics: A Research Agenda' (1991) 2 Structural Change and Economic Dynamics 2. 337.

1134 MS Andersen, 'An Introductory Note on the Environmental Economics of Circular Economy' (2007) 2 Sustainability Science. 135.

1135 DW Pearce and RK Turner, *Economics of Natural Resources and the Environment* (Johns Hopkins University Press 1990) 37-38; MS Andersen, 'An Introductory Note on the Environmental Economics of Circular Economy' (2007) 2 Sustainability Science. 134.

has the potential to use the residual materials through recycling and reuse, thus postponing the loss of non-renewable resources.[1136] Externality estimates are beneficial in determining the market value for recycled materials, and in reducing the burden from waste disposal and extraction of virgin materials.[1137]

Ecological and environmental economics share the ideas of making economic use out of waste. In addition, they both utilize of two laws of physics, the first and second law of thermodynamics. These have significantly impacted economic theory and are also relevant for the CE.

The first law of thermodynamics is the law of mass/energy conservation, the so-called "mass-balance principle". The law of energy conservation "implies that energy inputs must equal energy outputs for any transformation process." The law of mass conservation states that "mass inputs must equal mass outputs for every process (or process step), and that this must be true separately for each chemical element…all resources extracted from the environment must eventually become unwanted wastes and pollutants".[1138]

Boulding, and particularly Nicholas Georgescu-Roegen, have highlighted the relevance of the second law of thermodynamics to economics.[1139] The second law of thermodynamics is the entropy law. It signifies that "if the system is isolated and closed, so that it does not exchange matter or energy with any other system, its entropy increases with every physical action or transformation that occurs inside the system. Entropy can never decrease in an isolated system or in the universe as a whole."[1140] The second law of thermodynamics explains why recycling everything endlessly is not feasible financially and/or technically as materials within the economy tend to get dissipated within the system. In addition, energy cannot be recycled. Entropy thus creates a physical obstacle that impedes establishing a completely closed-looped system.[1141]

1136 DW Pearce and RK Turner, *Economics of Natural Resources and the Environment* (Johns Hopkins University Press 1990) 39-41; MS Andersen, 'An Introductory Note on the Environmental Economics of Circular Economy' (2007) 2 Sustainability Science. 135.

1137 MS Andersen, 'An Introductory Note on the Environmental Economics of Circular Economy' (2007) 2 Sustainability Science. 139.

1138 RU Ayres, 'Eco-Thermodynamics: Economics and the Second Law' (1998) 26 Ecological Economics 2. 189-190.

1139 DW Pearce and RK Turner, *Economics of Natural Resources and the Environment* (Johns Hopkins University Press 1990) 38; KE Boulding, 'The Economics of the Coming Spaceship Earth' in H Jarrett (ed) *Environmental Quality in a Growing Economy* (Johns Hopkins University Press 1966) 6. http://arachnid.biosci.utexas.edu/courses/THOC/Readings/Boulding_SpaceshipEarth.pdf;. See also, N Georgescu-Roegen, *The Entropy Law and the Economic Process* (Harvard University Press 1971).

1140 RU Ayres, 'Eco-Thermodynamics: Economics and the Second Law' (1998) 26 Ecological Economics 2. 190.

1141 DW Pearce and RK Turner, *Economics of Natural Resources and the Environment* (Johns Hopkins University Press 1990) 38.

Both ecological and environmental economics also call for systemic change. Environmental economics calls for a future trajectory that addresses, in broad terms, the issue of sustainability for the sake of present and future generations.[1142] The goal of ecological economics is sustainability of the combined ecological-economic system and to achieve this "we may have to reimpose long-run constraints by developing institutions (or using the ones we have more effectively) to bring global, long-term, multi-species, multi-scale, whole systems perspective to bear on short-term cultural evolution."[1143] This statement also reflects the need for policy and legal measures to achieve the goals of ecological economy. Similarly environmental economists perceive that decision makers have a crucial role in promoting the inclusion of externalities to prices because in the current market economy "only a limited range of circular options will make sense from the perspective of company managers",[1144] or otherwise the CE options would already have been realized on a larger scale.[1145] In this light, decision-makers and regulators have the responsibility to institute such mechanisms that CE practices can take place much more extensively.[1146]

10.2.3 Industrial Processes: Industrial Ecology

The goal of industrial ecology is to reconstruct industrial systems to be compatible with the function of natural ecosystems.[1147] Industrial ecology seeks to understand how industrial systems work, are regulated, and how they interact with the biosphere. This understanding is then combined with the knowledge about natural ecosystems. Though perfect industrial ecosystems can never be attained in practice, industrial ecology pushes manufacturers and consumers to change their habits to prevent current ways of living affecting the environment adversely.[1148]

Industrial ecology is an interdisciplinary field of research bringing together scientific ecology, natural and engineering sciences and economics.[1149] This fusing includes study areas such as industrial metabolism, industrial symbiosis, and approaches and frameworks to achieve industrial ecology's

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1142 MS Andersen, 'An Introductory Note on the Environmental Economics of Circular Economy' (2007) 2 Sustainability Science. 139.
1143 R Costanza, 'Ecological Economics: A Research Agenda' (1991) 2 Structural Change and Economic Dynamics 2. 339.
1144 MS Andersen, 'An Introductory Note on the Environmental Economics of Circular Economy' (2007) 2 Sustainability Science. 134.
1145 F Preston, 'A Global Redesign? Shaping the Circular Economy' (2012) Chatham House Briefing Paper. 8.
1146 MS Andersen, 'An Introductory Note on the Environmental Economics of Circular Economy' (2007) 2 Sustainability Science. 139; F Preston, 'A Global Redesign? Shaping the Circular Economy' (2012) Chatham House Briefing Paper. 19.
1147 S Erkman, 'Industrial Ecology: An Historical View' (1997) 5 Journal of Cleaner Production 1-2. 1.
1148 RA Frosch and NE Gallopoulos, 'Strategies for Manufacturing' (1989) 261 Scientific American 3. 144.
1149 D Gallaud and B Laperche, 'Building Region-Based Sustainable Development: Vocabulary and Tools' in *Circular Economy, Industrial Ecology and Short Supply Chain* (ISTE 2016) Volume 4. 21-22.

ultimate goal: nearly closed-looped industrial ecosystems.[1150] Industrial metabolism seeks to understand how industrial systems work in terms of material and energy flows.[1151] Industrial symbiosis is closely linked to industrial ecology.[1152] It reflects biological analogies and seeks to create physical linkages amongst companies in terms of exchange of energy, materials, water and by-products.[1153] Industrial symbiosis is considered to be "a key strategy to closing material flows".[1154] Industrial ecology uses tools and methods, such as life cycle assessment (LCA) and eco-design tools to evaluate the environmental impacts of products.[1155]

Multiple studies suggest that the theoretical and empirical foundations of the CE are based on industrial ecology.[1156] A key theme of industrial ecology is the transition from linear throughput to closed-loop material and energy use.[1157] The term "industrial ecosystem" became widely used after 1989, when Robert Frosch and Nicholas Gallopoulos presented the concept:[1158]

> …the traditional economic model of industrial activity – in which individual manufacturing processes take in raw materials and generate products to be sold plus waste to be disposed of – should be transformed into a more integrated model: an industrial ecosystem.[1159]

In an industrial ecosystem, manufacturing processes transform circulating stocks of materials from one shape to another. Though these processes still require energy and produce unavoidable wastes and harmful by-products, it happens at lower levels than is typical currently.[1160]

1150 X Li, *Industrial Ecology and Industry Symbiosis for Environmental Sustainability: Definitions, Frameworks, and Applications* (Palgrave Pivot 2018) 25.
1151 T Wautelet, 'The Concept of Circular Economy: Its Origins and Its Evolution' (2018) Working Paper, ResearchGate. 4.
1152 YMB Saavedra et al., 'Theoretical Contribution of Industrial Ecology to Circular Economy' (2018) 170 Journal of Cleaner Production. 1515.
1153 MR Chertow, 'Industrial Symbiosis: Literature and Taxonomy' (2000) 25 Annual Review of Energy and the Environment 1. 314-315; YMB Saavedra et al., 'Theoretical Contribution of Industrial Ecology to Circular Economy' (2018) 170 Journal of Cleaner Production. 1515.
1154 EJ Prosman et al., 'Closing Global Material Loops – Initial Insights into Firm-Level Challenges' (2017) 21 Journal of Industrial Ecology 3. 641.
1155 A Bruel et al., 'Linking Industrial Ecology and Ecological Economics - a Theoretical and Empirical Foundation for the Circular Economy' (2019) 23 Journal of Industrial Ecology 1. 13.
1156 *Ibid.* 16; P Ghisellini et al., 'A Review on Circular Economy: The Expected Transition to a Balanced Interplay of Environmental and Economic Systems' (2006) 114 Journal of Cleaner Production. 14; F Preston, 'A Global Redesign? Shaping the Circular Economy' (2012) Chatham House Briefing Paper. 3; EMF, 'Towards the Circular Economy Vol. 1: Economic and Business Rationale for an Accelerated Transition' (2013) 27.
1157 JR Ehrenfeld and N Gertler, 'Industrial Ecology in Practice – The Evolution of Interdepence in Kalundborg' (1997) 1 Journal of Industrial Ecology 1. 68.
1158 D Gallaud and B Laperche, 'Building Region-Based Sustainable Development: Vocabulary and Tools' in *Circular Economy, Industrial Ecology and Short Supply Chain* (ISTE 2016) Volume 4. 22.
1159 RA Frosch and NE Gallopoulos, 'Strategies for Manufacturing' (1989) 261 Scientific American 3. 144.
1160 *Ibid.* 146.

Industrial ecology highlights principles which seek to guide the design of industrial systems, such as closure of material and energy loops, energy efficiency, and dematerialization.[1161] According to Erkman, four key principles guide the reorganization of industrial ecosystems: waste and by-products must systematically be valorized, loss caused by dispersion must be minimized, the economy must be dematerialized, and energy must rely less on fossil hydrocarbon.[1162] The idea that waste should be released to the industrial food web as material and energy flows is one of the principles that the CE has inherited from industrial ecology.[1163]

A systemic point of view is central in industrial ecology, as it looks at the industrial system as whole.[1164] It entails designing production processes in line with local ecological constraints "while also taking into account their global impact so that they perform as close to living systems as possible".[1165] Systemic problems, such as the accumulation of persistent toxic materials, cannot be addressed if products and their production processes are viewed in isolation.[1166]

Implementation of the industrial ecology principles requires "sustainable manufacturing strategies and changing the industrial design of products and processes".[1167] Industrial ecology's practical implementation is still limited due to technological barriers and a lack of synergies between enterprises, and therefore an intervention from an external facilitator is required to advance implementation.[1168] Regulations at the local, national and international level have a key role to play in the transition from traditional methods of manufacturing to an industrial-ecosystem approach.[1169]

1161 A Bruel et al., 'Linking Industrial Ecology and Ecological Economics - a Theoretical and Empirical Foundation for the Circular Economy' (2019) 23 Journal of Industrial Ecology 1. 13.

1162 S Erkman, 'Industrial Ecology: A New Perspective on the Future of the Industrial System' (2001) 131 Swiss Medical Weekly 37-38. 533-534.

1163 P Ghisellini et al., 'A Review on Circular Economy: The Expected Transition to a Balanced Interplay of Environmental and Economic Systems' (2006) 114 Journal of Cleaner Production. 25.

1164 S Erkman, 'Industrial Ecology: A New Perspective on the Future of the Industrial System' (2001) 131 Swiss Medical Weekly 37-38. 531.

1165 D Gallaud and B Laperche, 'Building Region-Based Sustainable Development: Vocabulary and Tools' in *Circular Economy, Industrial Ecology and Short Supply Chain* (ISTE 2016) Volume 4. 15; EMF, 'Schools of Thought' https://www.ellenmacarthurfoundation.org/circular-economy/concept/schools-of-thought

1166 JR Ehrenfeld and N Gertler, 'Industrial Ecology in Practice – The Evolution of Interdepence in Kalundborg' (1997) 1 Journal of Industrial Ecology 1. 68.

1167 A Bruel et al., 'Linking Industrial Ecology and Ecological Economics - a Theoretical and Empirical Foundation for the Circular Economy' (2019) 23 Journal of Industrial Ecology 1. 13.

1168 T Wautelet, 'The Concept of Circular Economy: Its Origins and Its Evolution' (2018) Working Paper, ResearchGate. 5.

1169 RA Frosch and NE Gallopoulos, 'Strategies for Manufacturing' (1989) 261 Scientific American 3. 152.

10.2.4 PRODUCT-SERVICE SYSTEMS: PERFORMANCE ECONOMY

Economic activities are usually measured in terms of flows of goods, energy and services.[1170] The performance economy provides a framework and vision focusing on measuring economic activities in terms of utility, performance and radical efficiency.[1171] Walter Stahel and Geneviève Reday-Mulvey first coined the term "the performance economy".[1172] The performance economy transcends most interpretations of the CE, as it encompasses the idea that earning revenue and profits come from maximizing the value obtained from using stocks (manufactured capital, eg, infrastructure, buildings, equipment, durable consumer goods) instead of flows.[1173] It promotes "a full shift to servicisation, with revenue obtained from providing services rather than selling goods".[1174]

In Stahel's view, the CE and the performance economy are closely related but different concepts. The CE is based on second-hand markets, private and commercial reuse of goods, repair, remanufacturing and upgrading, and reprocessing, such as recycling.[1175] Whereas the CE reduces resource consumption and waste by reprocessing goods and materials, the performance economy goes beyond this by selling goods or molecules as services through rent, lease and shared business models.[1176] The main difference then is the approach to the concept of ownership. In the CE, independent service companies perform the maintenance operations, whereas in performance economy the service provider itself takes on the responsibility of internalizing the costs of waste and risk over the full service-life of goods.[1177]

Stahel asserts that wealth itself is a stock of goods and capital, and the quality of life in developed countries depends more on the quantity and the quality of these stocks than flows through the economy, which is a central principle of the performance economy.[1178] Reuse and remanufacturing

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1170 WR Stahel and R Clift, 'Stocks and Flows in the Performance Economy' in R Clift and A Druckman (eds) *Taking Stock of Industrial Ecology* (SpringerOpen 2016) 138.

1171 F Blomsma, 'Collective 'Action Recipes' in a Circular Economy: On Waste and Resource Management Frameworks and Their Role in Collective Change' (2018) 199 Journal of Cleaner Production. 973.

1172 See, WR Stahel and G Reday, 'The Potential for Substituting Manpower for Energy' (Research Contract No 76/l3-V/343/78-EN, Programme of Research and Actions on the Development of the Labour Market, DGV, Commission of the European Communities. Final Report 30 July 1977, Study No 76/13)

1173 WR Stahel and R Clift, 'Stocks and Flows in the Performance Economy' in R Clift and A Druckman (eds) *Taking Stock of Industrial Ecology* (SpringerOpen 2016) 138-139.

1174 *Ibid.* 137.

1175 *Ibid.* 140.

1176 WR Stahel, 'The Circular Economy' (2016) 531 Nature 7595. 436; Further elaborated in WR Stahel, *The Performance Economy* (2nd edn, Palgrave MacMillan 2010) and *Handbook of Performability Engineering* (2008); and WR Stahel, 'The Performance Economy: Business Models the Functional Service Economy' in KB Krishna (ed) *Handbook of Performability Engineering* (Sringer 2008).

1177 WR Stahel and R Clift, 'Stocks and Flows in the Performance Economy' in R Clift and A Druckman (eds) *Taking Stock of Industrial Ecology* (SpringerOpen 2016) 142.

1178 *Ibid.* 138.

are key elements in the performance economy to maintain the stock and extend the life of products.[1179] Stahel's "inertia principle" further supports the idea of maintaining stocks:

> Do not repair what is not broken, do not remanufacture something that can be repaired, do not recycle a product that can be remanufactured. Replace or treat only the smallest possible part in order to maintain the existing economic value of the technical system.[1180]

Converting the current linear economy, or in Stahel's words the "industrial economy", with the circular and performance economy is a huge challenge that requires systems thinking and a shift in policies from mere environmental protection to promoting business models that are unlimited in time and based on full ownership and liability.[1181] However, the limitation with the performance economy is that it is mostly applicable to "economies close to saturation, when the quantities of new goods entering use are similar to the quantities of goods being scrapped at the end of life".[1182]

Policy-makers, among others, have a role in advancing the CE and performance economies. Rather than using GDP as an indicator, value-per-weight or labor-input-per-weight should be used. Policies should encourage and reward focus on performance and internalizing external costs from emissions and pollution, and rethinking ownership. Stahel also encourages taxation for non-renewable resources and value-added taxation for value-adding activities such as mining, construction and manufacturing, but not for value-preserving stock management activities, such as reuse, repair and remanufacturing.[1183]

10.2.5 Design: Cradle-to-Cradle

Product design is considered to be crucial for sustainable circular systems. Since 1970s, several schools of thought within regenerative design strategies have emerged, most importantly cradle-to-cradle and biomimicry.[1184] Both of them are inspired by natural ecosystems. They aspire to create "fully regenerative closed ecological-economic system including both human as well as industrial systems,

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[1179] *Ibid.* 137.
[1180] WR Stahel, *The Performance Economy* (2nd edn, Palgrave MacMillan 2010) 195.
[1181] WR Stahel, 'The Circular Economy' (2016) 531 Nature 7595. 438.
[1182] WR Stahel and R Clift, 'Stocks and Flows in the Performance Economy' in R Clift and A Druckman (eds) *Taking Stock of Industrial Ecology* (SpringerOpen 2016) 137.
[1183] WR Stahel, 'The Circular Economy' (2016) 531 Nature 7595. 437-438.
[1184] EMF, 'Towards the Circular Economy Vol. 1: Economic and Business Rationale for an Accelerated Transition' (2013) 26-27. Regenerative design is an umbrella under which different strategies can be placed. Biomimicry was excluded because it shares similar ideas as cradle-to-cradle, but cradle-to-cradle –approach mainstreams more in the literature and has a more established connection to circular economy, for example through its certification programme.

which requires renewal or regeneration of sources of energy and materials that have been consumed."[1185] The cradle-to-cradle approach highlights toxicity and design perspectives.[1186]

William McDonough and Michael Braungart are the founders of the cradle-to-cradle approach. To show the flaws of current design strategies following from the Industrial Revolution, they have described the current retroactive design assignment as:

> Design a system of production that
>
> - Puts billions of pounds of toxic material into the air, water and soil every year
> - Measures prosperity by activity, not legacy
> - Requires thousands of complex regulations to keep people and natural systems from being poisoned too quickly
> - Produces materials so dangerous that they will require constant vigilance from future generations
> - Results in gigantic amounts of waste
> - Puts valuable materials in holes all over the planet, where they can never be retrieved
> - Erodes the diversity of biological species and cultural practices.[1187]

Furthermore, McDonough and Braungart argue that eco-efficiency also has all the same consequences as stated above, albeit to a lesser degree, and does not thus provide a sustainable solution.[1188] They suggest "eco-effectiveness" instead, which means that human industry should be regenerative instead of depleting, and this requires designing things not for cradle-to-grave life-cycles, but for cradle-to-cradle life-cycles.[1189]

According to McDonough and Braungart, eco-effectiveness "addresses the major shortcomings of eco-efficiency approaches: their inability to address the necessity for fundamental redesign of material flows, their inherent antagonism towards long-term economic growth and innovation, and their insufficiency in addressing toxicity issues."[1190] The aim of eco-effectiveness and cradle-to-cradle design is not necessarily to minimize material use or to prolong product life span, and even toxic materials can be used. However, the condition is that all materials retain their status as productive

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1185 M Lieder and A Rashid, 'Towards Circular Economy Implementation: A Comprehensive Review in Context of Manufacturing Industry' (2016) 115 Journal of Cleaner Production. 44.

1186 *Ibid.*

1187 M Braungart and B McDonough, The Next industrial Revolution' in M Charter and U Tischner (eds) *Sustainable Solutions: Developing Products and Services for the Future* (Greenleaf Publishing Limited 2001) 142.

1188 *Ibid.*

1189 M Braungart and B McDonough, The Next industrial Revolution' in M Charter and U Tischner (eds) *Sustainable Solutions: Developing Products and Services for the Future* (Greenleaf Publishing Limited 2001) 144.

1190 M Braungart et al. 'Cradle-to-Cradle Design: Creating Healthy Emissions – A Strategy for Eco-Effective Product and System Design' (2007) 15 Journal of Cleaner Production. 1337.

resources and remain in a closed system of material flows.[1191] Achieving these objectives represents a major technological and innovation challenge for the CE.

The cradle-to-cradle approach is based on three overarching principles.[1192] The first principle is "waste equals food". It provides that all products and materials have to provide nourishment for something new after each useful life cycle, either for the biological metabolism, or the technical metabolism. Products contain two kinds of materials, biological and technical nutrients. Products composed of materials that do not biodegrade should be designed as technical nutrients for closed-looped industrial cycles, and biological nutrients are designed to return to the biological cycle. Technical and biological substances should be kept apart to avoid cross-contamination.[1193] The second principle is "respect diversity". It entails that design respects, maximizes and enriches the regional, cultural and material uniqueness, allows for changes people and communities need, and that waste and emissions are regenerated.[1194] The third principle is "use current solar income", instead of the present system that relies on fossil fuels, petrochemicals, and incineration processes with destructive side effects.[1195] Cradle-to-cradle principles have been significant for the work of the EMF by contributing to its definition of the CE. The EMF's butterfly diagram of the CE is based on the separation of biological and technical nutrients as described in the cradle-to-cradle approach.[1196]

[1191] *Ibid.* 1338.
[1192] M Braungart and B McDonough, The Next industrial Revolution' in M Charter and U Tischner (eds) *Sustainable Solutions: Developing Products and Services for the Future* (Greenleaf Publishing Limited 2001) 145, 147, 148.
[1193] *Ibid.* 145-146.
[1194] *Ibid.* 147-148.
[1195] *Ibid.* 148.
[1196] T Wautelet, 'The Concept of Circular Economy: Its Origins and Its Evolution' (2018) Working Paper, ResearchGate. 10.

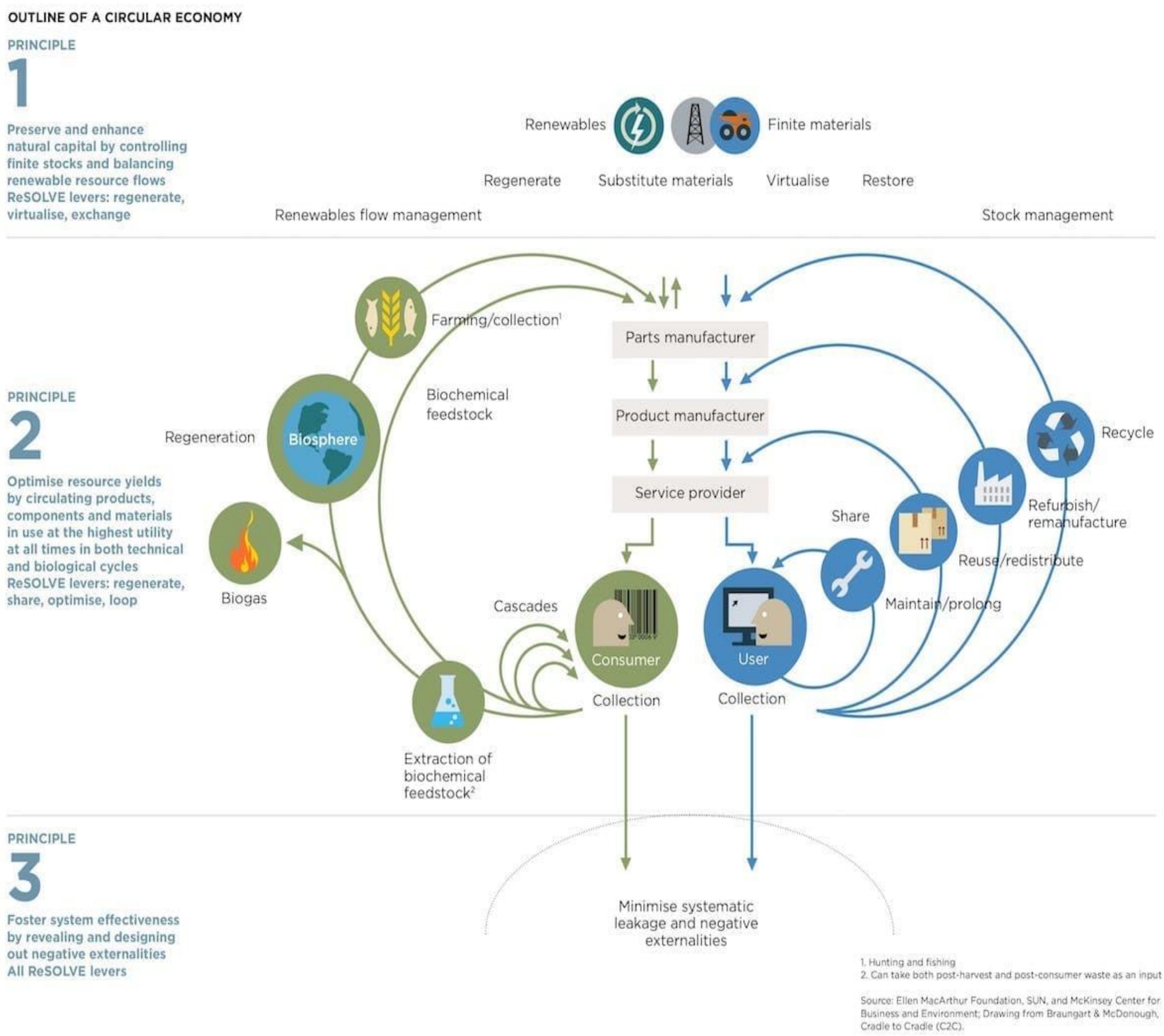

Fig. 15 Circular Economy System Diagram.[1197]

The cradle-to-cradle approach calls for a deep redesign of contemporary industry to erase the notion of waste and replace the focus from reducing negative impact with one of increasing positive impact over the long haul. McDonough and Braungart argue that present-day industry has deep design flaws. Eco-efficiency strategies address problems instead of sources, and thereby sustain a fundamentally flawed system. Therefore, they call for "a long-term vision for establishing a truly positive relationship

[1197] EMF, 'Infographic: Circular Economy System Diagram' https://www.ellenmacarthurfoundation.org/circular-economy/concept/infographic between industry and nature,"[1198] in which the design of products and systems are biomimetic.[1199] Approaches such as cradle-to-cradle require systemic changes. Widespread cooperation between companies and their supply chains may facilitate synchronized investments in innovation or machinery or logistics infrastructure and bring together knowledge and skills.[1200]

McDonough and Braungart do not generally refer to the role of law in the transition toward cradle-to-cradle approach. Their approach is mainly directed to companies, which is evidenced by their own certification scheme for product designers, manufacturers and brands, Cradle to Cradle Certified™.[1201] The idea is that businesses – and particularly their designers – should educate themselves and act in a manner that removes the need for regulation. Rather than being active, regulators should be careful not to provide perverse incentives.[1202] However, McDonough et al. note that legislation, such as the EU's End-of-Life Vehicles Directive, can result in the establishment of helpful collaborative mechanisms for product life cycle management.[1203]

10.3 Principles of the Circular Economy

"As a generic notion, the circular economy draws on several more specific approaches that gravitate around a set of basic principles."[1204] According to this Stahel's quote, all the different schools of thought accept a set of basic principles. However, despite a multitude of references in the literature to "principles of circular economy", it remains unclear what these basic principles are.[1205] Apart from the 3R principle, no consensus or even extensive, interactive discussion of the topic exists, only a wide collection of separate opinions as to which principles guide the CE. Arguably, the lack of

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1198 M Braungart et al. 'Cradle-to-Cradle Design: Creating Healthy Emissions – A Strategy for Eco-Effective Product and System Design' (2007) 15 Journal of Cleaner Production. 1340.
1199 M Lieder and A Rashid, 'Towards Circular Economy Implementation: A Comprehensive Review in Context of Manufacturing Industry' (2016) 115 Journal of Cleaner Production. 44.
1200 F Preston, 'A Global Redesign? Shaping the Circular Economy' (2012) Chatham House Briefing Paper. 9.
1201 Cradle to Cradle Products Innovation Institute, 'Cradle to Cradle Certified™' https://www.c2ccertified.org/get-certified/product-certification
1202 F Blomsma, 'Collective 'Action Recipes' in a Circular Economy: On Waste and Resource Management Frameworks and Their Role in Collective Change' (2018) 199 Journal of Cleaner Production. 975.
1203 M Braungart et al. 'Cradle-to-Cradle Design: Creating Healthy Emissions – A Strategy for Eco-Effective Product and System Design' (2007) 15 Journal of Cleaner Production. 1346.
1204 EMF, 'Schools of Thought' https://www.ellenmacarthurfoundation.org/circular-economy/concept/schools-of-thought
1205 See eg, P Ghisellini et al., 'A Review on Circular Economy: The Expected Transition to a Balanced Interplay of Environmental and Economic Systems' (2006) 114 Journal of Cleaner Production. 17; V Prieto-Sandoval et al., 'Towards a Consensus on the Circular Economy' (2018) 179 Journal of Cleaner Production. 610-611; J Kircherr et al. 'Conceptualizing the Circular Economy: An Analysis of 114 Definitions' (2017) 127 Resources, Conservation & Recycling. 223-224; Furthermore, the description of the core principles also varies in Ellen MacArthur Foundation's numerous publications and reports.

consensus on the principles of the CE contribute greatly to the confusion around the CE concept and its applications.

The different schools of thought presented in the earlier sub-chapter 10.2 all discuss some principles, or have similarities which could be interpreted to constitute basic underlying principles. Drawing from the different principles and concepts the schools of thought discuss, four common denominators can be identified. These are design for the circular economy, creating value out of waste, the 3R principle, and systems thinking. These appear to attract most common ground among the different disciplines discussed earlier. Choosing these four principles is thus an attempt to contribute to the discussion about "a set of basic principles" that guide the CE.

Removing waste from the lifecycle of a product through design is an inherent idea for the CE. However, it is not always communicated as a principle of the CE. Though not all schools of thought presented above promote design aspects, some – especially cradle-to-cradle and other regenerative design strategies – highlight it. So does industrial ecology in a broader sense. It is also the first principle the EMF considers as a basic principle of the CE, calling it "design out waste and pollution".[1206]

Choices at the design stage concern avoidance, substitution or limiting substances of concern, use of primary or secondary materials, and durability, repair, reuse, remanufacturing and recycling enablers.[1207] In the case of plastic products, this means decisions on the use of polymers, materials and additives, which can crucially impact the sustainability of plastic products and their end-of life treatment. Wider ambitions enabling longer lifetimes for plastic products by increasing durability, reparability and potential for renovation/upgrading of plastic products are also aspects that should be considered already at the design stage.[1208] The design stage determines more than 80% of a product's environmental impact,[1209] and therefore design for the CE should be considered a basic principle of the CE, as also suggested by the EMF.

As well as "design for the circular economy", treating waste as valuable resource is an inherent idea for the CE, and therefore different schools of thought have communicated it in slightly different ways

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1206 EMF, 'What Is the Circular Economy?' https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy

1207 EC, 'Commission Staff Working Document Accompanying the Document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Implementation of the Circular Economy Package: Options to Address the Interface between Chemical, Product and Waste Legislation' (2018) SWD/2018/020 Final. 6; EC, 'Ecodesign Your Future: How Ecodesign Can Help the Environment by Making Products Smarter' (2012) 3.

1208 Institution for European Environmental Policy, 'Policy Approaches to Incentivize Sustainable Plastic Design' (2018) 35.

1209 EC, 'Ecodesign Your Future: How Ecodesign Can Help the Environment by Making Products Smarter' (2012) 3.

according to their own disciplinary angles. In environmental economics, the idea of making economic use from waste is central. In industrial ecology, one of the main principles is to valorize waste, and in the cradle-to cradle-approach, one of the most important principles is waste equals food, whether biological or technical.

Compared to the 3R principle, which promotes a how-to approach by the "reduce, reuse and recycle" recipe, creating value out of waste is about how to mainstream and create market for using waste as a resource. It promotes the paradigm shift toward the CE because it requires an attitude shift in how waste is perceived and thus aims to change current worldviews. Arguably, there remains a negative attachment to waste and it is not necessarily considered as something to be valued. Placing these different formulations – making economic use out of waste, valorizing waste, and promoting waste equals food – under one principle could be beneficial in forging common understanding and appreciation of waste in the CE.

In literature, "the most common conceptualization of the 'how-to' of CE is a combination of reduce, reuse and recycling, the 3R framework."[1210] On a national level, China, Japan and Germany have been the forerunners of the CE. In China, the 3R principle, (reduce, reuse, recycle) is at the core of its national CE policy.[1211] The 3R principle is also the founding principle the CE is being built on in Europe, Japan, Korea, and the USA.[1212]

The first R is reduction. It refers to minimizing "the input of primary energy, raw materials, and waste through the improvement of efficiency in production and consumption processes".[1213] The second R is reuse. It refers to "any operation by which products or components that are not waste are used again for the same purpose for which they were conceived"[1214]. The third R is recycle. It refers to "any recovery operation by which waste materials are reprocessed into products, materials, or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are used as fuels or for backfilling operations."[1215]

[1210] J Kircherr et al. 'Conceptualizing the Circular Economy: An Analysis of 114 Definitions' (2017) 127 Resources, Conservation & Recycling. 229.
[1211] F Preston, 'A Global Redesign? Shaping the Circular Economy' (2012) Chatham House Briefing Paper. 4.
[1212] P Ghisellini et al., 'A Review on Circular Economy: The Expected Transition to a Balanced Interplay of Environmental and Economic Systems' (2006) 114 Journal of Cleaner Production. 15.
[1213] *Ibid.*; Z Feng and N Yan, 'Putting a Circular Economy into practice in China' (2007) 2 Sustainable Science 1. 95; BW Su et al. 'A Review of the Circular Economy in China: Moving Rhetoric to Implementation' (2013 42 Journal of Cleaner Production 42. 216.
[1214] Art 3(13), Council Directive 2008/98/EC of 19 November 2008 on Waste and Repealing Certain Directives [2008] OJ L 312.
[1215] *Ibid.* Art 3(17).

The 3R principle resonates with the concept of the waste hierarchy. In addition to sharing the same elements – prevent waste generation/reduce, reuse and recycle – the 3R principle and the waste hierarchy also share the idea that recycling is the least sustainable option compared to prevention/ reducing and reusing.[1216] The 3R principle is closely connected to the suggested basic principle of "creating value out of waste" in that it operationalizes it with simple and practical terms. Though the 3R principle of reduce, reuse and recycle is the most common combination in literature,[1217] scholars have also proposed R frameworks beyond the 3Rs, such as 4Rs, 6Rs and 9Rs, which further refine how to extend product life and reduce the amount of waste going to final disposal.[1218] Accepting the 3R principle as a basic principle of the CE is important for creating common ground, but should not mean closing the door for adding more Rs to it, because other value-retention processes such repair, refurbishment and remanufacturing are also at the heart of the CE.

Although often listed as principle in CE literature systems thinking is actually a field of research in its own right. The term was coined by Barry Richmond in 1987 and it has been debated ever since. To put it simply, systems thinking is "a system of thinking about systems", a skill set to better understand the complexity of the world.[1219] Richmond himself described systems thinking as follows:

> As interdependency increases, we must learn to learn in a new way. It's not good enough simply to get smarter about our particular "piece of rock". We must have a common language and framework for sharing our specialized knowledge, expertise and experience with "local experts" from other parts of the web. We need a systems Esperanto. Only then will we be equipped to act responsibly. In short, interdependency demands Systems Thinking. Without it, the evolutionary trajectory that we've been following since we emerged from the primordial soup will become increasingly less viable.[1220]

[1216] *Ibid.* Art 4(1); WR Stahel, 'Reuse is the Key to the Circular Economy' (10 September 2014) https://ec.europa.eu/environment/ecoap/about-eco-innovation/experts-interviews/reuse-is-the-key-to-the-circular-economy_en; WR Stahel, 'Policy for Material Efficiency – Sustainable Taxation as a Departure from the Throwaway Society' (2013) 371 Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences. 14-15.

[1217] J Kircherr et al. 'Conceptualizing the Circular Economy: An Analysis of 114 Definitions' (2017) 127 Resources, Conservation & Recycling. 226.

[1218] *Ibid.* 223; For examples of other R-combinations, see eg, D Reike et al., 'The Circular Economy: New or Refurbished as CE 3.0? – Exploring Controversies in the Conceptualization of the Circular Economy through a Focus on History and Resource Value Retention Options' (2018) 135 Resources, Conservation & Recycling; K Winans et al., 'The History and Current Applications of the Circular Economy Concept' (2017) 68 Renewable and Sustainable Energy Reviews 1. 826; IS Jawahir and R Bradley, 'Technological Elements of Circular Economy and the Principles of 6R-Based Closed-Loop Material Flow in Sustainable Manufacturing' (2016) 40 Procedia CIRP; IRP, 'Redefining Value. The Manufacturing Revolution. Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy' (2018)

[1219] RD Arnold and JP Wade, 'A Definition of Systems Thinking: A Systems Approach' (2015) 44 Procedia Computer Science. 670.

[1220] Quote from 1991 from Barry Richmond in RD Arnold and JP Wade, 'A Definition of Systems Thinking: A Systems Approach.' (2015) 44 Procedia Computer Science. 670.

Systems thinking has been argued to be a core principle of the CE.[1221] It takes a holistic approach in the sense that it seeks "to understand how individual decisions and activities interact within the wider systems they are part of". [1222] To achieve a comprehensive CE, understanding the influences, interdependencies, and the different forms of correlations and co-movements that the system entails are crucial.[1223]

Richmond mentions "local experts" and the need for them to exchange knowledge to accumulate a wider understanding of the whole complexity of the system. Applying this to the CE, international law and the global plastics problem, international lawyers are local experts in the sense that they can provide information from their own field of expertise. They can study the measures available in international law, which could promote the CE and thus over the long term reduce MPP. Yet this exercise alone requires crossing disciplinary lines. One must have at least a basic understanding of the CE to consider legal measures to promote it. However, systems thinking also requires exchange of this knowledge with other "local experts", such as engineers, educators, designers, economists, etc., to truly amass such a level of knowledge that the complexity of the problem at hand is respected and we are "equipped to act responsibly".[1224] For all the local experts to communicate efficiently, a certain level of interdisciplinarity is required to be able to engage in the discussion and to understand the basics of other local experts' backgrounds. Therefore, systems thinking is an underlying core principle of the CE, as it forces even "local experts" to acknowledge its complexity and to acquire knowledge in a manner that prepares them to communicate across disciplinary boundaries. This requires the recognition that whichever part of the CE they are dealing with must essentially contribute to the bigger picture based on interdependencies across the system.

All of these four principles – designing waste out of the lifecycle of a product, creating value out of waste, the 3R principle and systems thinking – are general enough to function as policy principles on a global scale. These principles stem from the origins of the CE and represent common values among different disciplines to promote it. They can in their different ways support the evolving standard of due diligence by determining the level of effort to prevent plastics leakage and marine plastics pollution a State is required to take under the no-harm rule, the prevention principle, and the general

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1221 J Kircherr et al. 'Conceptualizing the Circular Economy: An Analysis of 114 Definitions' (2017) 127 Resources, Conservation & Recycling. 224.

1222 M Niero and XC Schmidt Rivera, 'The Role of Life cycle Sustainability Assessment in the Implementation of Circular Economy Principles in Organizations' (2018) 69 Procedia CIRP 69. 795.

1223 M Esposito et al., 'Introducing Circular Economy: New Thinking with New Managerial and Policy Implications' (2018) 60 California Management Review 3. 9.

1224 Quote from 1991 from Barry Richmond in RD Arnold and JP Wade, 'A Definition of Systems Thinking: A Systems Approach.' (2015) 44 Procedia Computer Science. 670.

obligations to protect the marine environment. They also offer a way to operationalize the precautionary principle and the intergenerational equity principle by providing a more concrete basis for anticipatory action with regards to long-term protection of the oceans from plastics.

10.4 Limits of the Circular Economy

10.4.1 Criticism of the Circular Economy

Currently, the world in the whole is only 9% circular, and much of the scholarly work on CE is yet to turn into reality.[1225] Moreover, it has been argued that the idea of the CE "is more often celebrated than critically interrogated".[1226] CE solutions are not automatically sustainable solutions – the CE can also produce environmentally negative outcomes.[1227] Though the CE has the potential to change the current paradigm of production and consumption, its limits need also to be acknowledged not to create additional problems. Furthermore, as stated earlier, the idea that a CE of plastics on a global scale will reduce environmental and health pressures from plastics is a hypothesis. No guarantee exists that a CE of plastics would bring about sustainable development and reduce MPP, and even if it could, how long that process would take. Therefore, it is important to present also critique toward the CE. Regarding the CE of plastics, important limits to consider are, minimally, the thermodynamic or physical limits of the CE and the circular rebound effect.

10.4.2 Thermodynamic Limits

CE processes are subject to the laws of physics.[1228] The first law of thermodynamics denotes that energy and matter cannot be created or destroyed but only converted or dissipated. Any resource usage creates waste, and however the waste is treated, it must end up somewhere in the environment according to the first law of thermodynamics.[1229] Some of the waste can be used as a resource, but not all. This is due to the second law of thermodynamics, about entropy, that describes how well

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[1225] J Kircherr and R van Santen, 'Research on the Circular Economy: A Critique of the Field' (2019) 151 Resources, Conservation & Recycling. 1; Circle Economy, 'The Circularity Gap Report 2020' (2020) 8.
[1226] N Gregson et al., 'Interrogating the Circular Economy: The Moral Economy of Resource in the EU' (2015) 44 Economy and Society 2. 218.
[1227] R de Man and H Friege, 'Circular Economy: European Policy on Shaky Ground' (2016) 34 Waste Management and Research 2. 93.
[1228] Korhonen et al., 'Circular Economy: The Concept and Its Limitations' (2018) 143 Ecological Economics. 41-42.
[1229] E Maitre-Ekern, 'The Choice of Regulatory Instruments for a Circular Economy' in K Mathis and BR Huber (eds) *Environmental Law and Economics* (Springer 2017) Economic Analysis of Law in European Legal Scholarship 4. 308; DW Pearce and RK Turner, *Economics of Natural Resources and the Environment* (Johns Hopkins University Press 1990) 37.

matter and energy is organized. The more matter and energy humans extract, the more entropy increases. Circulating resources in the CE helps delay the increasing entropy.[1230]

In the light of the laws of thermodynamics, product reuse, repair, remanufacturing, and refurbishment are most desirable choices, whereas recycling for raw material and combustion for energy are less desirable and should be avoided. According to the laws of thermodynamics, perfect circularity of resources in the economy is only a theoretical possibility.[1231] It would be possible to recycle everything only by using the infinite, renewable energy of the sun. However, this would require the means to benefit from solar energy to the fullest extent.[1232] Creating completely waste-free economy would require gigantic quantities of energy, and it is particularly energy use in CE solutions that can signify negative ecological impacts.[1233] Furthermore, finding, recovering and processing all the dissipated materials and nutrients is not viable.[1234] For example, microplastics that are the result of degradation of plastics in the oceans are impossible to recover. Therefore, complete recycling and waste-free economy are thermodynamic impossibilities.[1235]

Due to the facts that matter and energy are constant and that their entropy tends to increase, even CE projects require energy and materials.[1236] Consequently, this produces wastes and by-products, and therefore these projects' sustainability contributions need to be analyzed carefully to avoid activities that might have more negative ecological impacts than linear solutions.[1237] This requires that the assumption that CE solutions always lead to sustainable outcomes should not be taken as a given.[1238]

10.4.3 The Rebound Effect[1239]

From an environmental perspective, the CE is about substituting lower-impact secondary production for environmentally intensive primary production. The assumption is generally that displacement

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1230 MS Andersen, 'An Introductory Note on the Environmental Economics of Circular Economy' (2007) 2 Sustainability Science. 134-135.
1231 D Lazarevic and H Valve, 'Narrating Expectations for the Circular Economy: Towards Common and Contested European Transition' (2017) 31 Energy Research & Social Science. 63-64.
1232 Korhonen et al., 'Circular Economy: The Concept and Its Limitations' (2018) 143 Ecological Economics. 42.
1233 R de Man and H Friege, 'Circular Economy: European Policy on Shaky Ground' (2016) 34 Waste Management and Research 2. 93.
1234 Korhonen et al., 'Circular Economy: The Concept and Its Limitations' (2018) 143 Ecological Economics. 42.
1235 R de Man and H Friege, 'Circular Economy: European Policy on Shaky Ground' (2016) 34 Waste Management and Research 2. 93;. KR Skene, 'Circles, Spirals, Pyramids and Cubes: Why the Circular Economy Cannot Work' (2018) 13 Sustainable Science 2. 489.
1236 N Georgescu-Roegen, 'The Entropy Law and the Economic Process in Retrospect' (1986) 12 Eastern Economic Journal 1. 3.
1237 Korhonen et al., 'Circular Economy: The Concept and Its Limitations' (2018) 143 Ecological Economics. 42.
1238 R de Man and H Friege, 'Circular Economy: European Policy on Shaky Ground' (2016) 34 Waste Management and Research 2. 93.
1239 This phenomenon, 'circular economy rebound', is similar to the energy efficiency rebound, also known as Jevons paradox. (T Zink and R Geyer, 'Circular Economy Rebound' (2017) 21 Journal of Industrial Ecology 3. 595.) Jevons

occurs on a 1:1 basis; each kilogram of secondary production reduces primary production by 1 kg. However, this remains an assumption. It is not clear whether and to what extent secondary production displaces primary production. Due to the market forces which largely govern the displacement, it is not likely that the displacement ratio would actually be 1:1.[1240] The economic nature of the interactions between primary and secondary goods make it difficult to predict developments. Secondary goods compete with primary goods in all markets of the CE – final goods, end-of-life goods, unprocessed scrap, semi-processed scrap, recycled materials, refurbished products, secondhand repaired products, etc.[1241] Secondary goods may not displace primary goods if their quality or other features are less desirable to users.[1242] A CE rebound effect may also occur when increased secondary production impacts on prices.[1243]

To avoid a CE rebound effect, three aspects should be considered. First, the CE should produce products and materials which fully replace primary production alternatives. Second, CE activities should target areas with satiable demand or ensure that secondary production does not significantly lower prices. Third, the CE should draw consumers away from primary production.[1244] Regarding plastics, the CE would undoubtedly target a market with satiable demand. However, the other challenges are highly prevalent. Secondary plastic products and materials should replace virgin plastic alternatives and attract consumers. These are complex challenges and the process of addressing them on a global level is only beginning.

10.5 The Role of International Law in Promoting the Global Circular Economy of Plastics

One the main instruments for implementation of a CE is law.[1245] It is evident from the earlier analysis of different schools of thought that within all of them the role of law is recognized as an important tool in promoting the CE. Both ecological and environmental economics stress the need for policy and legal measures to reach their goals. These fields highlight the responsibility of decision-makers

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paradox refers to a correlation between increased natural resource consumption and increased efficiency. Increasing production efficiency decreases production costs, which leads to decreased end-product costs and consequently boosts consumption. (JM Polimeni and RI Polimeni, 'Jevon's Paradox and the Myth of Technological Deliberation' (2006) 3 Ecological Complexity 4. 344.)

1240 T Zink and R Geyer, 'Circular Economy Rebound' (2017) 21 Journal of Industrial Ecology 3. 594.

1241 *Ibid.*. 596.

1242 *Ibid.* 597.

1243 *Ibid.* 598.

1244 *Ibid.* 599.

1245 B Suárez-Eiroa et al., 'Operational Principles of Circular Economy for Sustainable Development: Linking Theory and Practice' (2019) 214 Journal of Cleaner Production. 955; A de Jesus et al., 'Eco-Innovation in the Transition to a Circular Economy: An Analytical Literature' (2018) 172 Journal of Cleaner Production. 3012.

and regulators to particularly boost mechanisms for enabling reuse and recycling to take place on larger scales and to promote inclusion of externalities in prices.[1246] Also the field of industrial ecology recognizes that regulations, including regulations at the international level, have a key role to play in the transition from traditional methods of manufacturing to more circular ones.[1247] The performance economy promotes policy interventions that encourage and reward focus on performance and internalizing external costs from emissions and pollution. It also advocates rethinking ownership and using taxation for non-renewable resources, and value-added taxation for value-adding activities but not for value-preserving stock management activities, such as reuse, repair and remanufacturing.[1248] The cradle-to-cradle approach warns that regulators should be careful not to institute perverse incentives, but also admits that legislation can result in the establishment of helpful collaborative mechanisms for product life-cycle management.[1249] All in all, there is wide support from these key fields that law has a role to play in advancing CE practices. The challenge is thus more about further issues, such as the levels at which regulation should take place and what the precise content of law in the context of the CE should be.

Law can function in different ways in promoting a global CE of plastics. Law can provide a push for implementing more circular practices, or it can function as a barrier for the CE. Obstructive laws and regulations have been identified as one of the main regulatory barriers hampering the promotion of the CE.[1250] Therefore, shaping the role of law should not only be about introducing new measures but also removing, amending or further clarifying regulations that hinder adoption of CE techniques: "…measures taken at the government level are…important to…remove barriers and kick-start the circular economy. For example, costing environmental externalities and mandatory regulation for circular product design were regarded as major enablers even if they are difficult to implement."[1251] It should also been taken into account that regulatory efforts can learn from and be inspired by existing CE practices, and there can be a mutually beneficial relationship between lawmakers and practitioners:

1246 MS Andersen, 'An Introductory Note on the Environmental Economics of Circular Economy' (2007) 2 Sustainability Science. 134, 139; F Preston, 'A Global Redesign? Shaping the Circular Economy' (2012) Chatham House Briefing Paper. 8.

1247 RA Frosch and NE Gallopoulos, 'Strategies for Manufacturing' (1989) 261 Scientific American 3. 152; T Wautelet, 'The Concept of Circular Economy: Its Origins and Its Evolution' (2018) Working Paper, ResearchGate. 5.

1248 WR Stahel, 'The Circular Economy' (2016) 531 Nature 7595. 437-438.

1249 F Blomsma, 'Collective 'Action Recipes' in a Circular Economy: On Waste and Resource Management Frameworks and Their Role in Collective Change' (2018) 199 Journal of Cleaner Production. 975; M Braungart et al. 'Cradle-to-Cradle Design: Creating Healthy Emissions – A Strategy for Eco-Effective Product and System Design' (2007) 15 Journal of Cleaner Production. 1346.

1250 J Kircherr et al., 'Barriers to Circular Economy: Evidence from the European Union (EU)' (2018) 150 Ecological Economics. 269.

1251 AG Pheifer, 'Barriers & Enablers to Circular Business Models' (ValueC 2017) A Whitepaper. 21.

> Finally, it will definitely take considerable effort and time to adjust the linear economy legislation into one that is fit for a circular economy purpose. This should by no means be an obstacle for both private and non-private green initiatives. On the contrary, experimental settings may provide useful information when making new, either voluntarily or legislative, rules for a sound circular economy.[1252]

Implementing a CE on a macro level refers to putting it into action in society as whole including *inter alia* the international community.[1253] To date, "no international policy effort integrates circular-economy approaches"[1254] and "there has been no comprehensive review of how the Circular Economy is being implemented globally".[1255] One of the main obstacles to successful implementation is the lack of government coordination, an imbalance that also affects the implementation of the CE with law.[1256] The lack of global consensus has also been identified as one of the main barriers: "[t]here are a lot of different countries, so you need a high level of consensus and that is not easy."[1257] Therefore, a lack of global efforts to promote the CE does not necessarily reflect its aptness for being implemented at the international level but rather how challenging the task is.

1252 C Bodar et al., 'Risk Management of Hazardous Substances in a Circular Economy' (2018) 212 Journal of Environmental Management. 113.
1253 B Suárez-Eiroa et al., 'Operational Principles of Circular Economy for Sustainable Development: Linking Theory and Practice' (2019) 214 Journal of Cleaner Production. 955; A de Jesus et al., 'Eco-Innovation in the Transition to a Circular Economy: An Analytical Literature' (2018) 172 Journal of Cleaner Production. 3012.
1254 N Millar et al, 'The Circular Economy: Swings and Roundabouts?' (2019) 158 Ecological Economics. 17.
1255 *Ibid.*; See also, Y Geng et al., 'Globalize the Circular Economy' (2019) 565 Nature. 154.
1256 N Millar et al, 'The Circular Economy: Swings and Roundabouts?' (2019) 158 Ecological Economics. 17.
1257 J Kircherr et al., 'Barriers to Circular Economy: Evidence from the European Union (EU)' (2018) 150 Ecological Economics. 266.

CHAPTER 11 – THE CURRENT INTERNATIONAL ENVIRONMENTAL LEGAL FRAMEWORK AND TECHNICAL STANDARDS APPLICABLE TO PROMOTING A GLOBAL CIRCULAR ECONOMY OF PLASTICS

11.1 Introduction

Chapter 11 maps international environmental law and international technical standards to investigate, whether these possess elements that advance, or function as prerequisites for, a global CE of plastics. The instruments chosen for the mapping contain at least one element of the 3R principle (reduce, reuse, recycle) and the waste hierarchy elements of prevent (waste generation), reuse and recycle, or they provide other functions to establish CE practices on an international level.

11.2 Multilateral Environmental Agreements

11.2.1 The Stockholm Convention

The Stockholm Convention on Persistent Organic Pollutants (Stockholm Convention) is the only binding international instrument governing chemicals in plastics and plastics wastes. The Stockholm Convention regulates persistent organic pollutants (POPs), which are chemicals that possess toxic properties, resist degradation, bioaccumulate in both terrestrial and aquatic ecosystems, and can be transported across international boundaries through air, water, and migratory species.[1258] The Stockholm Convention provides binding measures to reduce the harm that plastics or plastics wastes may cause.[1259]

In the Stockholm Convention, the measures that correspond the first R of the 3R principle/waste hierarchy – reduce – concern production, trade and waste trade involving POPs in plastics and plastics wastes. The Stockholm Convention targets plastic producers through elimination measures aimed at production and use to minimize the hazard potential of plastic products.[1260] The Convention also reduces the quantity of plastics and plastics wastes containing POPs by regulating import and export of POPs planned for use in plastics, and controlling plastics wastes that contain or are contaminated with POPs.[1261]

[1258] Preamble, the Stockholm Convention.
[1259] K Raubenheimer and A McIlgorm, 'Can the Basel and Stockholm Conventions Provide a Global Framework to Reduce the Impact of Marine Plastic Litter?' (2018) 96 Marine Policy. 287.
[1260] *Ibid.*
[1261] *Ibid.*

Some additive chemicals used to modify the properties of plastics products are now classified as POPs under the Stockholm Convention.[1262] These chemicals are PCBs,[1263] pentaBDE's,[1264] octaBDE's,[1265] decaBDE's,[1266] PFOSs,[1267] HBCD,[1268] PCNs,[1269] and SCCPs.[1270] All of them are listed under Annex A, the objective of which is to eliminate the production and use of the listed chemicals. Though these chemicals are now classified as POPs, exemptions and legacy issues mean the problem has not gone away. For example with regard to BDE's, "older plastic products still in re(use), signify that the legacy of BDEs in our plastic can be with us for quite some years to come, only halting when the plastics are adequately incinerated using best available technology (BAT) or chemically recycled."[1271]

The Stockholm Convention does not promote the second or third Rs – reuse or recycle – which is a limitation to promoting a CE of plastics.[1272] A further limitation is that though some POPs listed in Annex A can still be used with specific exemptions, their international trade is only permitted for "environmentally sound disposal" which does not include recovery, recycling, reclamation, direct reuse or alternative uses of POPs.[1273] On one hand, these limitations are environmentally justified in view of the fact that the chemicals within the Stockholm Convention's scope are hazardous. On the other hand, in a closed loop system where technical nutrients are circulated and the hazardous components separated safely, plastics and plastics wastes containing POPs could potentially be part of the CE.

Yet, "toxic recycling is an obstacle to a truly circular economy," and "recycling materials containing toxic chemicals can contaminate consumer products, leading to a legacy of hazardous chemical

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1262 UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) 16.
1263 Listed under Annex A with specific exemptions and under Annex C, the Stockholm Convention; The Stockholm Convention, 'All POPs Listed in the Stockholm Convention' http://chm.pops.int/TheConvention/ThePOPs/AllPOPs/tabid/2509/Default.aspx
1264 Listed under Annex A with a specific exemption for use as articles containing these chemicals for recycling in accordance with the provision in Part V of Annex A, the Stockholm Convention.
1265 Listed under Annex A with a specific exemption for use as articles containing these chemicals for recycling in accordance with the provision in Part IV of Annex A, the Stockholm Convention.
1266 Listed under Annex A, the Stockholm Convention.
1267 Listed under Annex A with specific exemptions, the Stockholm Convention.
1268 Listed under Annex A, the Stockholm Convention.
1269 Listed under Annex A and C with specific exemptions, the Stockholm Convention.
1270 Listed under Annex A, the Stockholm Convention. However, "due to heavy industry lobbying, the resulting ban included loopholes to allow for continued use of SCCPs in the production of plastic, which demonstrates the inadequacy of current global regulatory frameworks to address toxic plastic additives." CIEL, 'Plastic & Health: The Hidden Costs of a Plastic Planet' (CIEL 2019) 40.
1271 HA Leslie et al. 'Propelling Plastics into the Circular Economy – Weeding Out the Toxics First' (2016) 94 Environment International. 233.
1272 See, K Raubenheimer and A McIlgorm, 'Can the Basel and Stockholm Conventions Provide a Global Framework to Reduce the Impact of Marine Plastic Litter?' (2018) 96 Marine Policy. 288.
1273 *Ibid.* 287.

exposures and re-releases into the environment."[1274] Recycling POPs would thus require extremely safe technologies and safe limits regarding permitted amounts of POPs in a product. For example, with regard to PBDE's:

> …different standards for PBDE content in virgin and recycled articles [in the EU] result from weak legislative thresholds for POPs waste, which do not take into account the potential toxicity of waste streams to be recycled. The problem extends far beyond EU borders. As recycling targets are globalized through recycling exemptions for PentaBDE and OctaBDE under the Stockholm Convention, this perpetuates the global toxic legacy of PBDEs' emissions and exposures.[1275]

In the absence of an internationally binding instrument on plastics and their chemicals, the Stockholm Convention provides for a procedure under Article 8 for further phase-outs of the most harmful substances in plastics. Parties to the Convention can suggest substances to be listed for elimination (Annex A), restriction (Annex B) or recognized in unintentional production (Annex C). The Secretariat and the POPs Review Committee evaluate the proposals, and a substance can be added to the list of POPs if it fulfills the conditions set out in Annex D: persistence (1.b), bio-accumulation (1.c), potential for long-range environmental transport (1.d) and adverse effects (1.e).

The challenge is, on the one hand, that a chemical may not be as harmful as a stand-alone substance as when it is part of a plastic product. For example, the risks of additives in plastics with endocrine disruptor properties "might not pass some of the POPs screening criteria, such as persistence in water in standard laboratory conditions, when selecting and assessing substances for the listing of new POPs in the Stockholm Convention."[1276] On the other hand, though "plastics in the marine environment exhibit some characteristics of persistent organic pollutants (organic man-made substances that persist, accumulate, and harm wildlife and people), the specifics of the Stockholm Convention would not apply to most plastic materials."[1277] Therefore, using the procedure under Article 8 of the Stockholm Convention to specific plastics types is challenging. Yet, the option to use Article 8 procedure to eliminate or restrict the most harmful chemicals contained in plastics should be kept in mind and used when possible, even if further eliminations and restrictions would include only a fraction of existing chemicals in plastics. In the spirit of curbing plastics wastes generation and applying the precautionary and intergenerational equity principles, the most persistent and toxic substances with irreversible effects on the marine environment and human health ought to be banned, or at least severely restricted.

1274 CIEL, 'Plastic & Health: The Hidden Costs of a Plastic Planet' (CIEL 2019) 48.
1275 *Ibid.*
1276 F Gallo et al., 'Marine Litter Plastics and Microplastics and their Toxic Chemicals Components: the Need for Urgent Preventive Measures' (2018) 30 Environmental Sciences Europe 13. 10.
1277 B Worm et al. 'Plastics as a Persistent Marine Pollutant' (2017) 42 Annual Review of Environment and Resources. 16.

11.2.2 THE BASEL CONVENTION

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel Convention) regulates transboundary movements of hazardous wastes and other wastes. Plastics wastes were previously classified as "other wastes" under the Basel Convention. Due to the so-called 'Plastic Amendments' to the Basel Convention, as of 2021 the classification of plastics can be either "other wastes", "hazardous wastes" or "plastic waste destined for recycling in an environmentally sound manner".[1278] Movements of wastes can serve a global CE of plastics when the objective is to use plastics wastes as a resource.

Though the Basel Convention Article 4(2) establishes a duty to reduce generation of wastes, it mostly provides regulations that concern the waste phase of plastics and provides the means for States to manage and restrict trade in plastics waste[1279]. Measuring progress in reducing plastic waste is difficult as the Convention does not provide any indicators, targets, timelines or reporting obligations for this purpose.[1280] The Basel Convention does not address reuse.

Regarding recycling of plastics wastes, the Fourteenth Conference of the Parties to the Basel Convention (COP14) adopted a decision, which amends Annexes II, VIII and IX to the Basel Convention.[1281] The COP14 adopted the decision following Norway's proposal for amendments. The rationale of the amendments was to address the global challenge of plastics leakage and marine plastic pollution through better control of transboundary shipments of waste and promoting trade for recovery of uncontaminated and sorted plastic waste streams.[1282] The aim was also to boost the market for secondary raw materials in particular.[1283]

The decision signifies that as of 1 January 2021, plastics wastes intended for trade can be classified under three entry options. First, as "other wastes" (Annex II, Y48), or second, as "hazardous wastes" (Annex VIII, A3210), both of which are subject to the prior consent procedure. The third option is

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1278 Fourteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'BC-14/12: Amendments to Annexes II, VIII and IX to the Basel Convention' (10 May 2019) UNEP/CHW.14/CRP.40; Art. 4(1), the Basel Convention.

1279 K Raubenheimer and A McIlgorm, 'Can the Basel and Stockholm Conventions Provide a Global Framework to Reduce the Impact of Marine Plastic Litter?' (2018) 96 Marine Policy. 286.

1280 *Ibid.* 287.

1281 Fourteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'BC-14/12: Amendments to Annexes II, VIII and IX to the Basel Convention' (10 May 2019) UNEP/CHW.14/CRP.40

1282 Fourteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'Explanatory Note from the Government of Norway on Its Proposals to Amend Annexes II, VIII and IX to the Basel Convention' (10 May 2019) UNEP/CHW.14/INF/18. 6-7.

1283 Government.no, 'Norway Pushing for Stronger Global Control of Plastic Waste' (2 May 2019) https://www.regjeringen.no/en/aktuelt/basel-convention/id2643569/

as "plastic waste destined for recycling in an environmentally sound manner" (Annex IX, B3011).[1284] The entry B3011 is the core of the proposal and strongly pushes for environmentally sound recycling of plastics by setting a list of conditions for plastic waste to qualify as recyclable.[1285] Therefore, the amended Basel Convention has the potential to become a valuable tool to promote a global CE of plastics, whilst protecting developing countries with inadequate waste management systems. Consequently, more stringent procedures to accept contaminated or hazardous plastics wastes for final disposal purposes can enhance the well-being of oceans over the long term. However, the Plastic Amendments only touch upon promoting a global CE plastics through recycling, but do not concern other value retention processes such as reuse, repair, refurbishment or remanufacturing.

11.2.3 The Fish Stocks Agreement

The Agreement for the Implementation of the Provisions of the 1982 United Nations Convention on the Law of the Sea Relating to the Conservation of Management of Straddling and Highly Migratory Fish Stocks (Fish Stocks Agreement) does not regulate material use or pollution *per se.*

However, Article 5 (f) of the Fish Stocks Agreement stipulates that States should:

> minimize pollution, waste, discards, catch by lost or abandoned gear … through measures including, to the extent practicable, the development and use of selective, environmentally safe and cost-effective fishing gear and techniques.[1286]

The Fish Stocks Agreement thus includes obligations concerning upstream activities by including waste minimization in the treaty text, which corresponds to the element of reduction in the waste hierarchy and the 3R principle. However, the Fish Stocks Agreement has no indicators or targets to measure progress on minimizing pollution, waste, discards, or catch by lost or abandoned gear.

Furthermore, pursuant to the Article 18(3)(d) the Fish Stocks Agreement, flag States must have

> [R]equirements for marking of fishing vessels and fishing gear for identification in accordance with uniform and internationally recognizable vessel and gear marking systems, such as the Food and Agriculture Organization of the United Nations Standard Specifications for the Marking and Identification of Fishing Vessels[.]

[1284] Fourteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'BC-14/12: Amendments to Annexes II, VIII and IX to the Basel Convention' (10 May 2019) UNEP/CHW.14/CRP.40; Art. 4(1), the Basel Convention.

[1285] Fourteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'BC-14/12: Amendments to Annexes II, VIII and IX to the Basel Convention' (10 May 2019) UNEP/CHW.14/CRP.40

[1286] Art. 5(f), Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (Adopted 4 August 1995, entered into force 11 December 2001) 2167 UNTS 3 ('Fish Stocks Agreement')

One of the objectives of marking fishing gear is to facilitate its recovery to eliminate abandoned, lost or otherwise discarded fishing gear (ALDFG).[1287] More efficient recovery of gear provides for further options of repair, reuse and recycling, and can thus facilitate a CE of plastics. To avoid any circumvents, "identification should be made an intrinsic feature of gear at the point of manufacture."[1288]

Though obligations to minimize waste and mark fishing gear are important notions, they do not by any means comprise a comprehensive legal framework for a CE of fishing gear made of plastics. Moreover, the Fish Stocks Agreement is limited in managing straddling fish stocks.[1289] However, the Fish Stocks Agreement provides some legal basis for further international cooperation with regard to promotion of CE of plastics-made fishing gear.

11.3 Soft Law

Multiple soft law instruments, which are applicable to plastics leakage, contain some references to CE activities. These are the 2017 Guidelines for the Implementation of MARPOL Annex V, the Action Plan to Address Marine Plastic Litter from Ships, the GPA, the Honolulu Strategy, the Global Partnership on Marine Litter, the Recommendation to Encourage Action to Combat Marine Litter adopted by the parties to the London Convention and Protocol, the CBD/COP13 decision Addressing Impacts of Marine Debris and Anthropogenic Underwater Noise on Marine and Coastal Biodiversity, and several United Nations Environment Assembly resolutions.

11.3.1 IMO Instruments

The 2017 Guidelines for the Implementation of MARPOL Annex V (Guidelines) advocate for waste minimization as part of garbage management, in line with the 3R principle and the waste hierarchy. Manufacturers, cargo owners, ports and terminals, ship owners and operators, and governments, should rethink the management of garbage associated with ships' supplies, provisions, and cargoes to minimize the generation of garbage in all forms, and ship-specific garbage minimization should be part of the garbage management plans.[1290]

1287 FAO, 'Voluntary Guidelines for the Marking of Fishing Gear' (2018) COFI/2018/Inf.30. 2.
1288 UNEP and FAO, 'Abandoned, Lost or Otherwise Discarded Fishing Gear' (2009) 82.
1289 UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 32.
1290 IMO, Res MEPC.295(71) '2017 Guidelines for the Implementation of MARPOL Annex V' (Adopted 7 July 2017) MEPC 71/17/Add.1. 5.

To decrease the amount of garbage, ship owners and operators, together with the ships' suppliers, are recommended to:

1. use supplies that come in bulk packaging,
2. use supplies that come in reusable or recyclable packaging and containers, and to avoid disposable cups, utensils, dishes, towels, rags and other convenience items whenever possible, and
3. avoid supplies that are packaged in plastic, unless a reusable or recyclable plastic is used,
4. as well as using permanent reusable coverings for cargo protection instead of disposable or recyclable plastic sheeting.[1291]

To facilitate collection, non-recyclable plastics and plastics mixed with non-plastic garbage should be separated from recyclable plastics.[1292] The Guidelines also encourage governments to undertake research and technology development to minimize garbage and its impact on the marine environment, particularly to develop technology for the use of biodegradable materials to replace current plastic products.[1293] Governments are also encouraged provide the IMO with technical information on shipboard garbage management methods such as minimization, recovery, recycling, reuse, incineration, compaction, sorting and sanitation system, packaging and provisioning methods.[1294] Moreover, governments are encouraged to collaborate with maritime colleges and technical institutes to include in their curricula legal duties and technical options for seafarers in handling ship-generated waste, particularly to minimize waste generation aboard ships.[1295]

The Guidelines address comprehensively all three Rs; reduce, reuse and recycle. However, they provide practical day-to-day suggestions rather than systemic recommendations. To further push action toward curbing MPP and promoting CE practices, the IMO's Action Plan to Address Marine Plastic Litter from Ships complements the Guidelines. The Action Plan has eight outcome goals and to achieve them it lists 30 specific measures. Those goals and measures which deal directly with the 3Rs to promote a global CE of plastics will be reviewed here.

The first outcome goal is reduction of marine plastic litter generated from, and retrieved by, fishing vessels. Measures to achieve this include *inter alia* considering "making mandatory, through an appropriate IMO instrument [(eg, MARPOL Annex V)], the marking of fishing gear with the IMO Ship Identification Number, in cooperation with the Food and Agriculture Organization of the United Nations (FAO)."[1296] A common system for the IMO and FAO via MARPOL Annex V for

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[1291] *Ibid.*
[1292] *Ibid.* 11.
[1293] *Ibid.* 6.
[1294] *Ibid.* 22.
[1295] *Ibid.*
[1296] IMO, Res MEPC.310(73) 'Action Plan to Address Marine Plastic Litter from Ships' (Adopted 26 October 2018) MEPC 73/19/Add.1. 4.

the marking of fishing gear could have far-reaching benefits. MARPOL Annex V is almost universally ratified, which would mean that such requirement could provide a significant boost to fishing gear marking. This could consequently reduce intentional abandoning of fishing gear, as well facilitating retrieval of ALDFG for reuse and recycling.

To improve the effectiveness of port reception facilities and treatment in reducing marine plastic litter, the Action plan aspires to encourage reuse and recycling by requiring "port reception facilities to provide for separate garbage collection for plastic waste."[1297] Furthermore, the Action Plan recommends States to:

> Consider the development of tools to support the implementation of cost frameworks associated with port reception facilities, taking into account the need to not create disincentives for the use of port reception facilities, the potential benefits of cost incentives that provide no additional fees based on volume and identifying waste types that can be reduced, reused or recycled through schemes that identify waste revenue[1298]

Schemes that identify waste revenue, and particularly revenue from plastics wastes, through the 3Rs are a direct reference to the CE. Involving port reception facilities around the globe in promoting such schemes would be an exemplary measure to promote the global CE of plastics.

In addition to the Guidelines and the Marine Litter Action plan, States have addressed upstream activities under the auspices of the London Convention and Protocol. They have given a 'Recommendation to Encourage Action to Combat Marine Litter', in which they highlight that measures addressing plastic pollution should be applied in the environment and at source.[1299] Since both the London Convention and Protocol deal with the act of disposal of plastics in the environment, stressing that measures should also address plastic at its source is an encouraging take on the issue. However, the recommendation does not elaborate on these measures in any way.

11.3.2 Land-Based Pollution and Biodiversity Instruments

The GPA sets as an objective regarding litter "the prevention or reduction of the generation of solid waste and improvements in its management, including collection and recycling litter", and calls for international actions that include recycling and reuse.[1300] Intergovernmental Review Meetings (IGR)

1297 *Ibid.* 6.

1298 *Ibid.* 7.

1299 Thirty-Eight Consultative Meeting of Contracting Parties to the London Convention & Eleventh Meeting of Contracting Parties to the London Protocol, 'Report of the Thirty-Eight Consultative Meeting and Eleventh Meeting of Contracting Parties' (18 October 2016) LC 38/16. Annex 8.

1300 UNEP/Intergovernmental Conference to Adopt a Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, 'Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities' (Adopted 5 December 1995) UN Doc UNEP(OCA)/LBA/IG.2/7 ('GPA') 55-56.

evaluate national implementation of the GPA based on national surveys.[1301] However, the surveys do not specifically include questions on the reduction, reuse or recycling of litter.[1302]

Also the GPML, a multi-stakeholder initiative supporting the GPA, promotes resource efficiency and economic development through waste prevention, eg 4Rs (reduce, re-use, recycle and re-design), and by recovering valuable material and/or energy from waste.[1303] Also the Honolulu Strategy provides a framework for further global efforts to reduce the impact of marine debris.[1304] The Honolulu strategy addresses waste minimization and reduction, reuse, recycling and recovery of waste.[1305] Either the GPML or the Honolulu Strategy set any further targets or indicators regarding these elements of the CE, however.[1306]

The Thirteenth Meeting of the Conference of the Parties to the CBD (COP13) adopted a non-binding decision, 'Addressing Impacts of Marine Debris and Anthropogenic Underwater Noise on Marine and Coastal Biodiversity', which highlights reduction, reuse and recycling as priority actions for land-based sources of marine debris. It promotes "structural economic changes that would reduce the production and consumption of plastics, increase production of environmentally friendlier materials, and support the development of alternative materials, increase recycling and reuse and support an enabling environment for these changes through capacity-building, regulations and standards and cooperation among industry, governments and consumers", and "resource-efficient and closed product-to-waste cycles".[1307] The Decision encourages governments to take action based on these suggestions.

11.3.3 UNEA Resolutions

Several UNEA Resolutions have touched upon the elements of a CE of plastics. The UNEA-2 outcomes relating to the topic, Resolution 2/8 on 'Sustainable Consumption and Production' and

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1301 UN Environment, 'Governing the Global Program of Action' https://www.unenvironment.org/explore-topics/oceans-seas/what-we-do/addressing-land-based-pollution/governing-global-programme

1302 See, National Reporting for the Fourth Inter-Governmental Review (IGR) of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) https://docs.google.com/forms/d/e/1FAIpQLSe7_sa3L12Zx8JKwUxI-1goiQqvIBetvtSz1GB2ggtlFTsuDQ/viewform

1303 GPML, 'Purpose, Function and Organization' (2018) Framework Document. 1-3.

1304 UNEP, 'The Honolulu Strategy: A Global Framework for Prevention and Management of Marine Debris' (2016) ('Honolulu Strategy') ES-1, 3.

1305 *Ibid.* 31-41

1306 *Ibid.* 3.

1307 Thirteenth Meeting of the Conference of the Parties to the Convention to Biological Diversity, 'Decision Adopted by the Conference of the Parties to the Convention on Biological Diversity: XIII/10. Addressing Impacts of Marine Debris and Anthropogenic Underwater Noise on Marine and Coastal Biodiversity' (10 December 2016) CDB/COP/DEC/XIII/10. 4-5.

Resolution 2/11 'Marine Plastic Litter and Microplastics' all promote the use of the 3R principle (reduce, reuse, recycle).[1308]

UNEA-3 Resolution 3/7 'Marine Litter and Microplastics' invites States and other actors to develop and implement action plans to encourage resource efficiency, to increase collection and recycling rates of plastic waste and re-design and re-use of products and materials, and to avoid unnecessary use of plastic and plastic containing chemicals of particular concern.[1309]

In UNEA-4, the CE was explicitly mentioned and referred to in five resolutions relevant for plastics. Resolution 4/1 'Innovative Pathways to Achieve Sustainable Consumption' explicitly promotes the CE, the 3R principle, remanufacturing and product-service-systems to advance sustainable production and consumption. It also expressly makes the link between work on sustainable production and consumption and combatting marine plastics pollution.[1310] Resolution 4/4 'Addressing Environmental Challenges through Sustainable Business Practices' refers to and promotes the CE and the 3R principle.[1311] Also Resolution 4/6 'Marine Plastic Litter and Microplastics' stresses the importance of CE and the 3R principle.[1312] Resolution 4/7 'Environmentally Sound Management of Waste' recognizes the connection between waste management and the CE, and invites member States to pay special attention to preparing waste for reuse and recycling, reducing landfill use, and applying the "waste hierarchy" to set priorities for all waste, and to particularly support the recycling of plastics, including the improvement of waste collection, transportation and recycling infrastructure.[1313] Also Resolution 4/8 'Sound Management of Chemicals and Waste' promotes the CE and underlines "the importance of waste prevention and minimization at source through, among other things, minimizing packaging materials, discouraging planned product obsolescence and improving the reusability and recyclability of products and the efficiency of resources through improved design and the use of secondary raw materials".[1314] Resolution 4/9 'Addressing Single-Use Plastic Products Production' notes "the important role played by key actors, such as plastics producers, retailers, the consumer goods industry, importers, packaging firms, transporters and recyclers, in contributing to a reduction in plastic waste resulting from their

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[1308] UNEA Res 2/8 'Sustainable Consumption and Production' (23-27 May 2016) UN Doc UNEP/EA.2/Res.8.; UNEA 2/11 'Marine Plastic Litter and Microplastics' (23-27 May 2016) UN Doc UNEP/EA.2/Res.11. 3.

[1309] UNEA Res 3/7 'Marine Litter and Microplastics' (4-6 December 2017) Un Doc UNEP/EA.3/Res.7. 2, para 4(c).

[1310] UNEA Res. 4/1 'Innovative Pathways to Achieve Sustainable Consumption' (11-15 March 2019) UN Doc UNEP/EA.4/Res.1. 1-5.

[1311] UNEA Res 4/4 'Addressing Environmental Challenges through Sustainable Business Practices' (11-15 March 2019) Un Doc UNEP/EA.4/Res.4. 2.

[1312] UNEA Res 4/6 'Marine Plastic Litter and Microplastics' (11-15 March 2019) UN Doc UNEP/EA.4/Res.6. 1.

[1313] UNEA Res 4/7 'Environmentally Sound Management of Waste' (11-15 March 2019) UN Doc UNEP/EA.4/Res.7. 2.

[1314] UNEA Res. 4/8 'Sound Management of Chemicals and Waste' (11-15 March 2019) UN Doc UNEP/EA.4/Res.8. 2.

products and activities, as well as in providing information on the impact of their products and encouraging the adoption of innovative approaches, such as the use of extended producer responsibility schemes and deposit refund schemes, among others".[1315] In addition to, and framing these resolutions, the Sustainable Development Goal 12: 'Ensure Sustainable Consumption and Production Patterns' (SDG 12), promotes the CE. By 2030, SDG 12 states, waste generation should be substantially reduced through prevention, reduction, recycling and reuse.[1316] In particular the five resolutions from the UNEA-4 are an important contribution to promoting a global CE of plastics, and represent the first attempt in international instruments to explicitly recognize the CE.

11.4 International Technical Standards

11.4.1 International Technical Standards as a Tool for Regulation

International technical standards are developed by international organizations, and these processes can be intergovernmental or private industry efforts, or combinations of the two.[1317] In complex societies, technical standards provide the means to communicate broadly and uniformly necessary common technical information, which can be continuously developed and expanded as technology is applied in new ways.[1318] With regard to regulating upstream activities relevant for plastics, the need to include international technical standards in the process has been recognized in the literature. Raubenheimer et al. advocate including global industry standards as part of a new treaty on plastics.[1319] The Governance Report also recognized "a lack of global industry standards for environmental controls and quality specifications of plastics."[1320] It recommended, as part of a new treaty, "a duty to cooperate to determine global industry standards."[1321] However, so far literature has not looked into existing available international technical standards that could already provide technical information on the topic. This sub-chapter investigates readily available international technical standards that could be used to promote the global CE of plastics.

[1315] UNEA Res 4/9 'Addressing Single-use Plastic Products Production' (11-15 March 2019) UN Doc UNEP/EA.4/Res.9. 2.
[1316] UNGA Res 70/1 'Transforming Our World: the 2030 Agenda for Sustainable Development' (25 September 2015) A/RES/70/1. 22.
[1317] See eg, W Mattli and T Büthe, 'Setting International Standards: Technological Rationality or Primacy of Power?' (2003) 56 World Politics 1. 1-2.
[1318] K Krechmer, 'The Fundamental Nature of Standards: Technical Perspective' (2000) 38 IEEE Communications Magazine 6. 2. https://www.isology.com/pdf/fundtec.pdf
[1319] K Raubenheimer et al., 'Towards an Improved International Framework to Govern the Lifecycle of Plastics' (2018) 27 Review of European, Comparative & International Environmental Law 3. 216.
[1320] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 12
[1321] *Ibid.* 104.

Technical standards "can play an important role in accelerating innovation in an industry by removing bottlenecks around an industry and encouraging economies of scale."[1322] With respect to the CE, "standardization could be important in a number of areas, from common protocols on smart infrastructure to the replaceability of parts. There may be scope for the formation of industry-level technology standards bodies to set increasingly high standards, bring in the laggards and accelerate diffusion."[1323] International technical standards are also fundamental for facilitating international trade, which is important for the global CE of plastics.[1324] For example, the EU Plastics Strategy promotes as a measure to support international trade "the development of international industry standards on sorted plastic waste and recycled plastics".[1325]

International technical standards are a relatively new form of international co-operation:[1326]

> In international environmental law, the private sector engages in the quintessential public task of general standard setting through regimes such as the International Organization for Standardization…Some express concern about these developments, fearing that erode the fundamental distinctiveness of law as a social instrument. However, the emergence of new approaches to standard setting and compliance represents understandable and appropriate response to the distinctive characteristics of international environmental problems:
>
> - These problems are physical as well as legal and political and involve a great deal of technical complexity.
> - They result primarily from private rather than governmental conduct.
> - They are highly uncertain and rapidly changing.[1327]

International technical standards can be useful tools in international law.[1328] Global and regional trade agreements or other treaties may explicitly recognize them, such as the WTO's Agreement on Technical Barriers to Trade (TBT Agreement).[1329] An inherent feature of international technical standards is the communication of complex technical information. Therefore, referring to the technical standards in legal instruments can provide an ideal way to combine a more general obligation to highly technical and detailed information, particularly when the object being regulated is as complex

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1322 F Preston, 'A Global Redesign? Shaping the Circular Economy' (2012) Chatham House Briefing Paper. 17.
1323 B Lee et al., 'Who Owns Our Carbon Future? Intellectual Property and Energy Technologies' (2009) A Chatham House Report. 61.
1324 OECD, 'International Trade and the Transition to a Circular Economy: Policy Highlights' (2018) 3.
1325 EC, 'Annexes to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A European Strategy for Plastics in a Circular Economy' (2018) COM(2018) 28 Final. Annex 1.
1326 See, J Pauwelyn et al. 'When Structures Become Shackles: Stagnation and Dynamics in International Lawmaking' (2014) 25 The European Journal of International Law 3. 756.
1327 D Bodansky, *The Art and Craft of International Environmental Law* (Harvard University Press 2010) 270.
1328 ISO(IEC), 'Using and Referencing ISO and IEC Standards to Support Public Policy' (2015) 5-6.
1329 N Roht-Arriaza, 'Shifting the Point of Regulation: the International Organization for Standardization and Global Law-Making on Trade and Environment' (1995) 22 Ecology Law Quarterly 3. 486; J Pauwelyn et al. 'When Structures Become Shackles: Stagnation and Dynamics in International Lawmaking' (2014) 25 The European Journal of International Law 3. 758.

as promoting a global CE of plastics. The international technical standards in focus here are ISO standards and the GHS.

11.4.2 ISO Standards

The ISO is conceivably "the most recognized, and by and large well respected, international standards institution", with more than 14.000 published standards that cover all major fields.[1330] The ISO standards provide globally accepted solutions to specific issues in the form of requirements, specifications, guidelines or characteristics that can be used to ensure that materials, products, processes and services are safe and fit for their purpose, as well as environmentally sound.[1331] ISO standards were chosen for several reasons. First, because they are recognized in the WTO, and the TBT Agreement makes references to ISO standards.[1332] Therefore the standards relevant for plastics investigated in this section are compatible with international trade rules. Second, because ISO standards are developed in a multi-stakeholder process involving also governments, it has elevated the ISO's status as a recognized and accepted standard developer.[1333] This allows for States and the plastics industry to come together in a well-established process. Third, the scope of ISO standards is broad, and able to thus include aspects relevant for promoting the global CE of plastics. And fourth, the ISO standards can be utilized as references in policy guidance or legislation.[1334] For example, government regulations may refer to them for a definition of terms, or government procurement rules may adopt them.[1335] Therefore, the legal techniques already exist to use ISO standards in regulation. For example, the IMO refers in its manual, 'Port Reception Facilities – How to Do It', to two ISO standards that aim to harmonize the management of wastes generated on vessels and discharged at ports (ISO 21070:2011 and 16304:2013). The IMO Manual states that these standards can be utilized to demonstrate compliance with the MARPOL Annex V regulations.[1336]

Furthermore, the ISO was chosen because it has recently established a new technical committee, ISO/TC 323, which is currently working on standards to strengthen the CE. The scope of the ISO technical committee on the CE is "[s]tandardization in the field of Circular Economy to develop frameworks, guidance, supporting tools and requirements for the implementation of activities of all

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[1330] J Morrison and N Roht-Arriaza, 'Private and Quasi-Private Standard Setting' in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008) 501-502.
[1331] ISO(IEC), 'Using and Referencing ISO and IEC Standards to Support Public Policy' (2015) 4, 17.
[1332] Annex 1 and 3, the TBT Agreement.
[1333] N Roht-Arriaza, 'Shifting the Point of Regulation: the International Organization for Standardization and Global Law-Making on Trade and Environment' (1995) 22 Ecology Law Quarterly 3. 486.
[1334] ISO(IEC), 'Using and Referencing ISO and IEC Standards to Support Public Policy' (2015) 5-6.
[1335] N Roht-Arriaza, 'Shifting the Point of Regulation: the International Organization for Standardization and Global Law-Making on Trade and Environment' (1995) 22 Ecology Law Quarterly 3. 486.
[1336] IMO, 'Port Reception Facilities – How to Do It' (2016) 48, 69, 85, 170.

involved organizations, to maximize the contribution to Sustainable Development."[1337] Some areas relating to the CE which are already covered by other standards are excluded from the scope of ISO/TC 323, such as the proposed EMS circular economy guide (Environmental Management System: Guidelines for Incorporating Redesign of Products and Components to Improve Material Circulation, ISO/CD 14009). The relevant standards here are: environmental performance evaluation (ISO 14031), environmental management and life cycle assessment (ISO 14040 and ISO 14044), ecodesign (ISO 14006) and environmental management and sustainable procurement (ISO 20400).[1338] This research accepts the ISO's own evaluation of standards it has identified as relevant for the CE, but adds to the mix ISO 15270 standard 'Plastics – Guidelines for the Recovery and Recycling of Plastics Waste', as it covers pertinent aspects regarding plastics. Furthermore, it should be noted that ISO has recently published a new standard, ISO/ TR 23891:2020 on 'Plastics –Recycling and Recovery – Necessity of Standards'.[1339] The ISO thus already provides multiple useful standards for promoting the global CE of plastics, and these standards will be briefly introduced here.

ISO 14031 (Environmental Management – Environmental Performance Evaluation – Guidelines) sets out an environmental evaluation process (EPE), which enables organizations to measure, evaluate and communicate their environmental performance with key performance indicators (KPIs), which are based on reliable and verifiable information.[1340] The process is not targeted to CE purposes exclusively, but suits to promote it. For example, the organization can choose a life cycle approach to selecting indicators by considering the inputs and outputs associated with a particular product and the environmental impacts at any stage of its lifecycle. The standards provides the following example. The organization has identified that a product does not allow for easy disassembly or separation of parts for reuse or recycling. Therefore, possible indicators for EPE are: percentage of a product's parts that can be recycled or reused; percentage of a product's parts that cannot be recycled or reused; and/or number of changes in product design to facilitate easy disassembly.[1341] The organization can thus include CE-related aspects in the indicators, and use the EPE to measure CE-related performance. This could well be applied in plastics production.

ISO 14040 (Environmental Management – Life Cycle Assessment –Principles and Framework) describes the principles and framework for life cycle management (LCA), which is a tool to better

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1337 ISO, 'Technical Committees: ISO/TC 323 Circular Economy' https://www.iso.org/committee/7203984.html
1338 *Ibid.*; Croner-i, 'New International Standards on Circular Economy Proposed' https://app.croneri.co.uk/whats-new/new-international-standards-circular-economy-proposed
1339 ISO, 'ISO/TR 23891:2020 Plastics – Recycling and Recovery – Necessity of standards' https://www.iso.org/standard/77294.html?browse=tc
1340 ISO 14031:2013. v.
1341 *Ibid.* 26.

understand the environmental impacts of products throughout their life cycle, from raw material acquisition to production, use, and end-of-life treatment options.[1342] LCA can assist in identifying opportunities to improve the environmental performance of products at different phases in their life cycle, informing decision-makers in industry, governments or NGOs, selecting relevant indicators of environmental performance, and marketing.[1343] The phases of the LCA analysis are the goal and scope definition, inventory analysis, impact assessment and interpretation.[1344] Similarly to ISO 14031, it can be used to incorporate CE-related goals, such as improved recycling or reuse of products.[1345] ISO 14044 (Environmental management – Life cycle assessment – Requirements and guidelines) contains the detailed requirements for practitioners conducting LCA,[1346] and provides the methodological framework for LCA, and requirements for its subsequent reporting and critical review.[1347] Particularly relevant for the CE in the standard are the allocation procedures. These refer to dividing the input or output flows of a process or a product system between the product system in question and one or more other product systems, which can be done for the purposes of recycling or reuse, either in closed-loop or open-loop product systems.[1348] These standards are already used in life cycle assessments regarding plastics products.[1349] However,

> [t]he International Organization for Standardization (ISO) standards for conducting life cycle assessments to identify environmental problems and areas for improvement in the production and use of products do not instruct to consider the impacts of products' release into the environment.[1350]

Therefore, LCAs should be developed to "include an analysis of the predominant end-of-life fates of the materials being considered. In the case of plastic materials, evaluation of the product's tendency to become litter should be included."[1351]

ISO 14006 (Environmental Management Systems – Guidelines for Incorporating Ecodesign) is primarily targeted at organizations who have implemented an EMS in accordance with 14001, but it can also be useful for integrating ecodesign aspects in other management systems.[1352] Ecodesign is a

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1342 ISO 14040:2006. v, 1.
1343 *Ibid.* 1.
1344 *Ibid.* 7.
1345 *Ibid.* 10, 18.
1346 *Ibid.* v.
1347 ISO 14044:2006.
1348 *Ibid.* 14-16.
1349 See eg, F Razza et al., 'Compostable Cutlery and Waste Management: An LCA Approach' (2009) Waste Management; A Ahamed et al., 'Life Cycle Assessment of Plastic Grocery Bags and Their Alternatives in Cities with Confined Waste Management Structure: A Singapore Case Study' (2021) 278 Journal of Cleaner Production.
1350 L Monroe, 'Tailoring Product Stewardship and Extended Producer Responsibility to Prevent Marine Plastic Pollution' (2014) 27 Tulane Environmental Law Journal 2. 226.
1351 *Ibid.* 228.
1352 ISO 14006:2011. 1. (Since this research was undertaken, the standard has been updated to ISO 14006:2020. Due to the cost of these standards it was not possible to purchase all standards.)

process that takes place within an organization's design and development area and aims to reduce environmental impacts and continually improve the environmental performance of products throughout their life cycle.[1353] ISO 14006 deals with the role of top management in ecodesign, provides guidelines for incorporating ecodesign into an EMS, and addresses various ecodesign activities in product design and development.[1354] Top management has two tasks to ensure incorporation of ecodesign: setting the strategy and managing the internal processes. Most relevant for the CE would be to focus on contributing to value creation as a strategy and then involving the total value chain, from upstream actors (suppliers) to downstream actors (after sales, service providers, recyclers).[1355] Designing plastics products for the purposes of the CE makes this standard extremely relevant.

ISO 20400 (Sustainable Procurement – Guidance) provides guidance on sustainable procurement and targets any public or private organizations regardless of its size or location. It aims to assist organizations by supplying an understanding of what sustainable procurement is, what the sustainability impacts and considerations are across policy, strategy, organization and processes in an organization, and how to implement sustainable procurement.[1356] The standard highlights that the organization needs to understand how its procurement practice affects its entire supply chain.[1357] The core subjects relevant to the CE of plastics and marine plastic pollution in the standard are the environment and consumer issues.[1358] Regarding the environment, sustainable resource use is one of the key themes and is closely linked to efficient use of materials by reuse, recycling, the CE and life cycle approach.[1359] As for consumer issues, the overarching theme is sustainable consumption, and the standard promotes design of products and packaging so that they can be easily reused, repaired or recycled, and suggests recycling services. When analyzing the organizational need for specific goods or services, the organization can use the concept of the CE to consider whether alternative options could deliver the same outcome in a more sustainable way. This can done by rethinking – for example eliminating the demand by reviewing the need, reducing the frequency of use/consumption, identifying alternative methods of fulfilling the demand (such as leasing rather than owning), sharing use, encouraging recycling, repairing, reusing or repurposing of older goods, and using recycled/renewable materials.[1360] The organization can also use CE-motivated requirements when

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1353 ISO 14006:2011. v.
1354 ISO 14006:2011.
1355 *Ibid.* 3, 23, 25.
1356 ISO 20400:2017. vi.
1357 *Ibid.* 13, 17-18,
1358 *Ibid.* 8.
1359 *Ibid.* 43.
1360 *Ibid.*. 27.

developing its sustainable procurement criteria, such as recycled content in a product.[1361] At the contract managing phase with the supplier, the standard underlines that disposal options should be reviewed to maximize recycling and reuse to minimize landfill use and pollution.[1362] Incorporating the CE of plastics into procurement practices is highly important.

ISO 15270 (Plastics – Guidelines for the Recovery and Recycling of Plastic Waste) targets all plastics industry stakeholders with the aim of developing a sustainable global infrastructure for plastics recovery and recycling and a sustainable market for recovered plastics materials and their derived manufactured products. The top priorities of the standard are general reduction of material and energy resource use and specific optimization of the use of plastic raw materials.[1363] The standard deals with mechanical recycling, feedstock or chemical recycling, and biological or organic recycling. Regarding these material recovery options for plastics waste, the standard highlights the crucial importance of consensus-based standards for these materials, and advises that manufacturers and users of plastics materials should provide the necessary information and documentation about plastic materials and products, such as thermal-stability, reactivity and other data, that are of assistance to recyclers.[1364] ISO 15270 also gives guidance on pre-treatment of plastic waste, identification of plastic types and additives, and their separation and sorting. It also notes that design for ease of disassembly, material identification and minimization of variety for plastic types used in manufacturing can optimize the recovery of plastic products and component parts.[1365] Furthermore, ISO 15270 provides quality requirements, which take into account general aspects, in addition to contamination, visual and aesthetic aspects, properties of recyclates, and criteria of acceptance of recyclate for specific applications.[1366] The standard also stresses that plastic material and product standards should not prohibit the use of recyclate as an alternative to virgin materials, and recommends that should the technical committee of plastics (ISO/TC 61) develop or revise material standards or product specifications relevant for plastic recyclates, they should refer to ISO 17244:2018 (Plastics – Environmental Aspects –General Guidelines) for their inclusion in the standards.[1367]

[1361] *Ibid.* 29-30.
[1362] *Ibid.* 39.
[1363] ISO 15270:2008. v.
[1364] *Ibid.* 6.
[1365] *Ibid.* 7.
[1366] *Ibid.* 9-10.
[1367] *Ibid.* 10.

11.4.3 THE GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELLING OF CHEMICALS

Using plastics wastes as resources is "a tremendous challenge for the development of novel chemical conversions that can cope with complex waste mixtures as feedstocks for the production of value-added molecules and materials." [1368] To recover chemicals in plastics wastes, the only viable option is chemical recycling. This can take place by gasification, pyrolysis, hydrogenation, coking and for some plastics also separation by using ionic liquids to de-polymerize polymers into monomers. However, as yet chemical recycling processes are not developed enough to be transformed into full-scale plants to be economically assessed, and other recycling options often cause unintended accumulation of additives in recyclates.[1369] To govern toxicologically safe CE practices for plastics requires knowledge of what chemicals plastics contain. Currently, there is an urgent need for publicly available information on the use of chemicals in plastics, and the exact chemical composition of finished plastics articles.[1370] Therefore discussing international governance of chemicals and how it affects the CE of plastics is essential.

Currently the only global mechanism targeting chemicals is the GHS.[1371] The GHS was developed under the auspices of the Interorganization Programme for the Sound Management of Chemicals (IOMC), and bequeathed to the new United Nations Economic and Social Council's Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals (UNSCEGHS) to promote implementation and manage the GHS.[1372] The aspiration of the GHS is that:

> Availability of information about chemicals, their hazards, and ways to protect people, will provide the foundation for national programmes for the safe management of chemicals. Widespread management of chemicals in countries around the world will lead to safer conditions for the global population and the environment, while allowing the benefits of chemical use to continue.

1368 T Keijer et al., 'Circular Chemistry to Enable a Circular Economy' (2019) 11 Nature Chemistry. 191.

1369 L van Oers et al., 'Addtives in the Plastics Industry' in B Bilitewski et al. (eds) *Global Risk-Based Management of Chemical Additives I: Production, Usage and Environmental Occurrence* (Springer 2012) 18 The Handbook of Environmental Chemistry. 140.

1370 *Ibid.* 145; KJ Groh et al., 'Overview of Known Plastic Packaging-Associated Chemicals and Their Hazards' (2019) 651 Science of the Total Environment 2. 3265.

1371 The Strategic Approach to International Chemicals Management (SAICM) functioned as an another international governance mechanism during 2006-2020. SAICM is a policy framework promoting chemical safety, which also endorsed the GHS as means to achieve this objective. See, UNEP, 'Strategic Approach to International Chemicals Management: SAICM Texts and Resolutions of the International Conference on Chemicals Management' (2016); The fourth session of the International Conference on Chemicals Management (ICCM4) initiated an intersessional process to prepare recommendations for future arrangements regarding the SAICM and the sound management of chemicals and waste beyond 2020. However, the next session of the International Conference on Chemicals Management (ICCM5) has been postponed until further notice due to COVID-19. As SAICM's mandate has expired, analysis of it is not included in this dissertation. See, SAICM, 'Fifth Session of the International Conference for Chemicals Management (ICCM5) [Postponed] http://www.saicm.org/About/ICCM/ICCM5/tabid/8207/Default.aspx

1372 Globally Harmonized System of Classification and Labelling Chemicals, Eight Revised Edition (2019) UN Doc ST/SG/AC.10/30/Rev.8. ('GHS') iii, 8.

> Harmonization will also have benefits in terms of facilitating international trade, by promoting greater consistency in the national requirements for chemical hazard classification and communication that companies engaged in international trade must meet.[1373]

The GHS is a technical standard that regulates the information that needs to accompany chemicals as they are traded, transported and used.[1374] The GHS "combines physicochemical data, health data and environmental risks, and communicates the potential risks to different target groups (workers, consumers, transportation and first-aid staff)" with 16 danger classes and labels with universal pictograms depicting their associated risks.[1375] The harmonized elements of the GHS can "be seen as a collection of building blocks from which to form a regulatory approach."[1376]

The GHS is also applicable to chemicals in plastics. However, applying the GHS to chemicals in plastics in a comprehensive manner would first require an extensive review of which chemicals are used in plastics production, from the raw material stage to the final product stage. Such review does not yet exist. However, studies on the topic provide some guidance and show the applicability of GHS to plastics. For example, Lithner et al. have identified hazardous substances used in plastics polymer production for which evaluations of risks are needed, by using the GHS risk categories in their research. The study showed that numerous hazardous substances are used in plastics production. This study included examples of chemical risks in plastics polymers production and included chemicals associated with raw materials, monomers, catalysts, solvents, by-products from production, and additives.[1377] The study showed a significant weakness of the GHS regarding plastics in that it lacks a hazard class for endocrine disrupters, which are substances with evidence of endocrine effects.[1378] For example, many plastic children's toys and baby bottles, which are items that are designed for children to chew on or drink from, have been shown to contain endocrine disrupters, such as Bisphenol A or phthalates.[1379]

[1373] *Ibid.* iv.
[1374] L Persson et al., 'The Globally Harmonized System of Classification and Labelling of Chemicals—Explaining the Legal Implementation Gap' (2017) 9 Sustainability 12. 6.
[1375] S Wagner and M Schlummer, 'Legacy Additives in a Circular Economy of Plastics: Current Dilemma, Policy Analysis, and Emerging Countermeasures' (2020) 158 Resources, Conservation & Recycling. 6.
[1376] Globally Harmonized System of Classification and Labelling Chemicals, Eight Revised Edition (2019) UN Doc ST/SG/AC.10/30/Rev.8. ('GHS') 8.
[1377] D Lithner et al., 'Environmental and Health Hazard Ranking and Assessment of Plastic Polymers Based on Chemical Composition' (2011) 409 The Science of Total Environment 18.
[1378] *Ibid.* 3316.
[1379] JP Charboneau and SM Koger, 'Plastics, Pesticides and PBDEs: Endocrine Disruption and Developmental Disabilities' (2007) 20 Journal of Developmental and Physical Disabilities. 117; A Quitmeyer and R Roberts, 'Babies, Bottles & Bisphenol A: The Story of a Scientist-Mother' (2007) 5 PLoS Biology 7. 1400; AP McGinn, 'Reducing Our Toxic Burden' in State of the World 2002: A Worldwatch Institute Report on Progress Toward a Sustainable Society (2002) 86, 94.

The GHS provides means to classify and label chemicals substances, and can be applied also to chemicals in plastics production to communicate their risks. However, the application requires that the chemicals in plastics production are first identified and then made subject to the GHS. Currently no international obligation exists to do this. However, so far the GHS has been fully implemented in national legislation in 50 States and partially in 15 others. The regions where full implementation has taken place are the EU (with its Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures) and parts of East and Southeast Asia.[1380] The aspiration of the UN Member States at the World Summit on Sustainable Development (WSSD) was to; "[e]ncourage countries to implement the new globally harmonized system for the classification and labelling of chemicals as soon as possible with a view to having the system fully operational by 2008."[1381] There is still long way to go to reach this objective with 128 States having not implemented the GHS at all.[1382]

Identifying, communicating and classifying the risks of chemicals that plastics and plastics wastes contain is a prerequisite for safe CE practices. Therefore, the GHS is a relevant instrument for promoting the global CE of plastics, even though it does not contain elements of the CE *per se*. However, increasing awareness about chemicals can also create barriers in the current system. Listing the chemical components of plastics can affect their collection, transport, recycling and recovery of such plastic wastes, as the facilities require specialized equipment and may have to meet additional administrative procedures to fulfill monitoring and reporting requirements, potentially limiting the number of facilities that can comply.[1383] It should be kept in mind that dealing with the complexity of chemicals in plastics production and chemicals in plastics wastes requires substantial technical, financial and regulatory capacities and capacity building.[1384]

1380 L Persson et al., 'The Globally Harmonized System of Classification and Labelling of Chemicals—Explaining the Legal Implementation Gap' (2017) 9 Sustainability 12. 8.

1381 UN, 'Plan of Implementation of the World Summit on Sustainable Development' in Report of the World Summit on Sustainable Development (2002) UN Doc A/CONF.199/20. 20, para 23c.

1382 L Persson et al., 'The Globally Harmonized System of Classification and Labelling of Chemicals—Explaining the Legal Implementation Gap' (2017) 9 Sustainability 12. 8.

1383 K Raubenheimer and A McIlgorm, 'Can the Basel and Stockholm Conventions Provide a Global Framework to Reduce the Impact of Marine Plastic Litter?' (2018) 96 Marine Policy. 288.

1384 See, L Persson et al., 'The Globally Harmonized System of Classification and Labelling of Chemicals—Explaining the Legal Implementation Gap' (2017) 9 Sustainability 12. 7-8.

11.5 Evaluation of the Current International Legal and Technical Standardization Framework

Mapping the field of international environmental law instruments applicable to plastics wastes generation and using plastics wastes as resources revealed traces of CE practices. However, these efforts are fragmented to the extent that no amount of coordination and regime interaction would be able to use them to formulate a coherent legal framework for promoting the global CE of plastics. Most of the international environmental law instruments have been developed to mitigate pollution from linear economic activities. Despite incorporating some CE elements, they are not equipped for the purpose of changing the current practices into more circular ones, which by design would minimize pollution.

A common flaw with the soft law instruments and also the Fish Stocks Agreement concerning promotion of the CE is the absence of any targets and indicators with regards to the elements of reduce, reuse and recycling. The most promising instrument for promoting the global CE of plastics is the Basel Convention with its latest Plastic Amendments. These can help to create a stronger market for secondary plastics with a waste trade that supports high-quality recycling of plastics wastes. The Stockholm Convention makes an important contribution by banning or restricting the use of the most hazardous chemicals previously used in plastics, and thus supports safer CE practices regarding the chemicals they contain. However, Stockholm Convention only covers a few harmful substances and the lack of other legal instruments regarding chemicals is a significant gap in international law.

Promoting a global CE of plastics requires a combination of legal measures and highly technical international standards. The need for this combination derives from the complexity of plastics as materials and plastics wastes as materials, and from the complex and global value chains of plastics in international trade. The level of detail that is required with plastics to create the needed changes is difficult to achieve with purely legal instruments, particularly international law instruments. For example, to create a standard for recycled content regarding plastic products made of PET necessitates, at a minimum, knowledge of the average material properties, including chemicals, of virgin PET and recycled PET, of legacy chemicals in recycled PET, of necessary chemicals to create a recycled PET product and so on and so forth. International technical standards can thus make a valuable contribution regarding the specifics of products and wastes in a CE. They can also provide more general support regarding CE practices, as the ISO standards presented in this chapter demonstrated. Furthermore, regulating the complexity of chemicals in plastics production requires the support that technical standardization can provide, as evidenced by the GHS which is currently the only functioning and nationally implemented global instrument addressing the risks of chemicals.

However, due to the urgency of the global plastics problem, international technical standardization alone is not enough either, although States should make use of international technical standards in binding legal instruments as regulatory tools. Implementation of the GHS in the EU and national legislations provides a good example of this. These combinations of binding obligations and technical standards could push private actors involved in the plastics industry or plastics wastes industry to adopt a more circular mindset for plastics production or using plastics wastes as resources. The ISO standards in this chapter already pave the way in this direction, but require more detailed product standards on secondary plastics to complement them. The next chapter will identify gaps in international law and international technical standardization regarding the global CE of plastics and provide recommendations to advance it further.

CHAPTER 12 – FURTHER LEGAL AND STANDARDIZATION MEASURES TO PROMOTE THE GLOBAL CIRCULAR ECONOMY OF PLASTICS

12.1 INTRODUCTION

The current situation is that overall the world is only 9% circular, and the same small percentage of produced plastics have been recycled.[1385] The majority of plastics (99%) are still derived from fossil fuels and are produced with fossil-fuel based energy.[1386] The challenge to turn the current linear model of producing and consuming plastics into a more circular one is thus enormous. Consequently, the measures discussed in this chapter do not attempt to provide a comprehensive vision of how a global circularity of plastics could be achieved. Such a vision cannot be realized only with international legal and technical standardization tools, which are the main focus of this chapter. Therefore, this chapter is merely an attempt to investigate and pinpoint some important stepping stones toward a more CE of plastics, particularly from the viewpoint of how international law can contribute.

This chapter focuses on four elements where international lawmaking efforts could contribute to promoting global CE practices: harmonization of classifications and harmonization of international technical standards to facilitate international trade, developing global EPR, and the added value of a new treaty on plastics in the context of CE. These elements are not exhaustive but were chosen based on the problem framing and research themes of this Part IV and their potential to facilitate scaling up CE practices globally.

12.2 HARMONIZATION OF CLASSIFICATIONS TO FACILITATE INTERNATIONAL TRADE

12.2.1 CLASSIFICATIONS IN THE HARMONIZED COMMODITY DESCRIPTION AND CODING SYSTEM

> In terms of a more granular picture on trade challenges, definitions, classifications are very important. Everything that is traded today is based on system of classifications, so in that system of classification, one will have to distinguish between what is waste, what is a secondary material, what is a secondary resource. And depending on how that is classified you will be encountering different trade restrictions, you may even be encountering a ban completely which will prohibit the product from entering the territory. So, that type of work is a technical level work, which requires agencies like World Customs Organization to come aboard.[1387]

[1385] R Geyer et al., 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances 7. 2-3; Circle Economy, 'The Circularity Gap Report 2020' (2020) 8.
[1386] CIEL, 'Fossils, Plastics & Petrochemical Feedstocks' (CIEL 2017) Fueling Plastics – Series. 1; CIEL, 'Untested Assumptions and Unanswered Questions in the Plastics Boom' (CIEL 2018) Fueling Plastics – Series. 2.
[1387] A Hoe Lim (Director of the Trade and Environment Division of the WTO) 'How Can Trade Agreements Promote Sustainable and Circular Trade?' (Helsinki, Finland 4.6.2019) World Circular Economy Forum (WCEF) https://www.youtube.com/watch?v=B6dhmfm5wpI&feature=youtu.be

One of the main regulatory barriers regarding international trade and the global CE of plastics is that the definitions and classifications of waste, scrap and secondary materials often vary between different jurisdictions.[1388] The absence of globally agreed and harmonized definitions and classifications is arguably one of the reasons for differing terminology in national legislations. The absence of common global definitions and classifications complicates tracking and understanding the volumes of waste, scrap, or secondary materials in international trade.[1389]

These challenges become evident with a closer look at the Harmonized Commodity Description and Coding System (HS). The HS is an Annex to the International Convention on the Harmonized Commodity Description and Coding System, and an integral part of the HS Convention.[1390] The HS is a multipurpose international product nomenclature developed by the World Customs Organization (WCO). More than 200 countries and economies use the system as a basis for their Customs tariffs and for the collection of international trade statistics. Over 98 % of the merchandise in international trade is classified under the terms of the HS, including plastics. This makes the HS a universal economic language and code for goods, and an important tool for international trade.[1391]

Regarding plastics, the main classification in the HS nomenclature is twofold: primary forms (I.), and waste, parings, scrap, semi-manufacturers and articles (II.). In addition, certain materials and products that contain plastics are classified under different chapters of the HS.[1392] Of different plastic types, the system differentiates only between PE, PP and PVC, and the rest belong to the category of "other plastics".[1393] Materials that have been transformed by recycling to secondary raw materials, are classified as primary forms in the HS system in the absence of internationally accepted definitions for secondary raw materials.[1394] The same critique about the lack of internationally accepted definition for secondary raw material in the HS can be applied to end-of-life or end-of-use products which have undergone value retention processes (VRPs). For example, few countries have legally defined remanufacturing, which affects remanufactured product sales and international trade. A commonly

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1388 S Yamaguchi, 'International Trade and the Transition to a More Resource Efficient and Circular Economy: A Concept Paper' (OECD Publishing 2018) OECD Trade and Environment Working Papers. 13; OECD, 'Improving Markets for Recycled Plastics: Trends, Prospects and Policy Responses' (OECD Publishing 2018) 88.

1389 S Yamaguchi, 'International Trade and the Transition to a More Resource Efficient and Circular Economy: A Concept Paper' (OECD Publishing 2018) OECD Trade and Environment Working Papers. 13.

1390 Art 2, the HS Convention.

1391 World Customs Organization, 'What is the Harmonized System (HS)?' http://www.wcoomd.org/en/topics/nomenclature/overview/what-is-the-harmonized-system.aspx

1392 Chapter 39. Plastics and articles thereof. Note 2. HS Nomenclature (2017 Edition)

1393 Chapter 39. Plastics and articles thereof. I-II. HS Nomenclature (2017 Edition)

1394 Chapter 39. Plastics and articles thereof. Note 7. HS Nomenclature (2017 Edition); S Yamaguchi, 'International Trade and the Transition to a More Resource Efficient and Circular Economy: A Concept Paper' (OECD Publishing 2018) OECD Trade and Environment Working Papers. 16.

accepted legal definition for remanufactured goods would facilitate their sale, as they would no longer be categorized as used products subject to various import restrictions and bans.[1395]

12.2.2 The Missing Classifications in the HS

Value retention processes, such as reuse, repair, refurbishment and remanufacturing, are CE practices. The International Resource Panel (IRP) has stated that "terminology and definitions for VRPs remain one of the most significant issues and challenges to increased scale and uptake of VRPs around the world."[1396] The topic has also been discussed under the auspices of the WTO, which stresses "[t]he ability of trade regimes to distinguish between unwanted waste and obsolete goods on the one hand, and goods, components and materials flowing in and out of circular economy activities, on the other".[1397]

To scale up the CE of plastics globally and facilitate international trade, internationally accepted definitions for secondary raw materials, reuse, repair, refurbishment and remanufacturing and derived products are needed. Moreover, they should also be reflected in the HS, which would also enable the tracking of these trade flows and volumes globally. The challenge is not the absence of definitions for secondary raw materials and VRPs *per se*, but the fact that agreed definitions are lacking on the global level and in crucial instruments, such as the HS. To promote CE activities, "a globally accepted approach to identify and classify CE-related activities will be critical".[1398] Furthermore, international efforts are needed "through the World Customs Organization (WCO) to agree on Harmonized System (HS) codes classifications that more accurately capture secondary goods (such as recycled material) and identify waste types."[1399] To provide an understanding of what is meant by secondary raw materials and VRPs, the following paragraphs give examples of their definitions.

A secondary raw material denotes a material that has already been "used and recycled (= recycled material). It refers to the amount of the outflow which can be recovered to be re-used or refined to re-enter the production stream".[1400] In the context of plastics, the ISO 15270:2008 defines "plastics

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1395 United States International Trade Commission, 'Remanufactured Goods: An Overview of the U.S. and Global Industries, Markets and Trade' (USITC Publication 4356, 2012) Investigation No 332-525. xx; P Hopkinson et al., 'Managing a Complex Global Circular Economy Business Model: Opportunities and Challenges' (2018) 60 California Management Review 3. 73.

1396 IRP, 'Redefining Value. The Manufacturing Revolution. Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy' (2018) 40. Also see, Figure 2.

1397 S Karsten, 'Trade Policies for a Circular Economy: What Can We Learn from WTO Experience? (WTO 2020) WTO Staff Working Paper No. ERSD-2020-10. 11.

1398 F Preston et al., 'An Inclusive Circular Economy – Priorities for Developing Countries' (2019) Chatham House Research Paper. 67.

1399 *Ibid.*

1400 IRP, 'Glossary' https://www.resourcepanel.org/glossary secondary raw material" to be a synonym for "recyclate", "recycled plastics", and "regenerate", and notes that once "the used plastics material has been treated in such a way that it is ready to replace virgin product, material or substance in a production process, it loses its characteristics as waste."[1401]

Reuse can be further categorized as reuse or direct reuse. Reuse is "the using again of a product, objective or substance that is not waste for the same purpose it was conceived, possibly after repair or refurbishment. In direct reuse, repair or refurbishment is not a necessity.[1402] Arranging direct reuse refers to "the collection, inspection and testing, cleaning, and redistribution of a product back into the market under controlled conditions".[1403] Products undergoing this value retention process "are not guaranteed to meet original specifications and are typically offered to the market at a significant price discount, with no, or at least much-modified product warranty".[1404]

Repair refers to "fixing a specified fault in an object that is a waste or a product and/or replacing defective components, in order to make the waste or product a fully functional product to be used for its originally intended purpose"[1405].

Refurbishment is "modification of an object that is waste or a product to increase or restore its performance and/or functionality or to meet applicable technical standards or regulatory requirements, with the result of making a fully functional product to be used for a purpose that is at

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1401 ISO 15270:2008. 4.

1402 IRP, 'Redefining Value. The Manufacturing Revolution. Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy' (2018) 41; Thirteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'Follow-Up to the Indonesian-Swiss Country-Led Initiative to Improve the Effectiveness of the Basel Convention' (2017) UNEP/CHW.13/4/Add.2. 9-10; Twelfth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'Technical Guidelines on Transboundary Movements of Electrical and Electronic Waste and Used Electrical and Electronic Equipment, in Particular Regarding the Distinction between Waste and Non-Waste under the Basel Convention, Appendix I: Glossary of Terms' (2015) UNEP/CHW.12/5/Add.1/Rev.1. 18.

1403 IRP, 'Redefining Value. The Manufacturing Revolution. Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy' (2018) 41; Thirteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'Follow-Up to the Indonesian-Swiss Country-Led Initiative to Improve the Effectiveness of the Basel Convention' (2017) UNEP/CHW.13/4/Add.2. 10; Twelfth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'Technical Guidelines on Transboundary Movements of Electrical and Electronic Waste and Used Electrical and Electronic Equipment, in Particular Regarding the Distinction between Waste and Non-Waste under the Basel Convention, Appendix I: Glossary of Terms' (2015) UNEP/CHW.12/5/Add.1/Rev.1. 18.

1404 IRP, 'Redefining Value. The Manufacturing Revolution. Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy' (2018) 41.

1405 Thirteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'Follow-Up to the Indonesian-Swiss Country-Led Initiative to Improve the Effectiveness of the Basel Convention' (2017) UNEP/CHW.13/4/Add.2. 7-8; Twelfth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'Technical Guidelines on Transboundary Movements of Electrical and Electronic Waste and Used Electrical and Electronic Equipment, in Particular Regarding the Distinction between Waste and Non-Waste under the Basel Convention, Appendix I: Glossary of Terms' (2015) UNEP/CHW.12/5/Add.1/Rev.1. 18.

least the one that it was originally intended".[1406] Refurbishment activities can occur to differing degrees in terms of material value and product utility. For example, comprehensive refurbishment "takes place within industrial or factory settings, with a high standard and level of refurbishment".[1407]

Remanufacturing has a wide range of definitions and descriptions worldwide. The IRP has devised the following definition for this VRP:

> A standardized industrial process that takes place within industrial or factory settings, in which cores are restored to original as-new condition and performance or better. The remanufacturing process is in line with specific technical specifications, including engineering, quality, and testing standards, and typically yields fully warranted products. Firms that provide remanufacturing services to restore used goods to original working condition are considered producers of remanufactured goods.[1408]

12.2.3 Issues with the Definitions of Waste

In addition to the lack of globally agreed definitions for VRPs, another issue is the definition of waste itself. When does an item become waste and how to identify the value of waste and whether an article could be subject to value retention processes or recycling? And when does an item that has undergone a VRP or recycling stop being waste? Confusing and differing definitions as to what constitutes waste between economies which are engaged in value retention processes and recycling and/or trade can significantly affect both the industries and policy-makers.[1409] Materials that are legally classified as waste face additional regulatory requirements regarding waste management, and thus are often subject to additional costs and administration relating to, for example, environmental permitting requirements for handling the material.[1410]

The starting point is that "any substance or object is either waste or non-waste".[1411] In trying to determine when a plastic object becomes waste, guidance can be sought from Article 2(1) of the Basel Convention or Article 3(1) of the Waste Framework Directive:

[1406] Thirteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'Follow-Up to the Indonesian-Swiss Country-Led Initiative to Improve the Effectiveness of the Basel Convention' (2017) UNEP/CHW.13/4/Add.2. 8-9; Twelfth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'Technical Guidelines on Transboundary Movements of Electrical and Electronic Waste and Used Electrical and Electronic Equipment, in Particular Regarding the Distinction between Waste and Non-Waste under the Basel Convention, Appendix I: Glossary of Terms' (2015) UNEP/CHW.12/5/Add.1/Rev.1. 18.

[1407] IRP, 'Redefining Value. The Manufacturing Revolution. Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy' (2018) 44.

[1408] *Ibid.* 47.

[1409] F Preston et al., 'An Inclusive Circular Economy – Priorities for Developing Countries' (2019) Chatham House Research Paper. 67.

[1410] OECD, 'Improving Markets for Recycled Plastics: Trends, Prospects and Policy Responses' (OECD Publishing 2018) 88.

[1411] EC, 'Guidance on the Interpretation of Key Provisions of Directive 2008/98/EC' (2012) 9.

> "Wastes" are substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law.[1412]
>
> 'waste' means any substance or object which the holder discards or intends or is required to discard.[1413]

The premise of any substance or object being either waste or non-waste[1414] can be criticized for making an overly simplified division in the CE context. The current definitions for waste do not include any differentiation between different kinds of waste in terms of identifying their value as a resource.[1415] Consequently, "confusing definitions of what is a waste and what is a resource can inhibit the reuse of otherwise valuable materials."[1416] Particularly in the context of different VRPs, it is important that the potential for a product to undergo an applicable VRP is identified before it reaches the legally defined waste-stage, and that it does not become subject to any additional regulatory requirements regarding waste management. For example, repair and refurbishment can be performed on both wastes and non-wastes, and therefore cannot be used to distinguish between waste and non-waste.[1417] Admittedly developing criteria for substances and objects that have become obsolete but could be subject to VRPs, and are legally currently situated somewhere between non-waste and waste, would not be an easy task. Furthermore, developing collection schemes and linking them with the applicable VRP providers have their own set of challenges. However, from the viewpoint of CE practices, and specifically VRPs, such a set of definitions would assist in identifying the resource value of substances and objects between non-waste and waste phases. It could help in diversifying opportunities to scale up CE activities, which are currently still heavily focused on merely recycling.

Another issue relating to the definition of waste is the point at which a substance or object that has undergone a VRP or recycling becomes a product or secondary material and stops being waste. The Basel Convention does not specify when a substance or object is no longer regarded waste.[1418] In the EU, this process of rethinking "when certain waste ceases to be waste and obtains a status of a product" (or a secondary raw material) is called creating end-of waste criteria for specific materials.[1419]

[1412] Art 2(1), the Basel Convention.

[1413] Art 3(1), Council Directive 2008/98/EC of 19 November 2008 on Waste and Repealing Certain Directives [2008] OJ L 312.

[1414] EC, 'Guidance on the Interpretation of Key Provisions of Directive 2008/98/EC' (2012) 9.

[1415] E Pongrácz and VJ Pohjola, 'Re-Defining Waste, the Concept of Ownership and the Role of Waste Management' (2004) 40 Resources, Conservation & Recycling. 152.

[1416] P ten Brink et al., Circular Economy Measures to Keep Plastics and Their Value in the Economy, Avoid Waste and Reduce Marine Litter' (Kiel Institute for the World Economy 2018) Economics Discussion Papers No 2018-3. 7.

[1417] IRP, 'Redefining Value. The Manufacturing Revolution. Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy' (2018) 42, 43.

[1418] Thirteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'Follow-Up to the Indonesian-Swiss Country-Led Initiative to Improve the Effectiveness of the Basel Convention' (2017) UNEP/CHW.13/4/Add.2. 3.

[1419] EC, 'Waste Framework Directive: End of Waste Criteria' http://ec.europa.eu/environment/waste/framework/end_of_waste.htm

The purpose is to encourage recycling "by creating legal certainty and a level playing field as well as removing unnecessary administrative burden."[1420] Article 6 of the EU Waste Framework Directive has set the general conditions that a waste material has to follow:[1421]

> certain specified waste shall cease to be waste [within the meaning of point (1) of Article 3] when it has undergone a recovery, including recycling, operation and complies with specific criteria to be developed in accordance with the following conditions:
>
> (a) The substance or object is commonly used for a specific purpose;
>
> (b) A market or demand exists for such a substance or object;
>
> (c) The substance or object fulfils the technical requirements for the specific purpose referred to in (a) and meets the existing legislation and standards applicable to products; and
>
> (d) The use of the substance or object will not lead to overall adverse environmental or human health impacts.[1422]

The EU is also in the process of developing specific end-of-waste criteria for plastic waste conversion – however, it focuses only on recycled plastic material.[1423] Though the Basel Convention does not provide end-of-waste criteria, the regime does offer some possibilities for waste to cease to be waste – if it has been prepared for reuse, if it has undergone a recycling operation and that operation is completed, or if it has otherwise gained end-of-waste status as a result of a recovery operation.[1424] Developing the classifications and identifications for secondary raw materials and VRPs goes hand in hand with the need to develop their corresponding end-of-waste criteria to determine the point at which the new classifications and definitions apply.

Developing globally agreed definitions for secondary raw materials, reuse and direct reuse, repair, refurbishment, remanufacturing, and developing end-of-waste criteria in relation to these definitions under the HS could facilitate the creation of a global CE of plastics and related international trade. The Basel Convention already supports trading plastic waste destined for recycling in an environmentally sound manner under specific conditions (Annex IX, B3011).[1425] Similarly, plastics

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[1420] EC, 'Waste Framework Directive: End of Waste Criteria' http://ec.europa.eu/environment/waste/framework/end_of_waste.htm

[1421] A Villanueva and P Eder, 'End-of-Waste Criteria for Waste Plastic for Conversion' (Publication Office of the European Union 2014) JRC Technical Proposals. 3.

[1422] Art 6, Council Directive 2008/98/EC of 19 November 2008 on Waste and Repealing Certain Directives [2008] OJ L 312.

[1423] A Villanueva and P Eder, 'End-of-Waste Criteria for Waste Plastic for Conversion' (Publication Office of the European Union 2014) JRC Technical Proposals. 5.

[1424] Thirteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'Follow-Up to the Indonesian-Swiss Country-Led Initiative to Improve the Effectiveness of the Basel Convention' (2017) UNEP/CHW.13/4/Add.2. 4.

[1425] Fourteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'BC-14/12: Amendments to Annexes II, VIII and IX to the Basel Convention' (10 May 2019) UNEP/CHW.14/CRP.40; Art. 4(1), the Basel Convention.

products or products containing plastics that are candidates for VRPs could benefit from globally accepted definitions that would facilitate trade between different jurisdictions. Based on these definitions, the current Plastic Amendments of the Basel Convention could be even further expanded to also include trading plastic waste destined for reuse or direct reuse, repair, refurbishment and remanufacturing.

12.3 Harmonization of International Technical Standards to Facilitate International Trade

Regulation can provide rules on the CE that would, for example, oblige States to increase recycling of plastics or the use of VRPs. The technical complexity at practical level necessary to fully comply with these rules requires that technical standards complement legal obligations. The family of ISO standards identified as relevant for the CE provides some preliminary tools and guidance for organizations interested in engaging in CE practices. However, though these standards provide general guidance, they are not specifically for plastics. Even the ISO 15270 only gives general guidelines regarding plastic recycling and recyclates. The need for increased and more specific international technical standardization in the CE is widely recognized and its use as a regulatory tool has the potential to scale up solutions globally. The question then is how the harmonization of international technical standardization process should be developed and what are the needs from a regulatory viewpoint, particularly in the context of promoting a global CE of plastics?

Standards are argued to be a necessary condition to develop trade and trade policies in the context of the CE.[1426] However, the current global CE of plastics remains limited and highly fragmented.[1427] Secondary plastic raw materials and products compete in the same market with virgin plastics, but while the virgin-plastics industry is "commoditized and supplies large volumes of standardized materials", the secondary-plastics industry mostly lacks these qualities.[1428] The absence of standards and coordination across value chains has resulted in proliferation of materials, formats, labelling, collection schemes, sorting and reprocessing systems.[1429] Strengthening the standards infrastructure can help "build trust along supply chains by allowing domestic companies to demonstrate compliance

[1426] A Flynn and N Hacking, 'Setting Standards for a Circular Economy: A Challenge Too Far for Neoliberal Environmental Governance?' (2019) 212 Journal of Cleaner Production. 1266.
[1427] World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, 'The New Plastics Economy – Rethinking the Future of Plastics' (2016) 17.
[1428] *Ibid.* 60.
[1429] *Ibid.* 17.

with transparency, traceability and other requirements that are needed for a circular economy to operate safely and efficiently at a global scale."[1430]

Under the WTO, the Committee on Technical Barriers to Trade (TBT Committee) has a practice called "specific trade concerns" (STCs) to discuss trade issues arising from specific measures, such as technical regulations and standards. Using this practice, WTO members have identified "the use of ineffective or inappropriate standards and technical requirements that do not coherently contribute to achieving circular economy goals" as a potential trade problem.[1431] Consequently, the need for harmonization of international technical standards is widely accepted. However, how to undertake this harmonization is an open question touching on multiple issues. Namely, what are the options in terms of who should be developing the standards, what is needed from these standards on general level, and what is needed from these standards regarding plastics specifically.

A pertinent question regarding international technical standardization in relation to the CE of plastics is who should be developing the standards. The WTO highlights the role of industry and international standard bodies in this regard:

> WTO agreements basically strongly encourage, if not require, technical regulations to be based on international standards, but the WTO does not develop international standards. International standards are developed by the industry working with international standard bodies and that part of the puzzle would also need to come in, what is happening in international standards world today, as far as circular economy is concerned.[1432]

As part of a global strategy for the CE, Geng et al. recommend that the ISO in particular should have a central role:

> …standards for performance measurement, reporting, accounting and future products need to be developed and harmonized. Key performance indicators should be derived through the International Organization for Standardization. These could be based on environmental and corporate social responsibility systems.[1433]

It has also been suggested that the international technical standardization should be done by establishing an intergovernmental expert group to develop global design standards as part of treaty

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[1430] S Karsten, 'Trade Policies for a Circular Economy: What Can We Learn from WTO Experience? (WTO 2020) WTO Staff Working Paper No. ERSD-2020-10. 16.
[1431] *Ibid.* 11.
[1432] A Hoe Lim (Director of the Trade and Environment Division of the WTO) 'How Can Trade Agreements Promote Sustainable and Circular Trade?' (Helsinki, Finland 4.6.2019) World Circular Economy Forum (WCEF) https://www.youtube.com/watch?v=B6dhmfm5wpI&feature=youtu.be
[1433] Y Geng et al., 'Globalize the Circular Economy' (2019) 565 Nature. 155.

negotiations concerning a potential new international agreement on plastics, and particularly in relation to a global EPR scheme:[1434]

> An essential element of the global EPR scheme would be the development of global design standards to facilitate sustainable end-of-life treatment of plastic products placed on the market.[1435]

As no official process is currently in train around a new treaty on plastics, the recommendation here leans toward using the ISO as the forum for developing and harmonizing standards to promote a global CE of plastics. The reasons for this are similar to those discussed earlier. The ISO standards are developed to be compatible with international trade rules.[1436] They are also developed in a multi-stakeholder process involving governments among other actors which allows for cooperation between States and the plastics industry as part of a well-established process.[1437] Moreover, the ISO standards can be utilized as references in policy guidance or legislation.[1438] Therefore, the legal techniques already exist to use ISO standards in regulation. Furthermore, the new technical committee, ISO/TC 323, is already working on standards to strengthen the CE. An intergovernmental process to develop standards would possess the advantage of having a specific mandate targeting the promotion of CE of plastics within a new treaty regime. However, the whole procedure of establishing such international technical standardization work would have to be done from scratch, including the aspects of how industry would participate in the process.

The lack of international policy efforts and goals integrating CE approaches complicates determining even general requirements as to what international technical standards should incorporate:[1439]

> For the transfer of the emerging knowledge to technical standards for the circular economy, the characterization of the different agents of the integrated ecosystem is required, whereby the norms, tools, and indicators are specified for each agent in each phase of their life cycle.[1440]

Raubenheimer et al. argue that global industry standards are an essential component of global governance of plastics. They also note that these should, first of all, include "minimum environmental

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[1434] K Raubenheimer and N Urho, 'Rethinking Global Governance of Plastics -The Role of Industry' (2020) 113 Marine Policy. 2.
[1435] *Ibid.*
[1436] Annex 1 and 3, the TBT Agreement.
[1437] N Roht-Arriaza, 'Shifting the Point of Regulation: the International Organization for Standardization and Global Law-Making on Trade and Environment' (1995) 22 Ecology Law Quarterly 3. 486.
[1438] ISO(IEC), 'Using and Referencing ISO and IEC Standards to Support Public Policy' (2015) 5-6.
[1439] Y Geng et al., 'Globalize the Circular Economy' (2019) 565 Nature. 154; A Flynn and N Hacking, 'Setting Standards for a Circular Economy: A Challenge Too Far for Neoliberal Environmental Governance?' (2019) 212 Journal of Cleaner Production. 1262; M Jesús Ávila-Gutiérrez et al., 'Standardization Framework for Sustainability from Circular Economy 4.0' (2019) 11 Sustainability 22. 8.
[1440] M Jesús Ávila-Gutiérrez et al., 'Standardization Framework for Sustainability from Circular Economy 4.0' (2019) 11 Sustainability 22. 9.

standards for all life-cycle processes from design to end-of-life".[1441] It can thus be concluded that the first set of international technical standards that are required are standards for all processes that the CE of plastics can entail. In this regard, the family of ISO standards, particularly on ecodesign and recycling, are relevant for the CE, and the work of the ISO/TC 232 is paving the way. It has under development four standards touching upon the general requirements for organizations:

- Circular economy — Framework and principles for implementation (ISO/WD 59004)
- Circular economy — Guidelines on business models and value chains (ISO/WD 59010)
- Circular economy — Measuring circularity framework (ISO/WD 59020)
- Circular economy – Performance-based approach – Analysis of cases studies (ISO/CD TR 59031)

To complement these, process standards should be developed for reuse, repair and refurbishment and remanufacturing.

In addition to reconciling the general standards regarding the different phases and processes of CE practices, harmonization is needed on concrete level regarding plastics materials and their qualities:

> Hitherto, standards have been found in a disaggregated manner which lacks specification of the concretion study level and of the phase of the life cycle in which they operate.[1442]

One of the most recognized needs for standardization concerns "definitions and criteria, for example reusable, compostable, degradable, recyclable". [1443] The list could be augmented with those definition/classification gaps identified in the previous subchapter regarding value retention options for plastics. Due to the technical characteristics of these definitions, it could be an option to develop an international technical standard(s) that would address the different definitions for plastics materials, their use in recycling and value retention processes and their waste-status relating to what constitutes waste and end-of-waste criteria. These definitions could then be used in a harmonized manner in both international law and domestic legislation. It would also be of use in labelling and certification schemes – for example with recycled content, appropriate disposal and hazard potential.[1444]

In terms of the CE of plastics particularly, international technical standardization should contribute to "simplifying complexity":[1445]

[1441] K Raubenheimer et al., 'Towards an Improved International Framework to Govern the Lifecycle of Plastics' (2018) 27 Review of European, Comparative & International Environmental Law 3. 216.
[1442] M Jesús Ávila-Gutiérrez et al., 'Standardization Framework for Sustainability from Circular Economy 4.0' (2019) 11 Sustainability 22. 9.
[1443] K Raubenheimer et al., 'Towards an Improved International Framework to Govern the Lifecycle of Plastics' (2018) 27 Review of European, Comparative & International Environmental Law 3. 216.
[1444] *Ibid.*
[1445] K Klümmerer et al., 'Rethinking Chemistry for a Circular Economy: Chemical Complexity Complicates Product Recycling and Manufacturing Sustainability' (2020) 367 Science 6476. 370.

> A series of chemistry keystones lie at the center of a CE and must be introduced into education, legislation, and industry…Most of today's chemical products are synthetic, based on nonrenewable resources, and formed into complex articles such as plastics. Recovering molecular value from these will require a considerable investment in funding and energy. Future products must constrain the levels of complexity of their constituent resources and not change them in recycling.[1446]

It is recommended that final products should be designed to have simple composition, the use of additives should be minimized, toxic components particularly should be avoided, and all elements should be easy to separate for recovery.[1447] Criteria for simplifying the complexity of different plastics materials with international technical standardization would contribute to coordination across the value chains of plastics products and help curb the current proliferation of materials, formats, labelling, collection schemes, sorting and reprocessing systems.[1448] Another plastic-specific gap that should be addressed with international technical standards is to target the most common types of plastics with the largest usage sectors; packaging, building and construction, and consumer and institutional products. Taking this approach even further, it could also include "guidelines and EPR schemes for all sectors, including waste-generating sectors such as tourism and agriculture."[1449]

For example, plastic packaging waste amounts to almost half of all plastic waste[1450]. Implementation of good practices and standards in packaging design and after-use processes would be a crucial element in reinforcing reuse and recycling. The EMF has estimated that for at least 20% of plastic packaging, reuse provides an economically attractive opportunity, and recycling would be economically attractive for at least 50% of the remaining plastic packaging.[1451] The EMF has called for setting up "a global, industry-wide, ongoing effort to develop and facilitate adoption of globally recognized plastic packaging design standards".[1452] Standardized material specifications for recycled plastics would contribute to strengthening their markets.[1453] The existing ISO standards do not contain guidance to promote circularity of plastic packaging specifically. However, the ISO has developed standards on environment and packaging (ISO 18601-18606), which could be use as guidelines to be built on further.[1454] Targeting recyclable and reusable plastic packaging with ISO

[1446] *Ibid.*
[1447] *Ibid.*
[1448] World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, 'The New Plastics Economy – Rethinking the Future of Plastics' (2016) 17.
[1449] K Raubenheimer et al., 'Towards an Improved International Framework to Govern the Lifecycle of Plastics' (2018) 27 Review of European, Comparative & International Environmental Law 3. 216.
[1450] UN Environment, 'Legal Limits on Single-Use Plastics and Microplastics – A Global Review of National Laws and Regulations' (2018) 6.
[1451] EMF, 'The New Plastics Economy – Catalysing Action' (2017) 17-18.
[1452] World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, 'The New Plastics Economy – Rethinking the Future of Plastics' (2016) 40.
[1453] *Ibid.* 59-61.
[1454] *Ibid.* 53.

standards to harmonize design, production and after-use processes across value chains could potentially dramatically reduce plastic packaging waste ending up in landfills, enhance energy recovery and safeguard the environment. It is therefore identified here as the most important gap not covered by international technical standards.

The general level of guidance is not the only issue with current international technical standards on the CE. Current General Agreement on Tariffs and Trade (GATT) practice does not permit discrimination among imports based on the process or manner in which they were produced. Even if the underlying goal is environmental protection, it is generally not in conformity with WTO obligations to treat products differently based solely on their process or production methods (PPMs).[1455] It is "one of the sacred tenets of trade law…that no distinction in trade treatment may be made among 'like' products on the basis of how they are produced. Only the traded product may be considered."[1456] PPMs are the underlying premise of, for example, life-cycle assessment or the new CE standards under development. If the current ISO CE standards that focus on process and production methods are used to inform businesses or consumers about their purchasing decisions and are incorporated in public regulations, they could be shown to have discriminatory effects on imports, and this could be interpreted as a trade restriction under international trade rules.[1457] This issue could potentially be circumvented by increasing product-related standardization, instead of or in addition to, PPMs' standardization.

12.4 Toward Global Extended Producer Responsibility

To promote a global CE of plastics, it is essential to engage the plastics industry in the process. Though international law cannot directly target companies, it can guide States to adopt common tools at the national level that address producers and thus scale up common solutions more broadly. One of these tools that can address producers and contribute to creating a movement toward more circular practices nationally, and potentially globally, is EPR.

EPR seeks "to shift the burden of managing certain end-of-life products from municipalities and taxpayers to producers" and to provide incentives for producers to redesign products and packaging

[1455] JR Lee, 'Process and Product. Making the Link between Trade and the Environment' (1994) 6 International Environmental Affairs 4. 320; AR Maggio, *Environmental Policy, Non-Product Related Process and Production Methods and the Law of the World Trade Organization* (Springer 2017) 108.
[1456] M Halle, 'Assessing the Trade and Environment Debate after 30 Years: Reflections from the Perspective of International Environmental Negotiations' (2017) International Environmental Law-Making and Diplomacy Review. University of Eastern Finland – UNEP Course Series 17. 8.
[1457] N Roht-Arriaza, 'Shifting the Point of Regulation: the International Organization for Standardization and Global Law-Making on Trade and Environment' (1995) 22 Ecology Law Quarterly 3. 518-520.

to reduce waste and increase recycling. The concept was developed due to pressures that municipalities were facing with managing waste that was growing in volume and complexity. [1458] The rationale is thus that producers are in the best position to reduce the environmental, social and economic impacts of their products.[1459] EPR schemes can also support the development of markets for secondary raw materials by providing "separated, high quality waste materials which can be more readily processed into raw materials."[1460] In practical terms, "EPR consists of collecting products that have become waste and sorting them before treatment according to the waste hierarchy." [1461] Essentially, it would make end-of-life management of plastic waste domestically viable by catalysing industry involvement for collection, sorting and recycling of plastic waste."[1462]

EPR is as relevant as ever in the context of reducing extensive plastics wastes generation and treating plastics wastes as resources to protect the oceans from increasing plastics pollution. EPR is "a legal tool that has been identified as one of the key opportunities 'for further development of regulatory and policy instruments to enable' circular economy approaches".[1463] It is recognized that EPR "needs to be used to induce change in the plastic producing industries".[1464] EPR provides "a promising option for addressing a number of life-cycle issues of plastics, and probably to overcome some of the problems with financing."[1465]

Currently EPR is "not adequately applied within the binding frameworks to the prevention of marine plastic litter and microplastics".[1466] However, the value of EPR has been recognized in international soft law instruments relevant for plastics, national and regional legislation (particularly in the EU), as well as in literature. In the Honolulu Strategy, EPR is recognized as an important market-based instrument to support solid waste management, particularly waste minimization. The Honolulu Strategy recommends States to "develop approaches for end-of-life materials management (e.g.,

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1458 OECD, 'Extended Producer Responsibility: Updated Guidance for Efficient Waste Management' (2016) 20.
1459 E Watkins et al., 'EPR in the EU Plastics Strategy and the Circular Economy: A Focus on Plastic Packaging' (IEEP 2017) 4.
1460 *Ibid.* 18.
1461 K Raubenheimer and N Urho, 'Rethinking Global Governance of Plastics -The Role of Industry' (2020) 113 Marine Policy. 2.
1462 *Ibid.*
1463 K Steenmans, 'Extended Producer Responsibility: An Assessment of Recent Amendments to the European Union Waste Frameworks Directive' (2019) 15 Law, Environment and Development Journal 2. 112; K Steenmans, 'Enabling Industrial Symbiosis through Regulations, Policies and Property Rights' (2017) 290.
1464 UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 101.
1465 N Simon et al., 'No More Plastics in the Ocean: Gaps in Global Plastic Governance and Options for a Legally Binding Agreement to Eliminate Marine Plastic Pollution' (adelphi 2018) Discussion Paper. 34.
1466 UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 89.

recycling, energy recovery, extended producer responsibility/cradle-to-cradle methodology) for packaging materials…medical wastes (blood /IV infusion bags), electronics (computers, cell phones) and other products".[1467] It also encourages expanding "voluntary 'Extended Producer Responsibility' activities and promote stewardship projects with industry, and where applicable, establish timelines and metrics for implementation".[1468] However, the Honolulu Strategy does not elaborate more specifically the application of EPR or provide targets or timelines.[1469] Also the UNEA-3 Resolution on Marine Litter and Microplastics

> [n]otes the important role of key sectors such as plastics producers, retailers and the consumer goods industry, as well as importers, packaging firms and transport firms, to contribute to the reduction of marine litter, including microplastics, arising from their products and activities, as well as to provide information on the impacts arising from their products throughout their life cycle, and encourages innovative approaches such as the use of extended producer responsibility schemes, container deposit schemes and other initiatives[.][1470]

Furthermore, the UNEP study 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' in its recommendations for States includes promotion of EPR programs and life cycle assessments as part of operationalizing the precautionary and the polluter pays principles.[1471]

While EPR schemes have generally managed to shift responsibility and cost burdens to producers, they have been less successful in changing product design.[1472] Therefore, the scope of the EPR schemes should be extended beyond the recycling component.[1473] This would mean in particular incentives for design that promote use of value retention options: "EPR schemes should be designed in such a way that they do not hamper, but rather encourage, actions related to prevention or reuse" and other VRPs.[1474] EPR "has led to industry take-back schemes, but should be extended to include the design phase aimed at circular material flows for plastic polymers and additives. Products would

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[1467] UNEP, 'The Honolulu Strategy: A Global Framework for Prevention and Management of Marine Debris' (2016) ('Honolulu Strategy') 33.
[1468] *Ibid.* 34.
[1469] UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 52.
[1470] UNEA Res 3/7 'Marine Litter and Microplastics' (4-6 December 2017) UN Doc UNEP/EA.3/Res.7. 3, para 6.
[1471] UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016) xiii, 126.
[1472] OECD, 'Extended Producer Responsibility: Updated Guidance for Efficient Waste Management' (2016) 64.
[1473] E Watkins et al., 'EPR in the EU Plastics Strategy and the Circular Economy: A Focus on Plastic Packaging' (IEEP 2017) 33.
[1474] *Ibid.*

not be allowed to market if they do not meet agreed standards of recyclability for all components and/or contribute substantially to other environmental targets".[1475]

The latest turn in the discussions with respect to EPR and plastics are calls for international/global EPR.[1476] It has been suggested that a global EPR scheme for plastics should be considered: [1477]

> Like waste management, industry activities are predominantly regulated at a national or sub-national level. Not all countries have the capacity to develop complex EPR schemes and provide the necessary management required to ensure transparency. Highly evolved applications of EPR can be found in some developed countries…Against this backdrop…there is a need to explore the development of a 'global EPR scheme'. Essentially, it would make end-of-life management of plastic waste domestically viable by catalysing industry involvement for collection, sorting and recycling of plastic waste.[1478]

Three elements are identified here that should be taken into account in the development of a global EPR scheme. In a global EPR approach to plastics, the first link between the global level and national EPR schemes are international technical standards:

> An essential element of the global EPR scheme would be the development of global design standards to facilitate sustainable end-of-life treatment of plastic products placed on the market.[1479]

National EPR schemes should be based on global design standards by meeting the minimum requirements or improving on them nationally:[1480]

> Standards for recycling can be applied domestically and to the international trade of plastic waste. Defining standards that provide cleaner bales within plastic waste streams and defining the criteria of "recyclable" products would assist in reducing costs to recycling facilities and reducing the number of contaminated bales being sent to landfill. The design of products must embrace the principle of Extended Producer Responsibility, which would encourage compatibility with recycling technologies as well as the release of microplastics through product wear and tear.[1481]

Raubenheimer and Urho discuss a global EPR scheme in the context of a new potential treaty for plastics and suggest establishing an intergovernmental expert group to develop global design

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1475 UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 107.

1476 See eg, K Raubenheimer and N Urho, 'Rethinking Global Governance of Plastics -The Role of Industry' (2020) 113 Marine Policy. 1-2; D Barrowclough and C Deere Birkbeck, 'Transforming the Global Plastics Economy: The Political Economy and Governance of Plastics production and Pollution' (2020) GEG Working Paper 142. 50; See also, A McCarthy and P Börkey, 'Extended Producer Responsibility (EPR) and the Impact on Online Sales: Policy Highlights' (OECD Publishing 2018) OECD Environment Working Papers. 3.

1477 K Raubenheimer and N Urho, 'Rethinking Global Governance of Plastics -The Role of Industry' (2020) 113 Marine Policy. 2.

1478 *Ibid.*

1479 *Ibid.*

1480 *Ibid.*

1481 UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5. 133.

standards.[1482] However, in the absence of a new treaty, a global approach to facilitate EPR could make use of harmonizing international technical standards under the ISO, as discussed earlier. Therefore, developing international technical standards could also make an important contribution to facilitating EPR schemes globally. National legislation regulating EPR schemes could refer to these standards.

The second link between a global EPR approach and the national level would be to recommend that international plastic producers not only use their global value chains for distributing their products globally but also develop reverse value chains to collect them after use.[1483] This would be particularly important regarding their distribution of plastics products in those States where waste management is known to be inadequate and plastics leak into the marine environment. The benefit in focusing on developing functioning reverse value chains would be that the channels for distribution have already been established and could therefore be complement with take-back schemes. Moreover, the use of reverse value chains would allow companies to produce products according to their preferences and not be subjected to international standardization, as long as they would carry out the responsibility to collect and treat their products after use.

The third link between a global EPR approach and national EPR schemes for plastics is a set of principles and increasing knowledge about the elements of EPR programs which, regardless of the jurisdiction or specific form of EPR applied, can contribute to protection of the marine environment.[1484] EPR programs should be more explicitly linked to prevention of plastics leakage.[1485] In advocating such an approach, Monroe has argued that the core elements to do this consist of:

- explicit statements of aquatic waste reduction among the program goals
- stronger emphases on incentives to motivate product design improvements that reduce negative environmental impacts
- incorporation of broader sets of regulatory activities beyond just recycling or product take-back, which will generate producer support for those measures necessary as the last points of intervention to prevent waste from polluting the marine environment
- monitoring and assessment of the extent to which programs and activities achieve a quantifiable reduction in marine plastic pollution[1486]

Though EPRs generally function at the national level, addressing the links between national EPRs schemes and a more global EPR approach in the context of plastics at the international level – in

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[1482] K Raubenheimer and N Urho, 'Rethinking Global Governance of Plastics -The Role of Industry' (2020) 113 Marine Policy. 2.
[1483] J Van Engeland et al., 'Literature Review: Strategic Network Optimization Models in Waste Reverse Supply Chains' (2020) 91 Omega. 1-2
[1484] L Monroe, 'Tailoring Product Stewardship and Extended Producer Responsibility to Prevent Marine Plastic Pollution' (2014) 27 Tulane Environmental Law Journal 2. 225
[1485] *Ibid.* 236.
[1486] *Ibid.* 225-226.

cooperation with States and other stakeholders – could bring some added value. This could be done independently or as part of a new treaty on plastics. Even a soft law instrument that specifically addresses the linkages identified in this section could be a valuable tool in developing national EPR schemes to better fit plastics leakage prevention and reduction of extensive plastics wastes generation. EPR schemes are generally not linked directly to assessing their impact on plastics leakage prevention, which would be an important goal to add to them to combat increasing MPP. Furthermore, the role of international technical standards and their use as references in national legislation would provide a channel to harmonize plastics product/waste streams and enable common practices among States without imposing any international obligations to do so. For those companies wishing to continue with as much freedom as possible in production and opposed to regulatory action, engaging with EPR through developing reverse value chains for their products, nationally and internationally, would provide a way of taking responsibility on their own terms for the negative impacts of their products.

12.5 Added Value of a New Treaty

12.5.1 Rationale for a New Treaty

Measures to promote CE are gradually transcending into the scope of due diligence obligations to protect the marine environment. Some evidence already demonstrates that CE practices qualify as BEP in terms of preventing plastics leakage and marine plastics pollution. However, as evidence of such development is still at an emerging and scattered stage, a new treaty on plastics would make an important contribution by including the promotion of CE practices within its scope.

Law is one of the main tools to implement the CE and all main fields engaged in CE recognize the role of policy and legal measures in promoting their respective goals.[1487] Law can both push and hinder development of the CE. The previous section on harmonization of classifications looked at removing the barriers which can block the progress of a global CE of plastics, while the section on harmonizing and developing international technical standards and this sub-chapter focus on how international law could incorporate CE practices.

[1487] See, T Zink and R Geyer, 'Circular Economy Rebound' (2017) 21 Journal of Industrial Ecology 3. 599; B Suárez-Eiroa et al., 'Operational Principles of Circular Economy for Sustainable Development: Linking Theory and Practice' (2019) 214 Journal of Cleaner Production. 955; A de Jesus et al., 'Eco-Innovation in the Transition to a Circular Economy: An Analytical Literature' (2018) 172 Journal of Cleaner Production. 3012; MS Andersen, 'An Introductory Note on the Environmental Economics of Circular Economy' (2007) 2 Sustainability Science. 134, 139; F Preston, 'A Global Redesign? Shaping the Circular Economy' (2012) Chatham House Briefing Paper. 8, 19; RA Frosch and NE Gallopoulos, 'Strategies for Manufacturing' (1989) 261 Scientific American 3. 152; T Wautelet, 'The Concept of Circular Economy: Its Origins and Its Evolution' (2018) Working Paper, ResearchGate. 5; WR Stahel, 'The Circular Economy' (2016) 531 Nature 7595. 437-438; M Braungart et al. 'Cradle-to-Cradle Design: Creating Healthy Emissions – A Strategy for Eco-Effective Product and System Design' (2007) 15 Journal of Cleaner Production. 1346.

The current IEL and governance framework applicable to extensive plastics wastes generation is palpably inadequate to promote a global CE of plastics, and even on a general level global policy and lawmaking efforts on CE are lacking.[1488] It is in this area that a new legally binding treaty on plastics is most needed. A new treaty would not only provide added value to addressing the problem of extensive plastics waste generation and not treating plastics wastes as resources, but would be a pioneering instrument in international law. It would combine environmental protection and promotion of CE practices, thus paving the way toward more sustainable production and consumption practices.

12.5.2 Vision, Principles, Objectives and Definitions

Understanding the roots of the problem (as framed in the sub-chapter 9.3) is critical to outlining a transformative vision for a potential new treaty:[1489]

> Against this backdrop, the overarching objective of a new agreement should be the reduction of residual waste, with a long-term vision of eliminating discharge of plastics to all environmental compartments (land, air, freshwater and ocean). This, in turn, would reduce the risk of harm from plastic pollution to marine environment and human health and bring other socio-economic benefits to all sectors of the community.[1490]

Including reduction of plastics wastes generation in the vision is paramount. The vision formulated earlier in sub-chapter 5.3.3 also captures this aspect: "a world where plastics are produced and consumed in a sustainable and circular manner that respects the Earth System and the aspiration is to protect the environment and humans holistically from the negative impacts of plastics production, consumption, and pollution."

To support this vision, a new treaty should not only include principles of IEL, but also principles of the CE. The treaty text should incorporate the precautionary principle which is particularly important in the context of dealing with chemicals in plastics and the leaching of chemicals into the (marine) environment. The negative impacts of plastics and additive chemicals on the (marine) environment and human health are still debated due to lack of full scientific certainty. Furthermore, a precautionary approach would be a supportive tool to promote CE practices as an alternative, precautionary way to

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[1488] A new development in this regard is the Global Alliance on Circular Economy and Resource Efficiency (GACERE) launched during UNEA-5 in February 2021. GACERE is an initiative of the EC (on behalf of the EU) and UN Environment (in coordination with UNIDO) which "aims to provide a global impetus for initiatives related to the circular economy transition, resource efficiency and sustainable consumption and production, building on efforts being deployed internationally." EC, 'Global Alliance on Circular Economy and Resource Efficiency' https://ec.europa.eu/environment/international_issues/gacere.html

[1489] K Raubenheimer and N Urho, 'Rethinking Global Governance of Plastics -The Role of Industry' (2020) 113 Marine Policy. 2

[1490] *Ibid.*

respond to challenges of the growing plastics production. Due to the longevity and irreversibility of MPP, the treaty should also include intergenerational equity principle as a guiding principle to encourage long-term solutions to the global plastics problem to lessen their impact on future generations. CE practices have shown promise as BEP to reduce extensive plastics wastes generation, and the treaty should further encourage the use of CE practices as BEP.

Furthermore, the treaty should develop and include the basic principles of the CE in the text. A new binding agreement should be a pioneering instrument at the interface of IEL and the CE and address production and consumption of plastics with this combination. Therefore it is not enough that such a treaty should only include principles of IEL but not the CE. For example, the principles discussed in sub-chapter 10.3 – design for CE; creating value out of waste; the 3R principle or an extended variation of it; and systems thinking - could be used as a thought starter of policy principles for CE.

A key objective of a new binding agreement should be "[s]ustainable consumption and production across the life cycle: To prevent, reduce and eliminate plastic litter in the wider environment by ensuring high-recycling value of plastic and eliminating residual waste across the value chain".[1491] Raubenheimer and Urho have also suggested strategic goals for a potential new treaty which would be aligned with promoting a global CE of plastics: elimination of problematic and avoidable plastic products; sustainable management of essential plastic products; sustainable plastic waste management; and reduction in chemical hazard.[1492] These strategic goals could be included as sub-goals to support the key objective. This objective and sub-goals would target the most crucial areas of promoting a CE of plastics and provide overarching guidance at the international level.

It is also essential that a new binding agreement contribute to common understanding of definitions and terms regarding a CE of plastics. The treaty could define some of these terms but also defer to international technical standards, as terms such recyclability are likely to evolve in meaning as CE practices develop.

12.5.3 Scope and Coordination with Other Treaties

The global plastics problem and a new treaty to address it require a new and pioneering approach:[1493]

> [A] treaty to manage marine plastic pollution would need to affect countries' production cycles and industrial processes, and thus be an ocean treaty and a sustainable production and consumption treaty

[1491] K Raubenheimer and N Urho, 'Possible Elements of a New Global Agreement to Prevent Plastic Pollution' (Nordic Council of Ministers 2020) 43.
[1492] *Ibid.*
[1493] EA Kirk, 'The Montreal Protocol or the Paris Agreement as a Model for a Plastics Treaty?' (2020) Symposium on Global Plastic Pollution. 114 American Journal of International Law. 216.

simultaneously. Such a combination of a treaty does not exist up to date and ocean governance and pollution control are mainly looked at separately.[1494]

The scope of a new treaty in relation to extensive plastics wastes generation would thus need to cover a whole range of activities along the global value chains of plastics products, with the exception of those few areas that are already covered by other treaties, specifically the most hazardous chemicals (the Stockholm Convention) and the transboundary movements of plastics wastes (the Basel Convention). The scope would thus be upstream activities from design to recycling.

A new treaty on plastics would need to address its relationship with other instruments relevant for promoting the global CE of plastics, namely the Stockholm and Basel Conventions.[1495] A new treaty on plastics addressing the reduction of chemical hazard in plastics would have an interface with the Stockholm Convention. Those chemical substances that are or could potentially be classified as persistent organic pollutants would belong under the Stockholm Convention regime, and a new treaty would need to address other chemical substances and their hazardous characteristics. This would require continuous collaboration and cooperation between the Stockholm Convention and a new treaty on plastics as knowledge of chemicals and their hazardous properties that are used in plastics production improves over time.

Furthermore, in relation to chemicals in plastics a new treaty should take note of the GHS, and contribute to its development in reducing the toxicity of plastics, in addition to supporting its implementation. As the GHS represents an existing framework to assess the risks of chemicals, a new treaty could focus on first identifying the chemicals that are relevant for its scope and whether some of these chemicals should be subject to the Stockholm Convention, and then develop criteria on how the rest should be regulated. A new treaty should create at least two categories for chemicals in plastics.[1496] These categories and criteria should indicate which chemicals are allowed in plastics production and which could be safely chemically recycled in the CE. For example, research has indicated the feasibility of recycling flame retardants contained in plastics in a closed looped system after disassembly and plastic identification.[1497] Moreover, it should include category and criteria for those chemicals that do not qualify as POPs under the Stockholm Convention but are still hazardous and should at least gradually be phased out. Regarding this category, a new treaty could draw

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[1494] I Tessnow-von Wysocki, 'International Cooperation for the Protection of Global Public Goods: Towards a Global Plastics Treaty' (Freie Universität Berlin 2019) 2 University Alliance for Sustainability Working Paper Series. 44.
[1495] See, R Bodle and S Sina, 'A Treaty on Plastic Waste' (ecologic 2019) Discussion Paper. 4.
[1496] See also, K Raubenheimer and A McIlgorm, 'Is the Montreal Protocol a Model That Can Help Solve the Global Marine Plastic Debris Problem?' (2017) 81 Marine Policy. 325.
[1497] See, JR Peeters et al., 'Closed Loop Recycling of Plastics Containing Flame Retardants' (2014) 84 Resources, Conservation and Recycling.

inspiration from the Montreal Protocol's model in phasing out harmful substances, which has incorporated the CBDR to provide longer phase-out periods for developing States.[1498]

The relationship between a new treaty on plastic and the Basel Convention also needs to be clarified. A new treaty on plastics has the potential to take a broader perspective on plastic waste prevention and minimization than the Basel Convention. However, the transboundary movement of plastics wastes would remain the domain of the Basel Convention.[1499] A further issue in the interface between the two treaties would potentially be transboundary movements of plastics wastes destined for CE processes other than recycling. Therefore, continuous collaboration and coordination between the Basel Convention and a new treaty on plastics would also be required to facilitate international trade aspects of global CE of plastics. Such coordination issues with other treaty regimes should be transparently included in the treaty text of a new binding agreement.

12.5.4 Substantive Commitments with Time-Bound Targets

To address the problem of extensive plastics waste generation, the key objective of sustainable consumption and production of plastics and the supportive strategic goals should be formulated into substantive obligations.[1500] However, these are more difficult to formulate into obligations of result than an obligation to eliminate plastic leakage.

In formulating substantive commitments regarding CE, a new treaty should take into account its inherent limitations, namely the challenges relating to laws of thermodynamics and the rebound effect. The laws of thermodynamics dictate that product reuse, remanufacturing, and refurbishment are the most desirable choices, whereas recycling should be avoided. [1501] Furthermore, they signify that perfect circularity of resources in the economy is practically impossible.[1502] Regarding the possible rebound effect of the CE, a new treaty should provide guidance toward reducing and gradually replacing virgin material production and consumption of plastics. This would be in line with the underlying objectives and principles of the CE which advocate reducing reliance on fossil fuels.[1503]

1498 See, E Brown Weiss, 'Common But Differentiated Responsibilities in Perspective' (2002) 96 Proceedings of the Annual Meeting (American Society of International Law) 367.

1499 R Bodle and S Sina, 'A Treaty on Plastic Waste' (Ecologic 2019) Discussion Paper. 4.

1500 K Raubenheimer and N Urho, 'Rethinking Global Governance of Plastics -The Role of Industry' (2020) 113 Marine Policy. 2.

1501 D Lazarevic and H Valve, 'Narrating Expectations for the Circular Economy: Towards Common and Contested European Transition' (2017) 31 Energy Research & Social Science. 63.

1502 *Ibid.* 64.

1503 S Erkman, 'Industrial Ecology: A New Perspective on the Future of the Industrial System' (2001) 131 Swiss Medical Weekly 37-38. 534; DW Pearce and RK Turner, *Economics of Natural Resources and the Environment* (Johns Hopkins University Press 1990) 39-40; MS Andersen, 'An Introductory Note on the Environmental Economics of Circular Economy' (2007) 2 Sustainability Science. 135; M Braungart and B McDonough, The Next Industrial Revolution' in M Charter and U Tischner (eds) *Sustainable Solutions: Developing Products and Services for the Future* (Greenleaf Publishing Limited 2001) 148.

Furthermore, the treaty should also aim at overall reduction in production and consumption, since a more circular model of production and consumption inevitably still produces wastes that cannot be turned into resources.

Elimination of all problematic and avoidable plastic products would function as an obligation as such. However, it is not feasible that the treaty text would provide a list of such products – this would have to be through an annex, protocol, or COP decision that could be continuously reviewed and updated. At the outset, elimination of problematic products should at least incorporate banning any non-essential products that include primary microplastics as components.[1504] Similarly, reduction of chemical hazard would function as an obligation as such, but would require that the chemicals are subject to continuous review and that the system is coordinated with the Stockholm Convention, as discussed in the previous section. Sustainable management of essential plastics products could perhaps best be advanced with technical standards on design aspects. The substantive commitment should oblige States to identify these products and then aim at making them as circular as possible – for example by developing specific technical standards.

Though substantive commitments to promote a safe CE of plastics are difficult to quantify, some guidance for creating targets to reduce plastics wastes generation can be sought from the model created by Borrelle et al., which was also used to create overall targets for plastics leakage prevention. To reach a target of specified plastic emission (8 Mt/year) by 2030, would require "plastic waste generation to be reduced by 40% in HI, 35% in UMI and LMI, and 25% in LI countries compared with the BAU [business-as-usual] trajectory."[1505] This refers to a target based on combined efforts to increase the proportion of managed waste, the recovery of existing plastics pollution and the reduction plastics wastes generation. If waste reduction is the only focus of the international community, it would mean that "plastic waste generation would need to be reduced by 85% across all income levels".[1506] These estimates provide some overall guidance for States that could be useful in evaluating their national implementation measures.

12.5.5 References to International Technical Standards

Regarding the inclusion of international technical standards that are necessary to incorporate the highly technical aspects of promoting global CE of plastics, the Montreal Protocol provides an

[1504] K Raubenheimer and N Urho, 'Possible Elements of a New Global Agreement to Prevent Plastic Pollution' (Nordic Council of Ministers 2020) 42.
[1505] SB Borrelle et al., 'Predicted Growth in Plastic Waste Exceeds the Efforts to Mitigate Plastic Pollution' (2020) 369 Science 6510. 1516.
[1506] *Ibid.*

existing model.[1507] The Montreal Protocol regime makes use of collaboration with international standardization bodies, such as the ISO, in developing the required technical standards:

> …request the Ozone Secretariat to enter into discussion with the International Organization for Standardization (ISO), ASTM International (ASTM), the European Committee for Standardization (CEN) as well as with other relevant multinational standardisation organisations encouraging them to identify methods based on ODS and to expedite the inclusion of non-ODS alternative methods, techniques and substances in their standard methods.[1508]

The Montreal Protocol regime also refers to such standards in the Decisions of the Meetings of the Parties to the Montreal Protocol.[1509] Therefore, it is not unprecedented that an MEA involves international standardization organizations in its work when it comes to the complex technical side of substances involved in the regime. A similar model of cooperation could be used in the interface of regulation and technical standards in the new plastics treaty, and its secretariat should be given a mandate to approach international standardization bodies regarding these issues.

12.5.6 Functional, Operational and Institutional Elements

Regarding the functional, operational, and institutional elements of a possible new treaty, sub-chapter 5.3.6 has already touched upon the Secretariat and its functions, national action plans, reporting and monitoring, a scientific body regarding plastics leakage and MPP, and financial and technical assistance and funding mechanism needs. The purpose here is to complement these aspects from a CE/reduction of extensive plastics wastes generation perspective, and to bring forth some additional views on what a pioneering instrument might need in this regard.

The UN agency that would be most suitable for the secretariat role is the UN Environment. This is due to its public-private-partnerships around CE, such as the Global Commitment with the EMF, as well as it cooperation with UNIDO regarding the CE, for example in the form of the Global Alliance on Circular Economy and Resource Efficiency (GACERE). In the CE context, the Secretariat should include in its coordination function organizations like UNIDO, WCO, WTO and international standardization bodies, such as the ISO.

Regarding national action plans, reporting, monitoring, financial and technical assistance and a funding mechanism, these aspects echo what has been already written, though substantively they would need to cover the CE-related commitments discussed above. In addition to having a scientific

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1507 K Raubenheimer et al., 'Towards an Improved International Framework to Govern the Lifecycle of Plastics' (2018) 27 Review of European, Comparative & International Environmental Law 3. 218.

1508 Twenty-First Meeting of the Parties on Substances that Deplete the Ozone Layer, 'Decision XXI/6: Global Laboratory Use Exemption' (2009)

1509 See eg, Twenty-Eighth Meeting of the Parties on Substances that Deplete the Ozone Layer, 'Decision XXVIII/4: Establishment of Regular Consultations on Safety Standards' (2016) body, the treaty should also establish a subsidiary technical body to deal with the juncture between linear and circular plastics production and consumption.

The complexity of regulating plastics materials and chemical additives, as well as the dynamic nature of the development of CE practices, calls for a treaty design that can be amended and complemented when necessary and is precautionary and future-oriented: [1510]

> It would anchor the issue on the agenda and establish a permanent forum to progressively address it, even if its legal obligations as such were initially more of a "framework" nature. A treaty could include mandates for further work and permanent institutions such as a Conference of Parties (COP) which adopts decisions to specify and guide parties' implementation over time.[1511]

To ensure it is responsive and dynamic, a new treaty should establish a Conference of the Parties (COP) as its governing body. The flexibility of the Montreal Protocol provides a good model in this regard. It is based on mandatory regular assessment and review control measures and the addition or removal of any substances that technical experts advise. These can be in the form of amendments to obligations which take form of decisions that become binding on parties once adopted, or adjustments that automatically enter into force.[1512] The Montreal Protocol is an example of "industry taking measures globally to reduce the environmental impacts of the products they produce. Similarly, a new international agreement for reducing the environmental impacts of plastics could regulate procedures, materials, applications and chemical additives through annexes to the instrument."[1513]

12.6 Preliminary Remarks of Plastics Wastes Generation Reduction Measures

Compared to the previous two main parts, it is evident that reducing plastics wastes generation by promoting the CE is the most undeveloped one from the perspective of international law. Yet it is also the only part that targets the root causes of the global plastics problem – linear, global and fossil fuel -based production and consumption – and therefore the most crucial one to develop. Within the CE paradigm law is recognized as an important implementation tool and traces of the CE can be identified within the current instruments of international law, yet the process is in its infancy. In particular discussions around the role of international law in promoting the CE are only beginning and provide a rich area for research.

[1510] R Bodle and S Sina, 'A Treaty on Plastic Waste' (Ecologic 2019) Discussion Paper. 3
[1511] *Ibid.*
[1512] K Raubenheimer and A McIlgorm, 'Is the Montreal Protocol a Model That Can Help Solve the Global Marine Plastic Debris Problem?' (2017) 81 Marine Policy. 324; Arts 2, 6, 11, Montreal Protocol on Substances that Deplete the Ozone Layer (Adopted 16 September, entered into force 1 January 1989) ATS 18 ('Montreal Protocol)
[1513] K Raubenheimer et al., 'Towards an Improved International Framework to Govern the Lifecycle of Plastics' (2018) 27 Review of European, Comparative & International Environmental Law 3. 218.

The review of the CE as a field of study demonstrates that the CE has many interfaces and is not confined in one discipline but inherently interdisciplinary. It also reveals that the CE comes with its own set of inherent limitations and is not a guarantee for sustainable solutions. These features and challenges need to be acknowledged and critically evaluated also in legal research and the CE cannot be taken at face value. On the one hand, it signifies that there are diverse regulatory challenges and opportunities involved in promoting the CE. On the other hand, it denotes that perfect circularity is impossible and therefore targeting plastics leakage and reducing existing MPP will continue to be relevant approaches also in the future.

Part IV is not a comprehensive review of international law and international technical standards in relation to instruments relevant for promoting a global CE of plastics. Rather it has sought to identify and analyze possible elements that are relevant. What becomes apparent from the analysis is that the linear economy paradigm has been embedded so profoundly also in the structures and elements of international law that shifting the paradigm to the CE is an enormous task which requires more than negotiating one new treaty on plastics, though it is an important part of it. However, the global plastics problem provides an apt opportunity to start identifying and investigating the needed changes towards the CE also under international law. In a globalized economy where goods and wastes travel across different jurisdictions via international trade, it is crucial that international law becomes part of the CE discussions and solutions.

PART V – CONCLUSIONS

CHAPTER 13 – A RECOMMENDATION FOR AN INTERNATIONAL LEGAL RESPONSE TO THE GLOBAL PLASTICS PROBLEM THREATENING THE MARINE ENVIRONMENT

13.1 Introduction

No panacea for the global plastics problem is available. This is not only true for international law which cannot provide such an all-encompassing solution but also for other fields involved in contributing to solutions, such as the CE. The best chance to confront the global plastics problem is to apply systems thinking, a fundamental principle of the CE. Systems thinking can help to understand how different fields and actors perceive the constituents of the problem and its solutions. It can also facilitate engaging all relevant actors in open interaction and cooperation, and from this foundation develop a concerted interdisciplinary response to the global plastics issue.

This dissertation set out to understand the science and root causes behind the global plastics problem and the role of international law in contributing to solutions with an ambition to provide States a recommendation for an international legal response. Although the approach is predominantly legal, this study has also discussed the scientific interdisciplinary basis used to formulate legal responses. It is essential that the international legal response this study advocates for is built upon solid scientific premises and conceptions of the problem. Only through openly framing the problems and scientific facts can experts from others fields evaluate the contribution of this study. It is of the essence that research aspires to overcome the disciplinary borders to construct problem-based, fit-for-purpose interdisciplinary solutions mixes to that together can confront the global plastics problem.

It is clear that international law has an important part to play in this collaborative effort. The global plastics problem concerns – in one way or another – each State in the world. In addition, a rich but fragmented mixture of international legal measures and mechanisms already exist. The role of international law and lawmaking are to establish global objectives to protect the environment from the global plastics problem, to reinforce existing obligations and create new ones to meet these goals, to push States to operationalize and be guided by the principles of international law, to provide for mechanisms and institutions that enable coordinating and steering common action, and to ensure compliance with commonly agreed measures. International law and lawmaking have a crucial role in sewing together this patchwork of different objectives, voluntary initiatives, obligations, principles, actors, institutions, and so on and so forth.

Part V analyses the findings of this dissertation thematically. Each main part of the thesis (II, III and IV) has analyzed a set of themes in relation to the three sub-research questions and sub-problems of 1) plastics leakage, 2) MPP and 3) extensive wastes generation. These themes entailed a description of the sub-problem; the underlying legal foundation of an international legal response originating from principles of international law; strengths and weaknesses of the existing and applicable instruments of international law and how they could be improved; recommendations for complementing measures that do not depend on a new binding agreement; and recommendations of what should be taken into account if new treaty negotiations begin. In this concluding chapter the findings from the three main parts are discussed thematically to transcend the structure of dividing the global plastics problem into three separate sub-problems and to highlight their interlinks.

13.2 The Three-Fold Problem-Based Framework as a Platform and Tool to Confront the Global Plastics Problem

In an attempt to confront the global plastics problem, this study broke this issue into three more manageable and interlinked sub-problems of plastics leakage, MPP and extensive plastics wastes generation. Breaking the global plastics problem into smaller units and framing it from different angles demonstrates that the debates around it should be inclusive. This signifies that the question is not whether plastics are a waste management problem, an environmental problem or a consumption problem. Rather, the question is how to define and frame the global plastics problem and its sub-problems in an inclusive manner that address all aspects of this international issue. This study chose the angles of waste management, environment, human health, and global production and consumption, but this is by no means an exhaustive list of framings for the problem. The different sub-problems and framings are also interlinked. For example, the global nature of the plastics problem arises from MPP and how it has globally spread all over the world's oceans from the surface to its greatest depths. MPP and scientific contributions that have created awareness of the seriousness of the issue are important *inter alia* for regulators as the reason and motivation to prevent plastics leakage or to promote CE practices.

The three sub-problems this study adopted were chosen because they had the ability to form a continuum that together form the global plastics problem. Presenting the global plastics problem as a continuum of sub-problems depicts both the root causes and their negative consequences, and provides solutions addressing the whole lifecycle of plastics. Extensive plastics waste generation and not using plastics wastes as resources has put an enormous pressure on national waste management systems and accelerated international trade in plastics wastes particularly from developed States to developing ones, and the failure to answer to these pressures has resulted in widespread transboundary and global MPP. However, the continuum of the sub-problems can be reversed to a continuum of solutions. Recovered MPP could be used as a resource, national waste management systems and international plastics wastes trade could be used as intermediate stages the purpose of which is not only incineration or final disposal but collection and sorting to enable recycling and value retention processes. These steps could contribute to a more circular manner of acquiring raw material and producing and consuming plastics.

Approaching the global plastics problem as a continuum of sub-problems provides States a simple three-fold framework to address the issue comprehensively. Using a combination of the three strategies is preferable and more balanced and realistic compared to opting for only one strategy. This framework is also adjustable and can be further developed. Though the purpose of the framework in this study was to describe and analyze the current international legal framework and how it should be developed to create a common direction for States at the international level, it can also be applied at regional, national, and even local levels. As the framework captures the main constituents of the global plastics problem, at least from an environmental viewpoint, it can be applied at other levels to evaluate which sub-problems should be prioritized regionally, nationally and locally. It can also help to evaluate how the measures taken are situated against the global picture. The framework can also be broken into more specific sub-problems and responses, or the three sub-problems can be complemented with additional sub-problems and solutions to widen the framework. For example, to evaluate how to respond to the global plastics problem from a sustainable development perspective, this framework could function as the environmental pillar, and it could be complemented with sub-problem descriptions targeting the economic development and growth and social dimensions, and respective measures regarding these pillars.

In summary, the three-fold framework is an initial platform and tool that can help to grasp and overcome the enormous complexity of the global plastics problem and the role of different scientific disciplines in contributing to responses in an inclusive manner. It can also assist experts from other fields to understand their role in contributing to legal solutions and how their research benefits legal research on the topic. This study asserts that to construct a wider concerted effort amongst different fields dealing with the problem, these type of suggestions for meta-level frameworks are needed in addition to individual substantive scientific contributions to organize the enormous amount of knowledge and provide structure for common efforts.

13.3 International Legal Foundation and Value Basis for a Common Legal Response

Principles of international law establish a tentative legal foundation on which to base an international legal response to the global plastics problem. In the absence of a policy consensus regarding how the problem should be tackled as a whole, this set of principles provides a common value basis for guiding the direction of current and future efforts from States under international law.

At present, the due diligence obligations provide the legally binding backbone to tackle the global plastics problem under international law, though the level of generality leaves much to be desired. Despite the customary international law status of the due diligence obligations to protect the marine environment and their applicability to the global plastics problem, this argument has not been central either in literature or policy reports to push States to take further action. Furthermore, in particular developed States should take note of recent developments regarding treatment of CE measures as BEP to prevent plastics leakage and MPP. The evolving standard of due diligence is continuously affected by developments of BEP, and therefore the CE has the potential to affect the standard of due diligence in the future, a progression of which there already exists tentative examples in international and regional spheres.

The polluter pays principle highlights the responsibility of operators engaged in activities involving plastics from two angles; liability and EPR. Regarding liability, the polluter pays principle guides States in developing mechanisms to channel to operators the costs of recovering MPP or compensating for damage. The polluter pays principle is also central to the concept of EPR, which in the context of plastics should be adjusted to functioning in a global economy with an objective to curb plastics leakage. The precautionary and intergenerational equity principles are particularly suitable for guiding long-term action and integrating CE practices into international law. The precautionary principle is not only useful to legally assess the chemical threats of plastics on ecological and human health, but also to broaden understanding of the precautionary options available to address the global plastics problem, such as CE practices. Intergenerational equity further underlines the long-term impacts of MPP, which are likely to stretch over many generations to come.

Though all these principles together offer a common legal and value foundation for an international legal response, their operationalizing with regards to the global plastics problem is urgently required. This study has also provided a list of principles of CE as a thought starter. States should initiate a discussion of a common set of principles of CE, as the global nature of plastics production and consumption dictates that a functioning CE of plastics will need to have a global dimension. States should develop an understanding of what is their common value basis also in this regard similarly to identifying relevant principles of international environmental law. It can also be expected that as production and consumption moves into more circular practices in the future that the lines between principles of IEL and the CE may become more blurred, and CE principles transcend more and more into the discussion of international environmental law scholarship. They can even challenge the sustainable development paradigm. This interface can provide an interesting area for future research and the global plastics problem is a fruitful starting point to initiate such discussions. A possible new binding agreement for plastics could be a pioneering instrument by adopting a set of principles from both IEL and the CE to guide its implementation.

13.4 Improvements to the Current International Legal Framework applicable to the Global Plastics Problem

Mapping and analyzing international law based on systematizing the global plastics problem as a continuum of three sub-problems revealed the stress of current efforts and indicated where the future efforts need to focus on. Currently the existing international legal framework applicable to the three sub-problems mostly addresses plastics leakage to the marine environment, whereas analysis of international legal remedies for existing MPP has been lacking almost completely, and analysis of applying international law to promote CE solutions also remains scarce and is in most part tied to discussions of a new binding agreement on plastics. This is evident from the discussion concerning application of rules of State responsibility and international liability principles to MPP and from analyzing the extent international environmental law comprises elements of the CE. IEL has so far focused on downstream activities and international pollution prevention measures particularly, and although the literature keeps highlighting the need to address upstream activities, such efforts are currently in their infancy and IEL has yet to embrace its potential role in this area.

Systematizing the global plastics problem and mapping international law this way also revealed new areas for research which have previously been on the sidelines. The advantage of this approach was that by investigating the sub-problems and their characteristics first, the lenses through which legal instruments were chosen was shifted. If the applicable law was chosen solely through doctrinal lenses, the result would have likely been an analysis of international marine environmental law. Though these instruments are also relevant here, the problem-based approach widened the spectrum of applicable law. The scientific studies, for example, highlighted river systems as a major pathway for plastics leakage to oceans, which lead to the discussion of the interconnectivity between oceans and (international) watercourses in the plastics leakage context. Another example is how the sub-problem description of extensive plastics wastes generation lead to investigating elements of international law that can advance shifting the process toward a global CE of plastics. These include, for example, international customs practices, the importance of harmonizing classifications or the relevance of international technical standardization to create safe and scalable CE practices worldwide. The problem-based approach can thus provide innovative angles for legal research and widen the understanding of what areas of law are relevant for solving environmental problems, as they are not confined to merely IEL.

States should aspire to perfect the current international legal framework in a way that takes explicitly into account the global plastics problem and informs and reminds States of their existing obligations under international law. To an exemplary extent, ocean-based sources of vessel-source plastic leakage and plastics leakage by dumping have been prohibited. However, strengthening compliance with these instruments addressing ocean-based sources is pivotal. Furthermore, it is evident that all States under customary international law are obligated to do their due diligence to protect the marine environment as a whole, including from global and transboundary MPP. This general and existing obligation should not be dismissed by the notion that no plastic-specific obligation currently exists in any treaty. Though soft law instruments on land-based plastics leakage have not proved largely successful in addressing the global plastics problem, they do provide some specifications that are valuable for clarifying the minimum standard of the due diligence obligations of States regarding land-based plastic leakage prevention. Thus there is a general obligation to prevent plastics leakage to the marine environment and at least theoretically the rules of State responsibility could be applied if this obligation is breached. In addition, the Draft Principles on Allocation of Loss provide some support for States willing to develop their national liability and compensation mechanisms to respond to environmental damage from MPP in the absence of a specific liability and compensation mechanism.

Most of the chemicals contained in plastics are not subject to any global governance mechanism at present. Though both the LOSC and the Stockholm Convention address the chemicals contained in plastics, the LOSC does not provide any specific rules of reference in this regard and only a handful of most hazardous chemicals are included within the scope of the Stockholm Convention. The Stockholm Convention provides a mechanism for introducing more chemicals within its scope, which could potentially be used in the future as knowledge of chemical hazards in plastics improves. The GHS offers further support for assessing risks of chemicals in plastics, and its implementation should be pushed more widely.

Particularly soft law instruments have been instrumental in advocating for CE activities. Specifically, UNEA Resolutions have explicitly introduced the concept of the CE to the international agenda and language in the context of plastics. However, these statements included in the UNEA Resolutions require further operationalizing which is challenging in the absence of support from binding instruments and a lack of a more comprehensive international policy on strengthening a CE of plastics. It is also evident from the drafting process of these Resolutions that developing a common understanding of the basics of the CE is essential. In this regard, this study provides a discussion of the theoretical underpinnings and limitations of a CE, with a particular focus on the role of (international) law in promoting it. The main takeaway from this discussion is that law has a crucial role in implementing a CE to remove barriers and to enable new initiatives. It is important to consider that the CE is not a panacea but has its own set of limitations to address a linear production and consumption of plastics.

The Basel Convention has made valuable progress in addressing the problems with global plastics wastes trade by adopting the Plastics Amendments which introduce more stringent rules on trading wastes for final disposal and encouraging trade for CE purposes. However, the Plastics Amendments only focus on recycling, leaving trade in plastics wastes for other purposes under the CE out of its scope. The Basel Convention would have potential to broaden the scope of the Plastics Amendments to also include value retention options of reuse, repair, refurbishment and remanufacturing to further strengthen a global CE of plastics.

International customs practices under the HS Convention and Nomenclature currently operate from a linear perspective and do not adequately cover categories of international trade in plastics that would facilitate CE practices. Moreover, varying definitions for wastes and other necessary terms in a CE (eg, waste, end-of-waste, secondary raw material, recyclates, reuse, repair, refurbishment and remanufacturing) in national legislations can cause friction in international trade and should be clarified at an international level. International technical standardization around a CE of plastics is drastically lagging behind compared to standardization of a current, primary linear production. Though some ISO standards provide tentative support for organizations to develop their CE practices and ISO is in the process of developing new standards to explicitly address CE practices, these developments still leave much to be desired in helping to build stronger markets for secondary plastics production in a global economy to curb plastics wastes generation.

13.5 New Measures to Complement The Current International legal Framework

New measures can build on and complement the existing international legal framework without a new binding agreement. In the absence of an actual new treaty negotiation process, it is important to also discuss further measures that could function independently of a new treaty. Furthermore, a negotiation process is likely to take years and it is crucial that concurrent progress happens also during this time. It is also possible to combine any of the suggestions below with a new treaty or even reaffirm and encourage use of these mechanisms within a possible new treaty regime.

Coastal and riparian States should improve international coordination and cooperation between RSOs and RBOs under the regional nodes mechanism that the GPML provides. Though the LOSC, the UNWC and the UNECE provide for general obligations for further interaction between the regimes regarding protection of the marine environment from riverine pollution, plastics leakage from international watercourses to the oceans has so far remained a blind spot between these two regimes. The GPML provides a procedure to add new relevant actors under its regional nodes mechanism to address plastics. Such cooperation has the potential to not only reinforce pollution prevention obligations, but also to reduce existing pollution in riverine and coastal environments, as well as introduce CE practices to minimize overall plastics wastes generation. If new treaty negotiations begin, riverine inputs of plastics leakage should be addressed and the GPML should be included under its coordination mechanism of relevant organizations which address the global plastics problem.

EPR is a concept that can simultaneously address both plastics leakage and promote CE practices. However, using EPR to promote a CE of plastics to protect the marine environment necessitates adjusting the concept to better take into account the global nature of activities surrounding plastics value chains. EPR schemes are generally not linked directly to assessing their impact on plastics leakage prevention, which would be an important goal to add to them. Furthermore, the role of international technical standards and their use as references in national legislation would provide a channel to harmonize plastics product/waste streams and enable common practices among States without any international obligations. A guiding soft law instrument providing general guidelines would be a valuable tool in developing, harmonizing and scaling up national EPR schemes to better contribute to plastics leakage prevention, reducing extensive plastics wastes generation, and promoting increased use of plastics wastes as resources. A possible new treaty should also include EPR practices within its scope.

Remedies for existing MPP have been on the sidelines of discussions compared to prevention of plastic leakage and CE practices. Yet it is imperative that MPP is recovered from the environment as it is the only way to prevent it from becoming unrecoverable micro- and nanoplastics polluting the environment for hundreds of years. Developing countries suffer from the most severely plastics-polluted regions and lack resources to efficiently respond to existing MPP. Yet MPP is also a wasted economic resource that could be used for CE purposes, or at least for recovering fuel or energy. Therefore, this study recommends States to establish an international private fund modeled after the GFATM. It would provide funding for restoration and cleanup activities in particular in hotspots in developing countries. Though the main focus of the fund should be reducing existing MPP, it should be combined with funding allocated to treating recovered plastics safely and using recovered plastics as a resource in the CE. In this way, the purpose of the fund could be broadened while prioritizing MPP mitigation. This recommendation stems from the analysis indicating the impracticability of remedying damage from MPP with existing rules on State responsibility or even with a new liability and compensation mechanism as part of a possible new treaty.

These measures are not an exhaustive list of possibilities, rather they serve as a sample of complementing efforts in the absence of a new treaty to address the global plastics problem. Such examples of different measures exemplify the importance of a diversified set of legal measures to confront the problem. Even with a new treaty, it cannot solve all the issues and regulate every aspect. Moreover, it is likely that a possible new treaty would rely on national action plans that leave much discretion to States in terms of how they choose achieve the objectives of a new agreement. Therefore, all these measures would likely also contribute to States' national efforts to fulfill their obligations under a possible new treaty.

13.6 A New Binding Agreement on Plastics

Analysis of the current international legal framework and complementary measures reveals that these measures cannot alone form an adequate international legal response to confront the global plastics problem. However, this analysis has illuminated the reasons why States should initiate a new treaty negotiation process and how it would fit into the existing patchwork of legal measures. A key component to designing the architecture to a new treaty is examining what added value such a treaty would bring to the international legal response to the global plastics problem. The added value of a new binding agreement derives from its potential to address significant substantive gaps and to establish a much-needed, comprehensive coordination mechanism. It should also start a new generation of MEAs by becoming a pioneering instrument in the field of IEL by addressing both protection of the (marine) environment and unsustainable production and consumption patterns with the means of the CE.

The scope of a new binding agreement should cover land-based plastics leakage and promoting a (global) CE of plastics to reduce extensive plastics wastes generation. Considerable gaps remain in targeting the global plastics problem under current international law in these areas. Most importantly, clear and specific obligations, time-bound targets, monitoring and reporting are lacking at the global level. A new treaty should establish obligations to eliminate plastics leakage to the environment, to promote a safe CE of plastics, and science-based global reduction targets that can be reviewed and adjusted if needed. These obligations would then be adjusted with respect to the differences in States' capacities and States would report and monitor according to standardized methodologies.

The secretariat or a subsidiary body of a new binding agreement would need to function as the coordination mechanism. Considering how many inter-governmental organizations alone are relevant, this will be an enormous and extremely important task, which should be taken on by the UN Environment. The organizations, programmes and partnerships to include in the coordination mechanism include at least IMO, FAO, RSP, GPML, GPA, UNIDO, WCO, and WTO. The interfaces with these organizations will include considering how States should jointly report and monitor their national action on plastics, as well as to coordinate action amongst the organizations themselves. From State perspective, it would be an advantage if they could report their national actions on plastics in one report, and not separately to each respective organization. Furthermore, the governing bodies of different treaty regimes need to coordinate their work in relation to the new treaty to avoid any duplicate work. Though the coordination would be challenging, such a diverse range of actors working in a concerted effort toward the goals of a new treaty also promises to be an unprecedented opportunity and example of the international community joining forces to confront a common problem. Moreover, the coordination mechanism should also include the possibility to involve international standardization bodies, such as the ISO, in relation to work involving the most technical parts of promoting a CE of plastics.

The most exciting implication of a new treaty negotiation process would be the opportunity to transcend the traditional approach by not being merely an international pollution prevention instrument addressing downstream activities. What is needed is a novel type of binding agreement that can deal with a variety of upstream activities and fundamentally change how plastics are produced and consumed in a global CE. This requires that States allow their waste management systems to become subject to international regulatory obligations and rethink how they can be transformed to serve the objectives of a CE. For this process to succeed, other elements of international law need to be brought onboard. These implications concern at least harmonizing relevant legal definitions, classifications and categories used in international customs and trade practices and international technical standardization. The challenge is enormous but it is crucial that the international community embraces the CE paradigm. A new pioneering binding agreement targeting the global plastics problem presents an opportunity for States to steer the world towards truly sustainable and healthy societies and could become an unprecedented example of how the humankind is capable of solving extremely complex environmental problems.

13.7 Final Remarks

The complexity of the environmental problems the world is facing today can be paralyzing and lead to non-inclusive debates of what constitutes the best approach to confront these complicated and multifaceted issues. This study has scrutinized the global plastics problem and offers a three-fold framework to comprehend the constituent elements of the problem while respecting its intricacies. From this problem-based perspective, the study has elaborated upon the obligations of States under current international law to prevent transboundary and global harm from plastics leakage, opportunities for States to seek legal remedies when faced with transboundary harm from MPP and examined how international law and technical standardization currently take into account promotion of a global CE of plastics to reduce extensive plastics wastes generation. It has also provided a range of options on how to further develop and complement these efforts to formulate an international legal response that confronts the global plastics problem as a whole.

To formulate and coordinate a common international legal response to the plastics problem requires that all three main approaches are connected and support each other. A global CE of plastics, even if it reached a high level of functionality, suffers from inherent limitations of the CE. Not all plastics are equally suitable for CE practices, and even a circular manner of producing and consuming plastics results in wastes which need to be treated with incineration or final disposal options. Therefore, addressing plastics leakage continues to be of relevance and supports the shortcomings of the CE to reduce plastics wastes generation. Moreover, eliminating leakage of plastics into environmental compartments continues to be a challenge and therefore targeting accumulating MPP cannot be disregarded. Furthermore, a substantial amount of plastics wastes have already leaked into the environment during the past decades, which highlights the need for cleanup efforts and developing legal remedies to address this plastics legacy issue. Therefore, a comprehensive legal response to protect the oceans from MPP necessitates a versatile set of measures with regards to all three sub-problems to confront the problem as a whole.

To need to curb the current rates of plastics leakage and reduce existing MPP and plastics wastes generation are clearly evident and bolstered by solid scientific knowledge on these issues. First estimate figures for global reduction targets are already available. Moreover, increasing understanding of practices from the field of the CE feeds into shifting the paradigm of a linear production and consumption where the global plastics problem has its root causes. Means to take action at the international level have been elaborated upon and it has been shown that there is not a lack of options on how to regulate and coordinate further international legal action. Through an analysis of the current international legal framework and complementary legal measures applicable to the global plastics problem it has also been shown that it needs to be addressed with a new binding international agreement. The question that remains to be answered is no longer how States should respond to the global plastics problem through international legal mechanisms, but rather whether they will have the political ambition to do so.

A FRAMEWORK AND ELEMENTS OF AN INTERNATIONAL LEGAL RESPONSE TO THE GLOBAL PLASTICS PROBLEM			
The sub-problem	Plastics leakage to the marine environment	MPP	Extensive plastics wastes generation
Relevant scientific factors for the sub-problem	volumes of plastics leakage, main sources, source categories and pathways of plastics leakage, trends regarding international movements of plastics wastes	mass balance of MPP, mass balance of chemicals, accumulation, distribution and behavior of MPP, ecological impacts (entanglement, ingestion, rafting, habitat damage), chemical hazard, navigational hazard, economic losses (shipping, fisheries, tourism), a possible threat of MPP on human health	differences between the linear and circular economy, international trade links to the CE, global plastics production trajectories, markets for virgin and secondary raw materials and products, disposal and recycling rates, raw materials, material properties, the most common polluting types and usage sectors
Activity type	downstream activities	downstream activities	upstream activities
Objective	elimination of plastics leakage	reduction of MPP to the extent practicable, particularly in hotspots in developing countries	increasing CE practices regarding plastics production and consumption in a global setting to reduce plastics wastes generation
Recommendations for the operationalization of the principles of IL and IEL	-reinforce the due diligence obligations of States under the LOSC Part XII, the no-harm rule and the prevention principle in relation to protecting the oceans from plastics leakage -provide mechanisms regarding technical and financial assistance for developing States in accordance with the CBDR	-establish that the global plastics problem is a common concern for the humankind -highlight that the rules of State responsibility and the Principles on Allocation of Loss can be applied in the context of MPP -find the most fit-for-purpose ways to apply the PPP (such as EPR) and critically assess the practicability of developing a liability and compensation mechanism for MPP	-promote the interpretation that the CE is becoming BEP to protect the oceans from irreversible MPP -promote continuous review of chemical hazards in plastics in accordance with the precautionary principle and push for a wider implementation of the GHS -promote the interpretation that the precautionary principle also includes alternatives assessments regarding production and that CE practices are an apt alternative to a linear plastics industry -promote CE practices as way to protect the oceans for future generations and to apply the intergenerational equity principle
Applicable and functioning elements of IL and international technical standards	The LOSC as an overarching framework, the MARPOL Annex V on vessel-source plastics leakage, the London Convention and Protocol on dumping of plastics wastes, general obligations of the UNWC and UNECE on the river-ocean interface,	ARSIWA, the Draft Principles on Allocation of Loss	The Basel Convention and its Plastic Amendments, the Stockholm Convention, the GHS, the ISO standards relevant for promoting CE, UNEA Resolutions promoting the CE

	the Espoo Convention and Protocol on transboundary EIAs, the GPA, the GPML, the Honolulu Strategy and the general due diligence obligations to protect the marine environment		
Recommendations to improve current elements of IL	-reinforce compliance with existing instruments -reinforce and clarify the content of due diligence obligations regarding land-based plastics leakage -use existing instruments and institutions to address plastics leakage from rivers to oceans (RSOs, RBOS, the GPML)	-encourage national implementation of the Draft Principles on Allocation of Loss -stress that international legal remedies for damage from MPP are available even though challenges remain in their application to this issue	-extend the scope of the Plastic Amendments of the Basel Convention to cover VRPs -to the extent possible, use the Stockholm Convention to regulate most hazardous chemicals used in plastics production -Amend the HS Convention and Nomenclature to better address CE practices
Recommendations of elements to add to IL	-initiate a negotiation process toward a new treaty on plastics that targets elimination of plastics leakage	-establish a new global fund the main function of which is to finance cleanups and restoration in MPP hotspots	-facilitate the links between a global CE of plastics and international trade by harmonizing crucial legal definitions and customs classifications (relating to waste, end-of-waste, secondary raw materials and recycling, and VRPs) -harmonize international technical standardization to promote a global CE of plastics and strengthen the market for secondary plastics, for example through the ISO -Develop a soft law instrument that guides States in implementing EPR in a global setting -initiate a negotiation process toward a new treaty on plastics that targets extensive plastics wastes generation and explicitly promotes a global CE of plastics

Fig. 16 The Conclusions Table

LIST OF FIGURES AND TABLES

BIBLIOGRAPHY

Conventions and Protocols

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 (Adopted 22 June 2012) ('Abidjan Protocol')

Additional Protocol to the Abidjan Convention on the Integrated Coastal Zone Management (Adopted 31 March 2017) ('ICZM Protocol')

Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin (Adopted and entered into force 5 April 1995) 2069 UNTS 3 ('Mekong River Protection Agreement')

Agreement on Technical Barriers to Trade (Adopted 15 April 1994, entered into force 1 January 1995) 1868 UNTS 120 ('TBT Agreement')

Agreement on the Establishment of the Zambezi Watercourse Commission (Adopted 13 July 2004, entered into force 19 June 2011) ('ZAMCOM Agreement')

Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (Adopted 4 August 1995, entered into force 11 December 2001) 2167 UNTS 3 ('Fish Stocks Agreement')

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Adopted 22 March 1989, entered into force May 5 1992) 1673 UNTS 57 ('Basel Convention')

Brussels International Convention on Civil Liability for Oil Pollution Damage (Adopted 29 November 1969, entered into force 19 June 1975) 973 UNTS 3

Brussels International Convention on the Establishment of an International Fund for Compensation of Oil Pollution Damage (Adopted 18 December 1971, entered into force 16 October 1978) 1110 UNTS 57

Cartagena Protocol on Biosafety to the Convention on Biological Diversity (adopted 29 January 2000, entered into force 11 September 2003) 2226 UNTS 208

Convention on Cooperation for the Protection and Sustainable Use of the Danube River (Adopted 29 June 1994, entered into force 22 October 1998) CELEX 21997A1212(03)

Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region (Adopted 21 June 1985, entered into force 30 May 1996) ('Nairobi Convention')

Convention for the Protection of the Rhine (adopted 12 April 1999, entered into force 1 January 2003) CELEX 22000A1116(01)

Convention on Environmental Impact Assessment in a Transboundary Context (Adopted 25 February 1991, entered into force 10 September 1997) 1989 UNTS 309 ('Espoo Convention')

Convention on Supplementary Compensation for Nuclear Damage (adopted 12 September 1997, entered into force 15 April 2015) 36 ILM 1473

Convention on the Law of the Non-Navigational Uses of International Watercourses (Adopted 21 May 1997, entered into force 17 August 2014) 2999 UNTS ('UNWC')

Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Adopted 13 November 1972, entered into force 30 August 1975) 1046 UNTS 120 ('London Convention')

Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Adopted 17 March 1992, entered into force 6 October 1996) 1936 UNTS 269 ('UNECE Water Convention')

HS Nomenclature (2017 Edition)

International Convention on the Harmonized Commodity Description and Coding System (Adopted 14 June 1983, entered into force 1 January 1988) 1503 UNTS 3 ('HS Convention')

International Convention for the Prevention of Pollution from Ships (Adopted 2 November 1973) 1340 UNTS 184, as amended by Protocol Relating to the 1973 International Convention for the Prevention of Pollution from Ships (Adopted 17 February 1978, entered into force 2 October 1983) 1340 UNTS 61 ('MARPOL Convention')

Minamata Convention on Mercury (Adopted 10 October 2013, entered into force 16 August 2017) ('Minamata Convention')

Montreal Protocol on Substances that Deplete the Ozone Layer (Adopted 16 September, entered into force 1 January 1989) ATS 18 ('Montreal Protocol)

Nagoya-Kuala Lumpur Supplementary Liability Protocol on Liability and Redress to the Cartagena Protocol on Biosafety (Adopted 15 October 2015, entered into force 5 March 2018) Conference of Parties, Decision BS-V/11

Nairobi International Convention on the Removal of Wrecks (Adopted 18 May 2007, entered into force 14 April 2015) 46 ILM 694.

Niger Basin Water Charter (Adopted 30 April 2008, entered into force 19 July 2010) ('Water Charter')

OECD Agreement Supplementary to the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy (Adopted 31 January 1963, entered into force 4 December 1974) 1041 UNTS 358 (as amended by 1964 and 1982 Protocols)

Paris Convention on Third Party Liability in the Field of Nuclear Energy (Adopted 29 July 1960, entered into force 1 April 1968) 956 UNTS 251 (as amended by 1964 and 1982 Protocols)

Protocol of 2003 to the international Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (Adopted 16 May 2003, entered into force 3 March 2005) IMO Doc: LEG7CONF.14/20

Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and Their Disposal (adopted 10 December 1999) UN Doc UNEP/CHW.1/WG/1/9/2 ('Basel Protocol')

Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Adopted 7 November 1996, entered into force 24 March 2006) 36 ILM 1 ('London Protocol')

Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context (adopted 21 May 2003, entered into force 11 July 2010) 2685 UNTS 140 ('Espoo Protocol')

Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage (Adopted 12 September 1997, entered into force 4 October 2003) 36 ILM 1454

Revised 2017 Compliance Procedures and Mechanisms Pursuant to Article 11 of the 1996 Protocol to the London Convention, 1972 (Adopted in 2007, revised in 2017) LC 39/16, Annex 5.

Revised Convention Creating the Niger Basin Authority (Adopted 27 October 1987)

Statute of the International Court of Justice (Adopted 26 June 1945, entered into force 24 October 1945) 33 UNTS 933 ('ICJ Statute')

Stockholm Convention on Persistent Organic Pollutants (Adopted 22 May 2001, entered into force 15 May 2004) 2256 UNTS 119 ('Stockholm Convention')

United Nations Convention on the Law of the Sea (Adopted 10 December 1982, entered into force 16 November 1994) 1833 UNTS 397 ('LOSC')

Vienna Convention on the Law of Treaties (Adopted 23 May 1969, entered into force 27 January 1980) 1155 UNTS 331 ('VCLT')

1963 Vienna Convention IAEA Vienna Convention on Civil Liability for Nuclear Damage (Adopted 21 May 1963, entered into force 12 November 1977) 1063 UNTS 251

EU Directives

Council Directive 2008/98/EC of 19 November 2008 on Waste and Repealing Certain Directives [2008] OJ L 312.

Council Directive 2008/56/EC of 17 June 2008 Establishing a Framework for Community Action in the Field of Marine Environmental Policy [2008] OJ L164.

Programmes, Plans, Strategies, MoUs and Guidelines

CICOS, 'Schéma Directeur d'Aménagement et de Gestion des Eaux de la CICOS (SDAGE): Programme de Mesures 2016-2020' (CICOS 2016)

COBSEA/UNEP, 'The Regional Programme of Action for the Protection of the Marine Environment of the East Asian Seas from the Effects of Land-based Activities' (2000)

COBSEA/UNEP, 'Marine Litter in the East Asian Seas Region' (2008)

EC, 'Annexes to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A European Strategy for Plastics in a Circular Economy' (2018) COM(2018) 28 Final.

EC, 'A New Circular Economy Action Plan for a Cleaner and More Competitive Europe' (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM(2020) 98 Final.

FAO, 'Voluntary Guidelines for the Marking of Fishing Gear' (2018) COFI/2018/Inf.30.

The Global Fund to Fight AIDS, Tuberculosis and Malaria, 'The Framework Document' (2001)

The Global Fund, 'Country Coordinating Mechanism Policy Including Principles and Requirements' (2018)

GPML, 'Purpose, Function and Organization' (2018) Framework Document

IMO, 'Revised Consolidated Format for Reporting Alleged Inadequacy of Port Reception Facilities' (1998) MEPC/Circ.349

IMO, 'Port Reception Facilities – How to Do It' (2016)

IMO, 'Strategic Plan for the London Protocol and the London Convention' (2017)

IMO, 'Consolidated Guidance for Port Reception Facility Providers and Users' (Adopted 1 March 2018) MEPC.1/Circ.834/Rev.1

Intergovernmental Conference to Adopt a Global Programme of Action for the Protection of the Marine Environment from Land- based Activities, Washington, D.C., (23 October-3 November 1995), Global Programme of Action for the Protection of the Marine Environment from Land-based Sources (3 November 1995): Selected Documents and Proceedings.

Memorandum of Understanding between the International Commission for the Protection of the Black Sea and the International Commission for the Protection of the Danube River on Common Strategic Goals (2001)

NBI, 'Environmental and Social Policy' (2013)

NOWPAP, 'Regional Action Plan on Marine Litter' (2008)

OSPAR Commission, 'Marine Litter Regional Action Plan' (2014)

A Tanzi et al., 'Guide to Implementing the Water Convention' (UNECE 2013) ECE/MP.WAT/39

UNEP, 'Strategic Approach to International Chemicals Management: SAICM Texts and Resolutions of the International Conference on Chemicals Management' (2016)

UNEP, 'The Honolulu Strategy: A Global Framework for Prevention and Management of Marine Debris' (2016) ('Honolulu Strategy')

UNEP/Intergovernmental Conference to Adopt a Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, 'Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities' (Adopted 5 December 1995) UN Doc UNEP(OCA)/LBA/IG.2/7 ('GPA')

UNEP/Intergovernmental Review Meeting on the Implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, 'Report of the Third Session of the Intergovernmental Review Meeting on the Implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities' (26 January 2012) UN Doc UNEP/GPA/IGR.3/6.

UNEP, 'Regional Plan for the Marine Litter Management in the Mediterranean' UN Doc UNEP(DEPI)/MED WG.379/5 (2013)

UNEP/Nairobi Convention Secretariat, 'Strategic Action Programme for the Protection of the Coastal and Marine Environment of the Western Indian Ocean from Land-based Sources and Activities' (2009)

UN, 'Plan of Implementation of the World Summit on Sustainable Development' in Report of the World Summit on Sustainable Development (2002) UN Doc A/CONF.199/20.

DECLARATIONS

Fortieth Regular Meeting of the Conference of Heads of Government of the Caribbean Community (CARICOM), 'St Johns Declaration' (Adopted 5 July 2019) <https://www.marketscreener.com/news/latest/CARICOM-Caribbean-Community-COMMUNIQUE-ISSUED-AT-THE-CONCLUSION-OF-THE-FORTIETH-REGULAR-MEETING-OF--28862544/>

Nordic Council of Ministers for the Environment and Climate, 'The Nordic Ministerial Declaration on the Need for a New Global Agreement to Prevent Marine Plastic Litter' (28 October 2020) <https://www.norden.org/en/declaration/nordic-ministerial-declaration-need-new-global-agreement-prevent-marine-plastic-litter>

The United Nations Conference on Human Environment, 'Declaration of the United Nations Conference on the Human Environment' (Adopted 16 June 1972) UN Doc A/CONF.48/14/Rev.1 ('Stockholm Declaration')

The United Nations Conference on Environment and Development, 'Rio Declaration on Environment and Development' (Adopted 14 June 1992) UN Doc A/CONF.151/26 (Vol I) ('Rio Declaration')

The United Nations Conference on Environment and Development, 'Agenda 21' (Adopted 14 June 1992) UN Doc A/CONF.151/26/Rev.1 (Vol I) ('Agenda 21')

The United Nations Conference to Support the Implementation of Sustainable Development Goal 14: Conserve and Sustainably Use the Oceans, Seas and Marine Resources for Sustainable Development, 'Our Ocean, Our Future: Call for Action' (Adopted 6 July 2017) UN Doc A/RES/72/312.

WCED, 'Our Common Future' (1987) UN Doc A/42/427. ('Brundtland Report')

Resolutions

IMO, Res MEPC.201(62) 'Amendments to the Annex of the Protocol of the 1978 Relating to the International Convention for the Prevention of Pollution from Ships, 1973 (Revised MARPOL Annex V)' (Adopted 15 July 2011, entered into force 1 January 2013)

IMO, Resolution A.1067(28) 'Framework and Procedures for the IMO Member State Audit Scheme' (Adopted 5 December 2013, entered into force 1 January 2016) A28/RES.1067.

IMO, Res MEPC.246(66) 'Amendments to the Annex of the Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships, 1973 (Amendments to MARPOL Annexes I, II, III, IV and V to Make the Use of the III Code Mandatory) (Adopted 4 April 2014, entered into force 1 January 2016)

IMO, Res MEPC.83(44) 'Guidelines for Ensuring the Adequacy of Port Waste Reception Facilities' (Adopted 13 March 2000) MEPC 44/20

IMO, Res MEPC.295(71) '2017 Guidelines for the Implementation of MARPOL Annex V' (Adopted 7 July 2017) MEPC 71/17/Add.1

IMO, Res MEPC.310(73) 'Action Plan to Address Marine Plastic Litter from Ships' (Adopted 26 October 2018) MEPC 73/19/Add.1

UNGA Res 3071 (XXVIII) 'Report of the International Law Commission' (30 November 1973) UN Doc A/RES/3071(XXVIII)

UNGA Res 52/156 'Report of the International Law Commission on the Work of Its Forty-Ninth Session' (15 December 1997) UN Doc A/RES/52/156

UNGA Res 799 (VIII) 'Request for the Codification of the Principles of International Law Governing State Responsibility' (7 December 1953) UN Doc A/RES/799(VIII)

UNGA Res 56/82 'Report of the International Law Commission on the Work of Its Fifty-Third Session' (12 December 2001) UN Doc A/RES/65/82

UNGA Res 60/30 'Oceans and the Law of the Sea' (29 November 2005) UN Doc A/RES/60/30.

UNGA Res 61/63 'Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities' (4 December 2006) UN Doc A/RES/61/36

UNGA Res 70/1 'Transforming Our World: the 2030 Agenda for Sustainable Development' (25 September 2015) UN Doc A/RES/70/1.

UNEA Res 2/8 'Sustainable Consumption and Production' (23-27 May 2016) UN Doc UNEP/EA.2/Res.8.

UNEA 2/11 'Marine Plastic Litter and Microplastics' (23-27 May 2016) UN Doc UNEP/EA.2/Res.11

UNEA Res 3/7 'Marine Litter and Microplastics' (4-6 December 2017) UN Doc UNEP/EA.3/Res.7

UNEA Res. 4/1 'Innovative Pathways to Achieve Sustainable Consumption' (11-15 March 2019) UN Doc UNEP/EA.4/Res.1.

UNEA Res 4/4 'Addressing Environmental Challenges through Sustainable Business Practices' (11-15 March 2019) UN Doc UNEP/EA.4/Res.4.

UNEA Res 4/6 'Marine Plastic Litter and Microplastics' (11-15 March 2019) UN Doc UNEP/EA.4/Res.6

UNEA Res 4/7 'Environmentally Sound Management of Waste' (11-15 March 2019) UN Doc UNEP/EA.4/Res.7.

UNEA Res. 4/8 'Sound Management of Chemicals and Waste' (11-15 March 2019) UN Doc UNEP/EA.4/Res.8.

UNEA Res 4/9 'Addressing Single-use Plastic Products Production' (11-15 March 2019) UN Doc UNEP/EA.4/Res.9

Decisions

Commission Decision (EU) 2017/848 of 17 May 2017 Laying Down Criteria and Methodological Standards on Good Environmental Status of Marine Waters and Specifications and Standardised Methods for Monitoring and Assessment, and Repealing Decision 2010/477/EU [2017] OJ L125.

Fourteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'BC-14/12: Amendments to Annexes II, VIII and IX to the Basel Convention' (10 May 2019) UNEP/CHW.14/CRP.40

Thirteenth Meeting of the Conference of the Parties to the Convention to Biological Diversity, 'Decision Adopted by the Conference of the Parties to the Convention on Biological Diversity: XIII/10. Addressing Impacts of Marine Debris and Anthropogenic Underwater Noise on Marine and Coastal Biodiversity' (10 December 2016) CDB/COP/DEC/XIII/10.

Twenty-First Meeting of the Parties on Substances that Deplete the Ozone Layer, 'Decision XXI/6: Global Laboratory Use Exemption' (2009)

Twenty-Eighth Meeting of the Parties on Substances that Deplete the Ozone Layer, 'Decision XXVIII/4: Establishment of Regular Consultations on Safety Standards' (2016)

Meeting Reports and Other Documents

Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics, 'Chair's Summary for the Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics' (13 November 2020)

African Ministerial Conference on the Environment (AMCEN), 'Report of the Ministerial Segment' (14-15 November 2019) UN Doc AMCEN/17/9

First Meeting of the Transitional Working Group to establish a Global Fund to fight AIDS, Tuberculosis, and Malaria, 'Final Report' (11-12 October 2001)

Fourteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'Explanatory Note from the Government of Norway on Its Proposals to Amend Annexes II, VIII and IX to the Basel Convention' (10 May 2019) UNEP/CHW.14/INF/18.

Intergovernmental Negotiating Committee for an International Legally Binding Instrument for Implementing Interactional Action on Certain Persistent Pollutants, 'Workshop on Liability and Redress Held in the Context of the Stockholm Convention on Persistent Organic Pollutants in Vienna from 19 to 21 September 2002: Report of the Co-Chairs' (2003) UN Doc UNEP/POPS/INC.7/INF/6.

Ninth Conference of the Contracting Parties to the Amended Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Western Indian Ocean Region, 'Proposed Work Programme for the Period 2018–2022 for the Implementation of the Nairobi Convention' (31 August 2018) UN Doc UNEP/EAF/CP.9/2/Rev.1.

Second Bureau Meeting of the Contracting Parties to the Convention on Cooperation for the Protection, Management and Development of the Marine Environment and Coastal Areas of the Atlantic Coast of the West, Central and Southern African Region (Abidjan Convention), 'List of Draft Decisions under Consideration' (23 June 2020) UN Doc ABC-WACAF/Bureau Meeting.2/COP12/Inf.3.

Second Meeting of the Transitional Working Group to establish a Global Fund to fight AIDS, Tuberculosis, and Malaria, 'Final Report Draft' (22-24 November 2001)

Thirty-Eight Consultative Meeting of Contracting Parties to the London Convention & Eleventh Meeting of Contracting Parties to the London Protocol, 'Report of the Thirty-Eight Consultative Meeting and Eleventh Meeting of Contracting Parties' (18 October 2016) LC 38/16. Annex 8.

Thirteenth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'Follow-Up to the Indonesian-Swiss Country-Led Initiative to Improve the Effectiveness of the Basel Convention' (2017) UNEP/CHW.13/4/Add.2.

Twelfth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 'Technical Guidelines on Transboundary Movements of Electrical and Electronic Waste and Used Electrical and Electronic Equipment, in Particular Regarding the Distinction between Waste and Non-Waste under the Basel Convention, Appendix I: Glossary of Terms' (2015) UNEP/CHW.12/5/Add.1/Rev.1. 18.

Twelfth Meeting of the Contracting Parties to the Convention for Cooperation in the Protection, Management and Development of the Marine and Coastal Environment of the Atlantic Coast of the

West, Central and Southern Africa Region, 'Draft report of the Twelfth Meeting of the Contracting Parties to the Convention for Cooperation in the Protection, Management and Development of the Marine and Coastal Environment of the Atlantic Coast of the West, Central and Southern Africa Region: Draft Decision [CP.12/3]: Amendment of the Text of the Abidjan Convention.' (27–31 March 2017) UN Doc UNEP/ABC-WACAF/COP.12/7.

UNGA 44th Session, 'Law of the Sea: Protection and Preservation of the Marine Environment' (1989) Report of the Secretary General. UN Doc A/44/461.

JUDICIAL DECISIONS

Arbitration regarding the Iron Rhine Railway (Belgium v The Netherlands) (Award) [2005] PCA Case No 2003-02

Case Concerning Armed Activities on the Territory of the Congo (The Democratic Republic of the Congo v. Uganda) (Judgment) [2005] ICJ Reports 168

Case Concerning the Barcelona Traction, Light and Power Company, Limited (Belgium v Spain) (Judgment) [1970] ICJ Reports 3

Case Concerning Certain Phosphate Lands in Nauru (Nauru v Australia) (Preliminary Objections: Judgment) [1992] ICJ Reports 240

The Case Concerning the Factory at Chorzów (Germany v Poland) (Judgment) [1927] PCIJ Series A No 9

Case Concerning the Gabcikovo-Nagymaros Project (Hungary v Slovakia) (Judgment) [1997] ICJ Reports 1997

Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. *Nicaragua) and Construction of a Road in Costa Rica along the San Juan River (Nicaragua* v. *Costa Rica)* (Judgment) [2015] ICJ Reports 2015

The Corfu Channel Case (UK v Albania) (Merits) [1949] ICJ Rep 1949

The Islands of Palmas Case (US v The Netherlands) (Award) [1928] PCA Case No 1925-01. XI RIAA.

Lake Lanoux Arbitration (France v Spain) (Award) [1957] 12 RIAA 281

Legal Consequences for States of the Continued Presence of South Africa in Namibia (South West Africa) Nothwithstanding Security Council Resolution 276 (1970) (Advisory Opinion) [1971] ICJ Reports 1971

Legality of the Threat or Use of Nuclear Weapons (Advisory Opinion) [1996] ICJ Reports 1996.

The MOX Plant Case (Ireland v United Kingdom) (Provisional Measures, Order of 3 December 2001) [2001] ITLOS Reports 2001

Phosphates in Morocco (Italy v France) (Preliminary Objections) PCIJ Series A/B No 74

Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay) (Judgment) [2010] ICJ Reports 2010.

Case Concerning the Difference between New Zealand and France Concerning the Interpretation or Application of Two Agreements, Concluded on 9 July 1986 between the Two States and Which Related to the Problems Arising from the Rainbow Warrior Affair (New Zealand v France) [1990] XX UNRIAA

Responsibilities and Obligations of States with respect to Activities in the Area (Advisory Opinion) [2011] ITLOS Reports 2011

The South China Sea Arbitration (The Republic of the Philippines v People's Republic of China) (Award) [2016] PCA Case No 2013–19.

Trail Smelter Arbitration (United States v Canada) (Award of 11 March 1941) III UNRIAA

WTO, *Russian Federation – Recycling Fee on Motor Vehicles*, DS462-DS463. https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds462_e.htm

International Technical Standards

Globally Harmonized System of Classification and Labelling Chemicals, Eight Revised Edition (2019) UN Doc ST/SG/AC.10/30/Rev.8. ('GHS')

ISO 14031:2013 Environmental Management – Environmental Performance Evaluation - Guidelines

ISO 14040:2006 Environmental Management – Life Cycle Assessment – Principles and Framework

ISO 14044:2006 Environmental Management – Life Cycle Assessment – Requirements and Guidelines

ISO 14006:2011 Environmental Management Systems -Guidelines for Incorporating Ecodesign

ISO 20400:2017 Sustainable Procurement - Guidance

ISO 15270:2008 Plastics – Guidelines for the Recovery and Recycling of Plastic Waste

International Law Commission Documents

R Ago, 'Second Report on State Responsibility: The Origin of International Responsibility' Yearbook of the International Law Commission (Vol II, 1970)

ILC, 'Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries' (2001) Yearbook of the International law Commission (Vol II, Part Two)

ILC, 'Draft Articles on Prevention of Transboundary Harm from Hazardous Activities, with Commentaries' (2001) Yearbook of the International Law Commission (Vol II, Part Two)

ILC, 'Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Activities, with Commentaries' (2006) Yearbook of the International Law Commission (Vol II, Part Two)

ILC 'Yearbook of the International Law Commission 1994, Volume II Part 2: Report of the Commission to the General Assembly on the Work of Its Forty-Sixth Session' (1994) UN Doc A/CN.4/ SER.A/1994/Add.1

ILC, 'Fragmentation of International Law: Difficulties Arising from the Diversification and Expansion of International Law' (Report of the Study Group of the International Law Commission, 2006) UN Doc A/CN.4/L.682

ILC, 'Report of the International Law Commission on the Work of Its Fifty-Third Session' (23 April – 1 June and 2 July -10 August 2001) UN Doc A/56/10

ILC, 'Report of the International Law Commission: Fifty-Eight Session' (1 May-9 June and 3 July-11 August 2006) UN Doc A/61/10.

Books and Book Chapters

E Adler and V Pouliot, *International Practices* (Cambridge University Press 2011)

F Ahmadov, *The Right of Actio Popularis before International Courts and Tribunals* (Brill 2018)

AL Andrady, 'Persistence of Plastic Litter in the Oceans' in M Bergmann et al. (eds) *Marine Anthropogenic Litter* (Springer 2015)

G Argüello, 'Regime Interaction and GAIRS' in PK Mukherjee et al. (eds) *Maritime Law in Motion* (Springer 2020) 8 WMU Studies in Maritime Affairs.

J Barboza, *The Environment, Risk and Liability in International Law* (Brill 2011)

RA Barnes, 'Flag States' in D Rothwell et al. (eds) *The Oxford Handbook of the Law of the Sea* (Oxford University Press 2015)

A Barrios Villarreal, *International Standardization and the Agreement on Technical Barriers to Trade* (Cambridge University Press 2018)

D Barstow Magraw and LD Hawke, 'Sustainable Development' in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008)

S Besson and J d'Aspremont, 'The Sources of International Law: An Introduction' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017)

U Beyerlin and T Marauhn, *International Environmental Law* (Hart Publishing 2011)

P Birnie et al., *International Law and the Environment* (3rd edn, Oxford University Press 2009)

AK Biswas, 'Management of Ganges–Brahmaputra–Meghna System: Way Forward' in O Varis et al. (eds) *Management of Transboundary Rivers and Lakes* (Springer 2008)

D Bodansky, *The Art and Craft of International Environmental Law* (Harvard University Press 2010)

S Boehmer-Christiansen, 'The Precautionary Principle in Germany-Enabling Government' in T O'Riordan and J Cameron (eds) *Interpreting on the Precautionary Principle* (EarthScan 1994)

KE Boulding, 'The Economics of the Coming Spaceship Earth' in H Jarrett (ed) *Environmental Quality in a Growing Economy* (Johns Hopkins University Press 1966) http://arachnid.biosci.utexas.edu/courses/THOC/Readings/Boulding_SpaceshipEarth.pdf

AE Boyle, 'Remedying Harm to International Common Spaces and Resources: Compensation and Other Approaches' in P Wetterstein (ed) *Harm to the Environment: the Right to Compensation and the Assessment of Damages* (Oxford University Press 1997)

AE Boyle, 'Reparation for Environmental Damage in International Law: Some Preliminary Problems' in M Bowman and AE Boyle (eds) *Environmental Damage in International and Comparative Law: Problems of Definition and Valuation* (Oxford University Press 2002)

M Braungart and B McDonough, 'The Next industrial Revolution' in M Charter and U Tischner (eds) *Sustainable Solutions: Developing Products and Services for the Future* (Greenleaf Publishing Limited 2001)

E Brown Weiss, 'Intergenerational Equity: a Legal Framework for Global Environmental Change' in E Brown Weiss (ed) *Environmental Change and International Law: New Challenges and Dimensions* (United Nations University Press 1992) http://intergenlaw.com/wp-content/uploads/2015/02/Brown-Weiss-Intergenerational-equity-UN2.pdf

E Brown Weiss, 'Implementing Intergenerational Equity' in M Fitzmaurice et al. (eds) *Research Handbook on International Environmental Law* (Edward Elgar Publishing 2010)

I Brownlie, *System of the Law of Nations: State Responsibility, Part I* (Oxford University Press 1983)

J Brunnée, 'Sources of International Environmental Law: Interactional Law' in S Besson and J d'Aspremont (eds) *The Oxford Handbook of the Sources of International Law* (Oxford University Press 2017)

R Churchill, 'The LOSC Regime for the Protection of the Marine Environment – Fit for the Twenty-First Century?' in R Rayfuse (ed) *Research Handbook on International Marine Environmental Law* (Edward Elgar Publishing Limited 2015)

J Crawford, *The State Responsibility: The General Part* (Cambridge University Press 2013)

R Cryer et al., *Research Methodologies in EU and International Law* (Hart Publishing 2011)

D Czybulka, 'Article 192 General Obligation' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017)

D Czybulka, 'Article 194: Measures to Prevent, Reduce and Control Pollution of the Marine Environment' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017)

H Davis, 'Life & Death in the Anthropocene: A Short History of Plastics' in H Davis and E Turpin (eds) *Art in the Anthropocene: Encounters Among Aesthetics, Politics, Environments and Epistemologies* (Open Humanities Press 2015)

L-A Duvic-Paoli, *The Prevention Principle in International Environmental Law* (Cambridge University Press 2018)

Environment Canada, University of Joensuu and UNEP, *Multilateral Environmental Agreement: Negotiator's Handbook* (2nd Edition 2007) University of Joensuu – UNEP Course Series 5.

AX Fellmeth and M Horwitz, *Guide to Latin in International Law* (Oxford University Press 2009)

M Fitzmaurice, 'Whaling and Inter- and Intra-Generational Equity' in M Bowman et al. (eds) *Research Handbook on Biodiversity and Law* (Edward Elgar Publishing 2016)

M Fitzmaurice, 'International Responsibility and Liability' in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008)

D Freestone and M Salman, 'Ocean and Freshwater Resources' in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008)

S Freinkel, *Plastic: A Toxic Love Story* (Houghton Mifflin Harcourt Publishing Company 2011)

J Friedrich, *International Environmental "Soft Law": The Functions and Limits of Nonbinding Instruments in International Environmental Governance and Law* (Springer 2013) Beiträge zum ausländischen öffentlichen Recht und Völkerrecht 247.

L Fuller, *The Morality of Law* (Yale University Press 1969)

D Gallaud and B Laperche, 'Building Region-Based Sustainable Development: Vocabulary and Tools' in *Circular Economy, Industrial Ecology and Short Supply Chain* (ISTE 2016) Volume 4.

S George, 'Plastics We Cannot Live Without' in TM Letcher (ed) *Plastic Waste and Recycling: Environmental Impact, Societal Issues, Prevention and Solutions* (Academic Press 2020)

N Georgescu-Roegen, *The Entropy Law and the Economic Process* (Harvard University Press 1971)

R Geyer, 'A Brief History of Plastics' in M Streit-Bianchi et al. (eds) *Mare Plasticum – The Plastics Sea: Combatting Plastic Pollution through Science and Art* (Springer 2020)

N Hanley, 'The Economic Value of Environmental Damage' in M Bowman and AE Boyle (eds) *Environmental Damage in International and Comparative Law: Problems of Definition and Valuation* (Oxford University Press 2002)

P Harremoes et al., *The Precautionary Principle in the 20th Century: Late Lessons from Early Warnings* (Taylor & Francis Group 2002)

J Harrison, *Saving the Oceans Through Law: The International Legal Framework for the Protection of the Marine Environment* (Oxford University Press 2017)

D Hassan, *Protecting the Marine Environment from Land-Based Sources of Pollution: Towards Effective International Cooperation* (Ashgate 2006)

E Hey, *Advanced Introduction to International Environmental Law* (Edward Elgar Publishing 2016)

M Hinteregger, 'Tort Law as an instrument for the Prevention and Remediation of Catastrophic Harm' in A Herwig and M Simoncini (eds) *Law and the Management of Disasters: The Challenge of Resilience* (Routledge 2017)

S Hobe, 'Evolution of the Principle on Permanent Sovereignty Over Natural Resources: From Soft Law to a Customary Law Principle?' in M Bungenberg and S Hobe (eds), *Permanent Sovereignty over Natural Resources* (Springer International Publishing Switzerland 2015)

RL Johnstone, *Offshore Oil and Gas Development in the Arctic under International Law: Risk and Responsibility* (Koninklijke Brill NV 2015)

J Kammerhofer, 'International Legal Positivism' in A Orford and F Hoffmann (eds) *The Oxford Handbook of the Theory of International Law* (Oxford University Press 2016)

T Kiessling et al., 'Marine Litter as Habitat and Dispersal Vector' in M Bergmann et al. (eds) *Anthropogenic Marine Litter* (Springer 2015)

AC Kiss and D Shelton, *Guide to International Environmental Law* (Martinus Nijhoff Publishers 2007)

T Koivurova, 'Due Diligence' in *Max Planck Encyclopedia of Public International Law* (2010)

T Kuhn, *The Structure of Scientific Revolutions* (2nd edn, The University of Chicago Press 1962)

S Kühn et al., 'Deletorius Effetcs of Litter on Marine Life' in M Bergmann et al. (eds) *Marine Anthropogenic Litter* (Springer 2015)

X Li, *Industrial Ecology and Industry Symbiosis for Environmental Sustainability: Definitions, Frameworks, and Applications* (Palgrave Pivot 2018)

A Lusher, 'Microplastics in the Marine Environment: Distribution, Interactions and Effects' in M Bergmann et al. (eds) *Anthropogenic Marine Litter* (Springer 2015)

AR Maggio, *Environmental Policy, Non-Product Related Process and Production Methods and the Law of the World Trade Organization* (Springer 2017)

E Maitre-Ekern, 'The Choice of Regulatory Instruments for a Circular Economy' in K Mathis and BR Huber (eds) *Environmental Law and Economics* (Springer 2017) Economic Analysis of Law in European Legal Scholarship 4.

JNK Mansell, *Flag State Responsibility: Historical Development and Contemporary Issues* (Springer 2009)

N Mileva and M Fortuna, 'Environmental Protection as an Object of and Tool for Evolutionary Interpretation' in G Abi-Saab et al. (eds) *Evolutionary Interpretation and International Law* (Hart Publishing 2019)

J Morrison and N Roht-Arriaza, 'Private and Quasi-Private Standard Setting' in D Bodansky et al. (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008)

EJ Molenaar, 'Port and Coastal States' in D Rothwell et al. (eds) *The Oxford Handbook of the Law of the Sea* (Oxford University Press 2015)

National Academy of Sciences et al., *Facilitating Interdisciplinary Research* (The National Academies Press 2005)

S Newman et al., 'The Economics of Marine Litter in M Bergmann et al. (eds) *Marine Anthropogenic Litter* (Springer 2015)

M Niaounakis, *Management of Marine Plastic Debris: Prevention, Recycling and Waste Management* (William Andrew Applied Science Publishers 2017)

L van Oers et al., 'Addtives in the Plastics Industry' in B Bilitewski et al. (eds) *Global Risk-Based Management of Chemical Additives I: Production, Usage and Environmental Occurrence* (Springer 2012) 18 The Handbook of Environmental Chemistry.

P Okowa, 'Responsibility for Environmental Damage' in M Fitzmaurice et al. (eds), *The Research Handbook on International Environmental Law* (Edward Elgar Publishing 2010)

A Pellet and D Müller, 'Competence of the Court, Article 38' in A Zimmermann et al. (eds) *The Statute of the International Court of Justice: A Commentary* (3rd Edn, Oxford University Press 2019)

N Pervushina, 'Water Management and Use in the Amur–Heilong River Basin: Challenges and Prospects in Environmental Security' in V Lagutov (ed) *Environmental Security in Watersheds: The Sea of Azov* (Springer 2012)

DW Pearce and RK Turner, *Economics of Natural Resources and the Environment* (Johns Hopkins University Press 1990)

ME Porter, *Competitive Advantage: Creating and Sustaining Superior Performance* (The Free Press 1985)

A Proelss, 'The Contribution of the ITLOS to Strengthening the Regime for the Protection of the Marine Environment' in A Del Vecchio and R Virzo (eds) *Interpretations of the United Nations Convention on the Law of the Sea by International Courts and Tribunals* (Springer 2019)

K Raworth, *Doughnout Economics: Seven Ways to Think Like a 21st Century Economist* (Penguin Random House Business 2011)

R Rayfuse, 'Principles of International Environmental Law Applicable to Waste Management' in K Kummer Peiry et al. (eds) *Waste Management and the Green Economy: Law and Policy* (Edward Elgar Publishing 2016)

H Ringbom, 'Vessel-Source Pollution' in R Rayfuse (ed) *The Research Handbook on International Marine Environmental Law* (Edward Elgar Publishing Limited 2015)

H Ringbom, 'Ship-Source Pollution' in A Noellkaemper and I Plakokefalos (eds) *The Practice of Shared Responsibility in International Law* (Cambridge University Press 2017)

CM Rochman, 'The Complex Mixture, Fate and Toxicity of Chemicals Associated with Plastic Debris in the Marine Environment' in M Bergmann et al. (eds) *Anthropogenic Marine Litter* (Springer 2015)

PG Ryan, 'A Brief History of Marine Litter Research' in M Bergmann et al. (eds) *Anthropogenic Marine Litter* (Springer 2015)

P Sands and J Peel, *Principles of International Environmental Law* (4th edn, Cambridge University Press 2018)

N de Sadeleer, *Environmental Principles – From Slogans to Legal Rules* (Oxford University Press 2002)

E Scotford, 'Environmental Principles Across Jurisdictions: Legal Connectors and Catalysts' in E Lees and J Vinuales (eds) *Oxford Handbook of Comparative Environmental Law* (Oxford University Press 2018)

T Scovazzi, 'Some Remarks on International Responsibility in the Field of Environmental Protection' in M Ragazzi (ed) *International Responsibility Today: Essays in Memory of Oscar Schachter* (Brill 2005)

MN Shaw*, International Law* (7th edn, Cambridge University Press 2014)

D Shelton, 'Soft Law' in D Armstrong (ed) *Routledge Handbook of International Law* (Taylor & Francis Group 2009)

WR Stahel, *The Performance Economy* (2nd edn, Palgrave MacMillan 2010)

WR Stahel and R Clift, 'Stocks and Flows in the Performance Economy' in R Clift and A Druckman (eds) *Taking Stock of Industrial Ecology* (SpringerOpen 2016)

T Stephens, 'Article 235: Responsibility and Liability' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017)

A Stöfen-O'Brien, *The International and European Legal Regime Regulating Marine Litter in the EU* (Nomos Verlagsgesellschaft 2015)

S Taekema, 'Relative Autonomy: A Characterisation of the Discipline of Law' in B van Klink and S Taekema (eds) *Law and Method: On Interdisciplinary Research into Law* (Mohr Siebeck 2011)

S Taekema and B van Klink, 'On the Border: Limits and Possibilities of Interdisciplinary Research' in B van Klink and S Taekema (eds) *Law and Method: On Interdisciplinary Research into Law* (Mohr Siebeck 2011)

H Thirlway, *The Sources of International Law* (2nd Edn, Oxford University Press 2019)

F Wacht, 'Article 207 Pollution from Land-Based Sources' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017)

F Wacht, 'Article 210 Pollution by Dumping' in A Proelss (ed) *United Nations Convention on the Law of the Sea: A Commentary* (C.H. Beck, Hart and Nomos 2017)

H Xue, *Transboundary Damage in International Law* (Cambridge University Press 2003)

THESES

K Raubenheimer, 'Towards an Improved Framework to Prevent Marine Plastic Debris, (Doctor of Philosophy Thesis, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong 2016)

L Cortat Simonetti Goncalves, 'Legal Remedies Against the Plastic Pollution of the Oceans: An Analysis of the Attempts from Public International Law and Private Initiatives to Face the Plastic Soup' (2020)

K Steenmans, 'Enabling Industrial Symbiosis through Regulations, Policies and Property Rights' (2017)

JOURNAL ARTICLES

A Ahamed et al., 'Life Cycle Assessment of Plastic Grocery Bags and Their Alternatives in Cities with Confined Waste Management Structure: A Singapore Case Study' (2021) 278 Journal of Cleaner Production.

MS Andersen, 'An Introductory Note on the Environmental Economics of Circular Economy' (2007) 2 Sustainability Science.

AL Andrady and MA Neal, 'Applications and Societal Benefits of Plastics' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences.

RD Arnold and JP Wade, 'A Definition of Systems Thinking: A Systems Approach.' (2015) 44 Procedia Computer Science.

CG Avio et al., 'Plastics and Microplastics in the Oceans: From Emerging Pollutants to Emerged Threat' (2017) 128 Marine Environmental Research 2.

RU Ayres, 'Eco-Thermodynamics: Economics and the Second Law' (1998) 26 Ecological Economics 2.

LV Bardwell, 'Problem-Framing: A Perspective on Environmental Problem-Solving' (1991) 15 Environmental Management 5.

DKA Barnes et al., 'Accumulation and Fragmentation of Plastic Debris in Global Environments' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences.

DC Baur and S Iudicello, 'Stemming the Tide of Marine Debris Pollution: Putting Domestic and International Authorities to Work' (1990) 17 Ecology Law Quarterly 1.

MJ Bean, 'Legal Strategies for Reducing Persistent Plastics in the Marine Environment' (1987) 18 Marine Pollution Bulletin.

NJ Beaumont et al., 'Global Ecological, Social and Economic Impacts of Marine Plastic' (2019) 142 Marine Pollution Bulletin.

A Birchenough and F Haag, 'The London Convention and London Protocol and Their Expanding Mandate' (2020) 34 Ocean Yearbook Online 1.

F Blomsma, 'Collective 'Action Recipes' in a Circular Economy: On Waste and Resource Management Frameworks and Their Role in Collective Change' (2018) 199 Journal of Cleaner Production.

D Bodansky, 'The United Nations Framework Convention on Climate Change: A Commentary' (1993) 18 Yale Journal of International Law 2.

C Bodar et al., 'Risk Management of Hazardous Substances in a Circular Economy' (2018) 212 Journal of Environmental Management.

F Bonciu, 'The European Economy: From a Linear to a Circular Economy' (2014) 14 Romanian Journal of European Affairs 4.

SB Borrelle et al., 'Predicted Growth in Plastic Waste Exceeds the Efforts to Mitigate Plastic Pollution' (2020) 369 Science 6510.

J Boucher et al., 'Review of Plastic Footprint Methodologies: Laying the Foundation for the Development of a Standardised Plastic Footprint Measurement Tool' (IUCN 2019)

J Boucher and D Friot, 'Primary Microplastics in the Oceans: a Global Evaluation of Sources' (IUCN 2017)

AE Boyle, 'State Responsibility and International Liability for Injurious Consequences of Acts Not Prohibited by International Law: A Necessary Distinction?' (1990) 39 International and Comparative Law Quarterly 1.

AE Boyle, 'Land-Based Sources of Pollution: Current Legal regime' (1992) 16 Marine Policy 1.

AE Boyle, 'Marine Pollution under the Law of the Sea Convention' (1995) 79 The American Journal of Law 2.

AE Boyle, 'Further Development of the Law of the Sea Convention: Mechanisms for Change' (2005) 54 International and Comparative Law Quarterly 3.

AE Boyle, 'Globalising Environmental Liability: The Interplay of National and International Law' (2005) 17 Journal of Environmental Law 1.

M Braungart et al. 'Cradle-to-Cradle Design: Creating Healthy Emissions – A Strategy for Eco-Effective Product and System Design' (2007) 15 Journal of Cleaner Production.

PA Breen, 'A Review of Ghost Fishing by Traps and Gillnets' in RS Shomura and ML Godfrey (eds) Proceedings of the Second International Conference of Marine Debris (NOAA Technical Memorandum NMFS 1990)

J Brown and G Macfadyen, 'Ghost Fishing in European Waters: Impacts and Management Responses' (2007) 31 Marine Policy 4.

E Brown Weiss, 'Common But Differentiated Responsibilities in Perspective' (2002) 96 Proceedings of the Annual Meeting (American Society of International Law)

MA Browne et al., 'Microplastic Moves Pollutants and Additives to Worms, Reducing Functions Linked to Health and Biodiversity' (2013) 23 Current Biology 23.

A Bruel et al, 'Linking Industrial Ecology and Ecological Economics - A Theoretical and Empirical Foundation for the Circular Economy (2019) 23 Journal of Industrial Ecology 1.

J Brunnée, 'The Responsibility of States for Environmental Harm in a Multinational Context – Problems and Trends' (1993) 34 Les Cahiers de Droit 3.

J Brunnée, 'Of Sense and Sensibility: Reflections on International Liability Regimes as Tools for Environmental Protection' (2004) 53 International and Comparative Law Quarterly 2.

MS Carolan, 'The Precautionary Principle and Traditional Risk Assessment: Rethinking How We Assess and Mitigate Environmental Threats' (2007) 20 Organization & Environment 1.

JP Charboneau and SM Koger, 'Plastics, Pesticides and PBDEs: Endocrine Disruption and Developmental Disabilities' (2007) 20 Journal of Developmental and Physical Disabilities.

R Churchill 'Port State Jurisdiction Relating to the Safety of Shipping and Pollution from Ships—What Degree of Extra-Territoriality? (2016) 31 The International Journal of Marine and Coastal Law 3.

M Carbery et al., 'Trophic Trasnfer of Microplastics and Mixed Contaminants in the Marine Food Web and Implications for Human Health' (2018) 115 Environment International.

MR Chertow, 'Industrial Symbiosis: Literature and Taxonomy' (2000) 25 Annual Review of Energy and the Environment 1.

S Connelly, 'Mapping Sustainable Development as a Contested Concept' (2007) 12 Local Environment 3.

R Costanza, 'Ecological Economics: A Research Agenda' (1991) 2 Structural Change and Economic Dynamics 2. 341.

SE Cornelius, 'Marine Turtle Mortalities along the Pacific Coast of Costa Rica' (1975) 1 Copeia.

L Cortat Simonetti Goncalves and M Faure, 'International Law Instruments to Address the Plastic Soup' (2019) 43 William Mary Environmental Law and Policy Review 3.

A Cózar et al., 'Plastic Debris in the Open Ocean' (2014) 111 Proceedings of the National Academy of Sciences of the United States of America 28.

C Cucuzzella and P De Coninck, 'The Precautionary Principle as a Framework for Sustainable Design: Attempts to Counter the Rebound Effects of Production and Consumption' (2008) First International Conference on Economic De-growth for Ecological Sustainability and Social Equity. https://www.researchgate.net/profile/Carmela_Cucuzzella/publication/237613196_The_Precautionary_Principle_as_a_Framework_for_Sustainable_Design_Attempts_to_Counter_the_Rebound_E ffects of Production and Consumption/links/0deec529e09fc02b9d000000/The-Precautionary-Principle-as-a-Framework-for-Sustainable-Design-Attempts-to-Counter-the-Rebound-Effects-of-Production-and-Consumption.pdf

P Cullet, 'Differential Treatment in Environmental Law: Addressing Critiques and Conceptualizing the Next Steps' (2016) 5 Transnational Environmental Law 2.

A Daniel, 'Civil Liability Regimes as a Complement to Multilateral Environmental Agreements: Sound International Policy or False Comfort? (2003) 12 Review of European, Comparative & International Environmental Law 3.

P Dauvergne, 'Why is the Global Governance of Plastic Failing the Oceans? (2018) 51 Global Environmental Change.

J-P W Desforges et al., 'Ingestion of Microplastics by Zooplankton in the Northeast Pacific Ocean' (2015) 69 Archives of Environmental Contamination and Toxicology 3.

L-A Duvic-Paoli, 'Fighting Plastics with Environmental Principles? The Relevance of the Prevention Principle in the Global Governance of Plastics' (2020) 114 American Journal of International Law Unbound. Symposium on Global Plastic Pollution.

JR Ehrenfeld, 'Industrial Ecology – Paradigm Shift or Normal Science? (2000) 44 American Behavioral 2.

JR Ehrenfeld and N Gertler, 'Industrial Ecology in Practice – The Evolution of Interdepence in Kalundborg' (1997) 1 Journal of Industrial Ecology 1.

E Engle, 'Ontology, Epistemology, Axiology: Bases for a Comprehensive Theory of Law' (2008) 8 Appalachian Journal of Law 1.

M Eriksen, 'The Plastisphere – The Making of a Plasticized World' (2014) 27 Tulane Environmental Law Journal.

M Eriksen et al., 'Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea' (2014) 9 PLoS ONE 12.

S Erkman, 'Industrial Ecology: An Historical View' (1997) 5 Journal of Cleaner Production 1-2.

S Erkman, 'Industrial Ecology: A New Perspective on the Future of the Industrial System' (2001) 131 Swiss Medical Weekly 37-38.

M Esposito et al., 'Introducing Circular Economy: New Thinking with New Managerial and Policy Implications' (2018) 60 California Management Review 3.

MG Faure and T Hartlief, 'Compensation Funds versus Liability and Insurance for Remedying Environmental Damage' (1996) 5 Review of Comparative, European & International Environmental Law 4.

MG Faure and A Nollkaemper, 'International Liability as an Instrument to Prevent and Compensate for Climate Change' (2007) 26 Stanford Environmental Law Journal.

G Ferraro and P Failler, 'Governing Plastic Pollution in the Oceans: Institutional Challenges and Areas for Action' (2020) 112 Environmental Science and Policy.

S Fietta et al., 'The South China Sea Award: A Milestone for International Environmental Law, the Duty of Due Diligence and the Litigation of Maritime Environmental Disputes' (2017) 29 Georgetown Environmental Law Review 4.

L Finska and J Gjørtz Howden, 'Troubled Waters – Where is the Bridge? Confronting Marine Plastic Pollution from International Watercourses' (2018) 27 Review of European, Comparative and International Environmental Law 3.

E Fisher et al., 'Maturity and Methodology: Starting a Debate about Environmental Law Scholarship' (2009) 21 Journal of Environmental Law 2.

A Flynn and N Hacking, 'Setting Standards for a Circular Economy: A Challenge Too Far for Neoliberal Environmental Governance?' (2019) 212 Journal of Cleaner Production.

Z Feng and N Yan, 'Putting a Circular Economy into practice in China' (2007) 2 Sustainable Science 1.

C Foster, 'The ILC Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities' (2005) 14 Review of European, Comparative and International Environmental Law 3.

HL De Frond, 'Estimating the Mass of Chemicals Associated with Ocean Plastic Pollution to Inform Mitigation Efforts' (2019) 15 Integrated Environmental Assessment and Management 4.

RA Frosch and NE Gallopoulos, 'Strategies for Manufacturing' (1989) 261 Scientific American 3.

F Galgani et al. 'Distribution and Abundance of Debris on the Continental Shelf of the North-Western Mediterranean Sea' (1995) 30 Marine Pollution Bulletin 11.

F Galgani et al. 'Litter on the Sea Floor along European Coasts' (2000) 40 Marine Pollution Bulletin 6.

F Galgani and F Lecornu 'Debris on the sea floor at "Hausgarten"' (2004) in M Klages and J Thiede, The Expedition ARK XIX/3 of the Research Vessel POLARSTERN in 2003: Reports of Legs 3a, 3b, and 3c. 488 Reports on Polar and Marine Research.

WB Gallie, 'Essentially Contested Concepts' (1956) 56 Proceedings of the Aristotelian Society 1.

F Gallo et al., 'Marine Litter Plastics and Microplastics and their Toxic Chemicals Components: the Need for Urgent Preventive Measures' (2018) 30 Environmental Sciences Europe 13.

CW Gattringer, 'A Revisited Conceptualization of Plastic Pollution Accumulation in Marine Environments: Insights from a Social Ecological Economics Perspective' (2018) 96 Marine Policy.

Y Geng et al., 'Globalize the Circular Economy' (2019) 565 Nature.

S Geisendorf and P Pietrulla, 'The Circular Economy and Circular Economy Concepts – A Literature Analysis and Redefinition' (2018) 60 Thunderbird International Business Review.

N Georgescu-Roegen, 'The Entropy Law and the Economic Process in Retrospect' (1986) 12 Eastern Economic Journal 1.

R Geyer et al., 'Production, Use, and Fate of All Plastics Ever Made' (2017) 3 Science Advances 7.

P Ghisellini et al., 'A Review on Circular Economy: The Expected Transition to a Balanced Interplay of Environmental and Economic Systems' (2006) 114 Journal of Cleaner Production.

N Giannopoulos, 'Global Environmental Regulation of Offshore Energy Production: Searching for Legal Standards in Ocean Governance' (2019) 28 The Review of European, Comparative & International Environmental Law 3.

LFE Goldie, 'Concepts of Strict and Absolute Liability and the Ranking of Liability in Terms of Relative Exposure to Risk' (1985) 16 Netherlands Yearbook of International Law.

TP Good et al., 'Derelict Fishing Nets in Puget Sound and the Northwest Straits: Patterns and Threats to Marine Fauna' (2010) 60 Marine Pollution Bulletin 1.

M Gold et al., 'Stemming the Tide of Plastic Marine Litter: A Global Action Agenda' (2014) 27 Tulane Environmental Law Journal 2.

R Grace et al., 'Secondary Materials and International Trade' (1978) 5 Journal of Environmental Economics and Management 5.

MR Gregory, ' Environmental Implications of Marine Debris in Marine Settings-Entanglement, Ingestion, Smothering, Hangers-on, Hitch-Hiking, and Alien Species' (2009) 364 Philosophical Transactions of the Royal Society B.

N Gregson et al., 'Interrogating the Circular Economy: The Moral Economy of Resource in the EU' (2015) 44 Economy and Society 2.

KJ Groh et al., 'Overview of Known Plastic Packaging-Associated Chemicals and Their Hazards' (2019) 651 Science of the Total Environment 2.

PE Hagen, 'The International Community Confronts Plastics Pollution from Ships: MARPOL Annex V and the Problem that Won't Go Away' (1990) 5 American University International Law Review 2.

M Halle, 'Assessing the Trade and Environment Debate after 30 Years: Reflections from the Perspective of International Environmental Negotiations' (2017) International Environmental Law-Making and Diplomacy Review. University of Eastern Finland – UNEP Course Series 17.

XB Han et al., 'A Whole Life Cycle Assessment on Effects of Waterborne PBDEs on Gene Expression Profile along the Brain–Pituitary–Gonad Axis and in the Liver of Zebrafish' (2011) 63 Marine Pollution Bulletin 5-12.

PC Harper and JA Fowler, 'Plastic Pellets in New Zealand Storm-Killed Prions (Pachyptila spp.) 1958-1977' (1987) 34 Notornis 1.

NB Hartmann et al., 'Are We Speaking the Same Language? Recommendations for a Definition and Categorization Framework for Plastic Debris' (2019) 53 Environmental Science & Technology.

BD Harvesty et al. 'Using Numerical Model Simulations to Improve the Understanding of Micro-Plastic Distribution and Pathways in the Marine Environment' (2017) 4 Marine Pollution: Frontiers in Marine Science.

G Haughton, 'Environmental Justice and the Sustainable City' (1999) 18 Journal of Planning Education and Research.

H Hirai et al., 'Organic Micropollutants in Marine Plastic Debris from the Open Ocean and Remote and Urban Beaches (2011) 62 Marine Pollution Bulletin 8.

LA Holmes et al., 'Absorption of Trace Metals to Plastic Resin Pellets in the Marine Environment' (2012) 160 Environmental Pollution 1.

AS Homrich et al., 'The Circular Economy Umbrella: Trends and Gaps on Integrating Pathways' (2018) 175 Journal of Cleaner Production.

T Honkonen, 'The Principle of Common But Differentiated Responsibility in Post-2012 Climate Negotiations' (2009) 18 Review of European, Comparative & International Environmental Law 3.

P Hopkinson et al., 'Managing a Complex Global Circular Economy Business Model: Opportunities and Challenges' (2018) 60 California Management Review 3.

B Hopwood et al., 'Sustainable Development: Mapping Different Approaches' (2005) 13 Sustainable Development.

JR Jambeck et al., 'Plastic Waste Inputs from Land into the Ocean' (2015) 347 Science 6223.

Y Jang et al. 'Estimating the Global Inflow and Stock of Plastic Debris Using Material Flow Analysis: a Preliminary Approach' (2015) 86 Journal of the Korean Society for Marine Environment and Energy 4.

IS Jawahir and R Bradley, 'Technological Elements of Circular Economy and the Principles of 6R-Based Closed-Loop Material Flow in Sustainable Manufacturing' (2016) 40 Procedia CIRP.

M Jesús Ávila-Gutiérrez et al., 'Standardization Framework for Sustainability from Circular Economy 4.0' (2019) 11 Sustainability 22.

A de Jesus et al., 'Eco-Innovation in the Transition to a Circular Economy: An Analytical Literature' (2018) 172 Journal of Cleaner Production.

CJ Joyner and S Frew, 'Plastic Pollution in the Marine Environment´ (1991) 22 Ocean Development and International Law 1.

JA Ivar do Sul et al., 'Plastic Debris Retention and Exportation by a Mangrove Forest Patch' (2014) 78 Marine Pollution Bulletin 1-2.

J Kaiser, 'The Dirt on Ocean Garbage Patches' (2010) 328 Science 5985.

T Kaissi, 'Invalidating the Orontes River Treaty in the Context of Middle Eastern Politics' (2014) 26 Georgetown International Environmental Law Review 2.

IA Kane et al., ‘Seafloor Microplastic Hotspots Controlled by Deep-Sea Circulation’ (2020) 368 Science 6495.

JH Kandziora et al., ‘The Important Role of Marine Debris Networks to Prevent and Reduce Ocean Plastic Pollution’ (2019) 141 Marine Pollution Bulletin.

T Keijer et al., ‘Circular Chemistry to Enable a Circular Economy’ (2019) 11 Nature Chemistry.

EA Kirk, ‘The Montreal Protocol or the Paris Agreement as a Model for a Plastics Treaty?’ (2020) Symposium on Global Plastic Pollution. 114 American Journal of International Law

EA Kirk and N Popattanachai ‘Marine Plastics: Fragmentation, Effectiveness and Legitimacy in International Lawmaking’ (2018) 27 Review of European, Comparative and International Environmental Law 3.

J Kircherr et al. ‘Conceptualizing the Circular Economy: An Analysis of 114 Definitions’ (2017) 127 Resources, Conservation & Recycling.

J Kircherr et al., ‘Barriers to Circular Economy: Evidence from the European Union (EU)’ (2018) 150 Ecological Economics.

J Kircherr and R van Santen, ‘Research on the Circular Economy: A Critique of the Field’ (2019) 151 Resources, Conservation & Recycling.

K Klümmerer et al., ‘Rethinking Chemistry for a Circular Economy: Chemical Complexity Complicates Product Recycling and Manufacturing Sustainability’ (2020) 367 Science 6476.

R Kolb, ‘Principles as Sources of International Law (With Special Reference to Good Faith’ (2006) LIII Netherlands International Law Review.

J Korhonen et al., ‘Circular Economy: The Concept and Its Limitations’ (2018) 143 Ecological Economics.

J Korhonen et al., ‘Circular Economy as an Essentially Contested Concept’ (2018) 175 Journal of Cleaner Production.

A Koutsodendris et al. ‘Benthic Marine Litter in Four Gulfs in Greece, Eastern Mediterranean; Abundance, Composition and Source Identification’ (2008) 77 Estuarine, Coastal and Shelf Science 3.

M Koyano, ’The Significance of Procedural Obligations in International Environmental Law: Sovereignty and International Co-Operation’ (2011) 54 Japanese Yearbook of International Law.

K Krechmer, 'The Fundamental Nature of Standards: Technical Perspective' (2000) 38 IEEE Communications Magazine 6. https://www.isology.com/pdf/fundtec.pdf

M Landon-Lane, 'Corporate Social Responsibility in Marine Plastic Debris Governance' (2018) 127 Marine Pollution Bulletin.

D Lazarevic and H Valve, 'Narrating Expectations for the Circular Economy: Towards Common and Contested European Transition' (2017) 31 Energy Research & Social Science.

KL Law et al., 'Plastic Accumulation in the North Atlantic Subtropical Gyre' (2010) 329 Science 5996.

KL Law, 'Plastics in the Marine Environment' (2017) 9 Annual Review of Marine Science.

JB Lamb et al. 'Plastic Waste Associated with Disease on Coral Reefs' (2018) 359 Science 6374.

LCM Lebreton et al., 'River Plastic Emissions to the World's Oceans' (2017) 8 Nature Communications.

B Lee et al., 'Who Owns Our Carbon Future? Intellectual Property and Energy Technologies' (2009) A Chatham House Report.

D Lee et al. 'Distribution Characteristics of Marine Litter on the Seabed of East China Sea and the South Sea of Korea' (2006) 70 Estuarine, Coastal and Shelf Science 1.

JR Lee, 'Process and Product: Making the Link between Trade and the Environment' (1994) 6 International Environmental Affairs 4.

SM Lélé, 'Sustainable Development: A Critical Review' (1991) 19 World Development 6.

SA Lentz, 'Plastics in the Marine Environment: Legal Approaches for International Action' (1987) 18 Marine Pollution Bulletin 6B.

HA Leslie et al. 'Propelling Plastics into the Circular Economy – Weeding Out the Toxics First' (2016) 94 Environment International.

M Lieder and A Rashid, 'Towards Circular Economy Implementation: A Comprehensive Review in Context of Manufacturing Industry' (2016) 115 Journal of Cleaner Production.

D Lithner et al., 'Environmental and Health Hazard Ranking and Assessment of Plastic Polymers Based on Chemical Composition' (2011) 409 The Science of Total Environment 18.

M MacLeod et al., 'Identifying Chemicals That Are Planetary Boundaries Threats' (2014) 48 Environmental Science & Technology 19.

A Mah, 'Future-Proofing Capitalism: The Paradox of the Circular Economy for Plastics' (2021) Global Environmental Politics.

J Males and P Van Aelst, 'Did the Blue Planet set the Agenda for Plastic Pollution? An Explorative Study on the Influence of a Documentary on the Public Media, and Political Agendas' (2021) 51 Environmental Communication 1.

R de Man and H Friege, 'Circular Economy: European Policy on Shaky Ground' (2016) 34 Waste Management and Research 2.

BS Manheim, 'Annex V of the MARPOL Convention: Will It Stop Marine Plastic Pollution? (1988) 71 The Georgetown International Environmental Law Review 1.

S Maljean-Dubois and B Mayer, 'Liability and Compensation for Marine Plastic Pollution: Conceptual Issues and Possible Ways Forward' (2020) Symposium on Global Plastic Pollution. 114 American Journal of International Law.

C Martin et al., 'Mangrove Forests as Traps for Marine Litter' (2019) 247 Environmental Pollution.

W Mattli and T Büthe, 'Setting International Standards: Technological Rationality or Primacy of Power?' (2003) 56 World Politics 1.

N Matz-Lück and E Van Doorn, 'Due Diligence Obligations and the Protection of the Marine Environment' (2017) 42 L'Observateur des Nations Unies.

B Meier-Wehren, 'The Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities' (2013) 17 New Zealand Journal of Environmental Law 1.

R Merli et al., 'How Do Scholars Approach the Circular Economy? A Systematic Literature Review' (2018) 178 Journal of Cleaner Production.

N Millar et al, 'The Circular Economy: Swings and Roundabouts?' (2019) 158 Ecological Economics.

L Monroe, ' Tailoring Product Stewardship and Extended Producer Responsibility to Prevent Marine Plastic Pollution' (2014) 27 Tulane Environmental Law Journal 2.

CJ Moore et al., 'A Comparison of Plastic and Plankton in the North Pacific Central Gyre' (2001) 42 Marine Pollution Bulletin 12.

A Murray et al., 'The Circular Economy: An Interdisciplinary Exploration of the Concept and Its Application in a Global Context' (2017 140 Journal of Business Ethics 3.

M Niero and XC Schmidt Rivera, 'The Role of Life cycle Sustainability Assessment in the Implementation of Circular Economy Principles in Organizations' (2018) 69 Procedia CIRP 69.

P Næss and KG Høyer, The Emperor's Green Clothes: Growth, Decoupling, and Capitalism' (2009) 20 Capitalism Nature Socialism 3.

PN Okowa, 'Procedural Obligations in International Environmental Agreements' (1997) 67 British Yearbook of International Law 1.

F Oosterhuis et al., 'Economic Instruments and Marine Litter Control' (2014) 102 Ocean & Coastal Management.

D Owen and C Noblet, 'Interdisciplinary Research and Environmental Law' (2014) 41 Ecology Law Quarterly 4.

BH Oxman, 'The Duty to Respect Generally Accepted International Standards' (1991) 24 New York University Journal of International Law and Politics

L Paradell-Trius, 'Principles of International Law: An Overview' (2000) 9 Review of European, Comparative & International Environmental Law 2.

J Pauwelyn et al. 'When Structures Become Shackles: Stagnation and Dynamics in International Lawmaking' (2014) 25 The European Journal of International Law 3.

MG Pawson, 'The Catching Capacity of Lost Static Fishing Gears: Introduction. (2003) 64 Fisheries Research 2.

JR Peeters et al., 'Closed Loop Recycling of Plastics Containing Flame Retardants' (2014) 84 Resources, Conservation and Recycling.

LM Persson et al., 'Confronting Unknown Planetary Threats from Chemical Pollution' (2013) 47 Environmental Sciences & Technology 22.

L Persson et al., 'The Globally Harmonized System of Classification and Labelling of Chemicals—Explaining the Legal Implementation Gap' (2017) 9 Sustainability 12.

CK Pham et al., 'Marine Litter Distribution and Density in European Seas, from the Shelves to Deep Basins' (2014) 9 PLoS ONE 4.

J Pinto da Costa, 'The 2019 Global Pandemic and Plastic Pollution Measures: Playing Catch Up' (2021) 774 Science of the Total Environment.

R Pisillo-Mazzeschi, 'The Due Diligence Rule and the Nature of the International Responsibility of States' (1992) 35 German Yearbook of International Law 9.

I Plakokefalos, 'Prevention Obligations in International Environmental Law' (2012) 23 Yearbook of International Environmental Law 1.

JM Polimeni and RI Polimeni, 'Jevon's Paradox and the Myth of Technological Deliberation' (2006) 3 Ecological Complexity 4.

E Pongrácz and VJ Pohjola, 'Re-Defining Waste, the Concept of Ownership and the Role of Waste Management' (2004) 40 Resources, Conservation & Recycling.

F Preston, 'A Global Redesign? Shaping the Circular Economy' (2012) Chatham House Briefing Paper.

V Prieto-Sandoval et al., 'Towards a Consensus on the Circular Economy' (2018) 179 Journal of Cleaner Production.

EJ Prosman et al., 'Closing Global Material Loops – Initial Insights into Firm-Level Challenges' (2017) 21 Journal of Industrial Ecology 3.

AT Pruter, 'Sources, Quantities, and Distribution of Persistent Plastics in the Marine Environment' (1987) 18 Marine Pollution Bulletin 6B.

PS Rao, 'International Liability for Transboundary Harm' (2004) 34 Environmental Policy and Law 6.

A Quitmeyer and R Roberts, 'Babies, Bottles & Bisphenol A: The Story of a Scientist-Mother' (2007) 5 PLoS Biology 7.

K Raubenheimer and A McIlgorm, 'Is the Montreal Protocol a Model That Can Help Solve the Global Marine Plastic Debris Problem?' (2017) 81 Marine Policy.

K Raubenheimer and A McIlgorm, 'Can the Basel and Stockholm Conventions Provide a Global Framework to Reduce the Impact of Marine Plastic Litter?' (2018) 96 Marine Policy.

K Raubenheimer and A McIlgorm, 'Can a Global Fund Help Solve the Global Marine Plastic Debris Problem?' (2018) 5 Journal of Ocean and Coastal Economics 1.

K Raubenheimer et al., 'Towards an Improved International Framework to Govern the Lifecycle of Plastics' (2018) 27 Review of European, Comparative & International Environmental Law 3.

K Raubenheimer and N Urho, ‘Rethinking Global Governance of Plastics -The Role of Industry’ (2020) 113 Marine Policy.

F Razza et al., ‘Compostable Cutlery and Waste Management: An LCA Approach’ (2009) Waste Management

D Reike et al. The Circular Economy: New or Refurbished as CE 3.0? – Exploring Controversies in the Conceptualization of the Circular Economy through a Focus on History and Resource Value Retention Options’ (2018) 135 Resources, Conservation & Recycling.

K Richardson et al. ‘Estimates of Fishing Gear Loss Rates at a Global Scale: A Literature Review and Meta-Analysis’ (2019) 20 Fish and Fisheries 3.

A Rieu-Clarke and R Kinna, ‘Can Two Global UN Water Conventions Effectively Co-exist? Making the Case for a ‘Package Approach’ to Support Institutional Coordination’ (2014) 23 Review of European, Comparative & International Environmental Law 1.

CM Rochman et al., ‘The Ecological Impacts of Marine Debris: Unraveling the Demonstrated Evidence from What is Perceived’ (2016) 97 Ecology 2.

J Rockström et al., ‘Planetary Boundaries: Exploring the Safe Operating Space for Humanity’ (2009) 14 Ecology and Society 2.

N Roht-Arriaza, ‘Shifting the Point of Regulation: the International Organization for Standardization and Global Law-Making on Trade and Environment’ (1995) 22 Ecology Law Quarterly 3.

SI Rothstein, ‘Plastic Particle Pollution of the Surface of the Atlantic Ocean: Evidence from a Seabird’ (1973) 75 Condor.

PG Ryan et al., ‘Monitoring the Abundance of Plastic Debris in the Marine Environment’ (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences.

YMB Saavedra et al., ‘Theoretical Contribution of Industrial Ecology to Circular Economy’ (2018) 170 Journal of Cleaner Production.

S Sauvé et al., ‘Environmental Sciences, Sustainable Development and Circular Economy: Alternative Concepts for Trans-Disciplinary Research’ (2016) 17 Environmental Development.

GM Scheutz et al., ‘Adaptable Crosslinks in Polymeric Materials: Resolving the Intersection of Thermoplastics and Thermosets’ (2019) 141 Journal of the American Chemical Society.

S Schmeier et al., 'Clearing the Muddy Waters of Shared Watercourses Governance: Conceptualizing International River Basin Organisations' (2016) 16 International Environmental Agreements: Politics, Law and Economics.

C Schmidt et al., 'Export of Plastic Debris by Rivers into the Sea' (2017) 51 Environmental Science & Technology 21.

C Schmidt et al. 'Correction to Export of Plastic Debris by Rivers into the Sea' (2018) 52 Environmental Science & Technology 2.

P Schroeder et al., 'The Relevance of Circular Economy Practices to the Sustainable Development Goals' (2019) 23 Journal of Industrial Ecology 1.

P Schröder et al. 'Degrowth within: Aligning Circular Economy and Strong Sustainability Narratives' (2019) 146 Resources, Conservation & Recycling.

AE Schwarz et al., 'Sources, Transport and Accumulation of Different Types of Plastic Litter in Aquatic Environments: A Review Study' (2019) 143 Marine Pollution Bulletin.

D Shelton, 'Common Concern of Humanity' (2009) 39 Environmental Policy and Law 2.

BK Sidhu and BH Desai, 'Plastics Pollution: A New Common Concern of Humankind?' (2018) 48 Environmental Policy and Law 5.

AB Sielen, 'The New International Rules on Ocean Dumping: Promise and Performance' (2009) 21 Georgetown International Environmental Law Review 2.

S Sivakumaran, 'Techniques in International Law-Making: Extrapolation, Analogy, Form and the Emergence of an International Law of Disaster Relief' (2018) 28 The European Journal of International Law 4.

KR Skene, 'Circles, Spirals, Pyramids and Cubes: Why the Circular Economy Cannot Work' (2018) 13 Sustainable Science 2.

WR Stahel, 'The Circular Economy' (2016) 531 Nature 7595.

WR Stahel, 'Policy for Material Efficiency – Sustainable Taxation as a Departure from the Throwaway Society' (2013) 371 Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences.

K Steenmans, 'Extended Producer Responsibility: An Assessment of Recent Amendments to the European Union Waste Frameworks Directive' (2019) 15 Law, Environment and Development Journal 2.

BW Su et al. 'A review of the Circular Economy in China: Moving Rhetoric to Implementation' (2013 42 Journal of Cleaner Production 42.

B Suárez-Eiroa et al., 'Operational Principles of Circular Economy for Sustainable Development: Linking Theory and Practice' (2019) 214 Journal of Cleaner Production.

S Taekema and W van der Burg, 'Introduction: The Incorporation Problem in Interdisciplinary Legal Research' (2015) 8 Erasmus Law Review 2.

Y Tanaka, 'Reflections on Time Elements in the International Law of the Environment' (2013) 73 Heidelberg Journal of International Law.

Y Tanaka, 'The South China Sea Arbitration: Environmental Obligations under the Law of the Sea Convention' (2018) 27 Review of European, Comparative & International Law 1.

M Thiel et al., 'Anthropogenic Marine Debris in the Coastal Environment: a Multi-Year-Comparison between Coastal Waters and Local Shores' (2013) 71 Marine Pollution Bulletin 1-2.

RC Thompson et al., 'Plastics, the Environment and Human Health: Current Consensus and Future Trends' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences

G Teubner, 'The Invisible Cupola: From Causal to Collective Attribution in Ecological Liability' (1994) 16 Cardozo Law Review 2.

EL Teuten, 'Transport and Release of Chemicals from Plastics to the Environment and to Wildlife' (2009) 364 Philosophical Transactions of the Royal Society B: Biological Sciences 1526.

JA Tickner and K Geiser, 'The Precautionary Principle Stimulus for Solutions- and Alternatives-Based Environmental Policy (2004) 24 Environmental Impact Assessment Review 7-8.

A Triponel, 'Global Fund to Fight AIDS, Tuberculosis and Malaria: A New Legal and Conceptual Framework for Providing International Development Aid' (2009) 35 North Carolina Journal of International Law & Commercial Regulation 1.

A Trouwborst, 'Managing Marine Litter: Exploring the Evolving Role of International and European Law in Confronting a Persistent Environmental Problem' (2011) 27 Merkourios 73.

M Valverde Soto, 'General Principles of International Environmental Law' (1996) 3 ILSA Journal of International and Comparative Law 1.

J Van Engeland et al., 'Literature Review: Strategic Network Optimization Models in Waste Reverse Supply Chains' (2020) 91 Omega.

DL VanderZwaag et al., 'The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities: A Myriad of Sounds, Will the World Listen?' (1998) 13 Ocean Yearbook.

P Villarrubia-Gómez et al., 'Marine Plastic Pollution as a Planetary Boundary Threat – The Drifting Piece in the Sustainability Puzzle' (2018) 96 Marine Policy.

S Vinogradov, 'Marine Pollution via Transboundary Watercourses – An Interface of the 'Shoreline' and 'River-Basin' Regimes in the Wider Black Sea Region' (2007) 22 International Journal of Marine and Coastal Law 4.

C Velis, 'No Circular Economy If Current Systemic Failures Are Not Addressed' (2018) 36 Waste Management and Research 9.

P Verlaan, 'Current Legal Developments London Convention and London Protocol' (2011) 26 The International Journal of Marine Coastal Law 1.

FO Vicuna, 'Responsibility and Liability for Environmental Damage under International Law: Issues and Trends' (1998) 10 Georgetown International Environmental Law Review 2.

C Voigt, 'State Responsibility for Climate Change Damages' (2008) 77 Nordic Journal of International Law 1.

S Wagner and M Schlummer, 'Legacy Additives in a Circular Economy of Plastics: Current Dilemma, Policy Analysis, and Emerging Countermeasures' (2020) 158 Resources, Conservation & Recycling.

T Wautelet, 'The Concept of Circular Economy: Its Origins and Its Evolution' (2018) Working Paper, ResearchGate.

D Wilson et al., 'Role of Informal Sector Recycling in Waste Management in Developing Countries' (2006) 30 Habitat International.

K Winans et al., 'The History and Current Applications of the Circular Economy Concept' (2017) 68 Renewable and Sustainable Energy Reviews 1.

R Wolfrum, 'Purposes and Principles of International Environmental Law' (1990) 33 German Yearbook of International Law.

B Worm et al. 'Plastics as a Persistent Marine Pollutant' (2017) 42 Annual Review of Environment and Resources.

B Xue et al., 'Survey of Official's Awareness on Circular Economy Development in China: Based on Municipal and County Level' (2010) 54 Resources, Conservation & Recycling.

R Yotova, 'The Principles of Due Diligence and Prevention in International Environmental Law' (2016) 75 The Cambridge Law Journal 3.

N Ziebarth et al., 'All at Sea' in L Fuhr and M Franklin (eds) *Plastic Atlas: Facts and Figures about the World of Synthetic Polymers* (Heinrich Böll Foundation/Break Free from Plastic 2019)

T Zink and R Geyer, 'Circular Economy Rebound' (2017) 21 Journal of Industrial Ecology 3.

Reports

The Black Sea Commission, 'Marine Litter in the Black Sea Region' (2009)

BIR Ferrous Division, 'World Steel Recycling in Figures 2013-2017: Steel Scrap – a Raw Material for Steelmaking' (BIR 2018)

Circle Economy, 'The Circularity Gap Report 2020' (2020)

FAO, 'Transboundary River Basin Overview – Ganges-Brahmaputra-Meghna' (2011) FAO AQUASTAT Reports

GESAMP, 'Sources, Fate and Effects of Microplastics in the Environment: A Global Assessment' (IMO 2015) 90 Reports and Studies.

GESAMP, 'Pollution in the Open Oceans 2009-2013 – A Report by a GESAMP Task Team' (2015) 91 GESAMP Reports and Studies

GESAMP, 'Guidelines for the Monitoring and Assessment of Plastic Litter and Microplastics in the Ocean' (UNEP 2019) 99 Reports and Studies.

The Global Fund, 'Results Report 2019' (2019)

IMO, 'End-of-Life Management of Fibre Reinforced Plastic Vessels: Alternatives to At Sea Disposal' (IMO 2019)

IMO, 'Review of the Current State of Knowledge Regarding Marine Litter in Wastes Dumped at Sea Under London Convention and Protocol – Final Report' (IMO 2016)

International Council of Forest & Paper Associations, 'Sustainability Progress Report' (2019)

International Coastal Cleanup and Ocean Conservancy, 'Turning the Tide on Trash: 2014 Report' (2014)

IRP, 'Redefining Value. The Manufacturing Revolution. Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy' (2018)

ISO(IEC), 'Using and Referencing ISO and IEC Standards to Support Public Policy' (2015)

AP McGinn, 'Reducing Our Toxic Burden' in State of the World 2002: A Worldwatch Institute Report on Progress Toward a Sustainable Society.

Ocean Conservancy and International Coastal Cleanup, 'The Beach and Beyond: 2019 Report' (Ocean Conservancy and International Coastal Cleanup 2019)

SACEP, 'Marine Litter in the South Asian Seas Region' (2007)

SADC, Zambezi Environment Outlook (SADC 2015)

SADC-WD, SIDA/DANIDA, 'Integrated Water Resources Management Strategy and Implementation Plan for the Zambezi River Basin' (Euroconsult Mott MacDonald 2008)

SAM, 'Environmental and Health Risks of Microplastic Pollution' (Publications Office of the European Union 2019) Group of Scientific Advisors Scientific Opinion 6/2019

SAPEA, 'A Scientific Perspective on Microplastics in Nature and Society' (SAPEA 2019) Evidence Review Report 4.

UNEA, 'Report of the First Meeting of the Ad-Hoc Open-Ended Expert Group on Marine Litter and Microplastics' (19 June 2018) UN Doc UNEP/AHEG/2018/1/6

UNEP and FAO, 'Abandoned, Lost or Otherwise Discarded Fishing Gear' (2009)

UNEP, 'Glossary of Terms for Negotiators of Multilateral Environmental Agreements' (UNEP 2007)

UNEP, 'Biodegradable Plastics and Marine Litter: Misconceptions, Concerns and Impacts on Marine Environments' (2015)

UNEP, 'Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change' (2016)

UNEP, 'Recycling Rates of Metals – A Status Report' (2011) A Report of the Working Group on the Global Metal Flows to the International Resource Panel.

UNEP, 'Valuing Plastics: The Business Case for Measuring, Managing and Disclosing Plastic Use in the Consumer Goods Industry' (UNEP 2014)

UNEP, 'Marine Litter Legislation: A Toolkit for Policymakers' (UNEP 2016)

UNEP and COBSEA, 'A Human Rights-Based Approach to Preventing Plastic Pollution' (2019) Issue Brief 1.

UN Environment, 'Addressing Marine Plastics: A Systemic Approach – Stocktaking Report (2018)

UN Environment, 'Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International Regional and Subregional Governance Strategies and Approaches' (2017) UNEP/EA.3/INF/5.

UN Environment, 'Global Manual on Ocean Statistics: Towards a Definition of Indicator Methodologies' (2018)

UN Environment, 'Legal Limits on Single-Use Plastics and Microplastics: A Global Review of National Laws and Regulations' (UN Environment 2018)

UN Environment, 'Mapping of Global Plastics Value Chain and Plastics Losses to the Environment (with a Particular Focus on Marine Environment) (2018)

United Nations, Division for Ocean Affairs and the law of the Sea Office of Legal Affairs, 'The Law of the Sea – Obligations of State Parties under the United Nations Convention on the Law of the Sea and Complementary Instruments' (2004)

A Villanueva and P Eder, 'End-of-Waste Criteria for Waste Plastic for Conversion' (Publication Office of the European Union 2014) JRC Technical Proposals.

J Wang et al., 'Chapter 25. Marine Debris' (United Nations, United Nations Division for Ocean Affairs and the Law of the Sea, 2016) First Global Integrated Marine Assessment.

PAPERS

D Barrowclough and C Deere Birkbeck, 'Transforming the Global Plastics Economy: The Political Economy and Governance of Plastics production and Pollution' (2020) GEG Working Paper 142.

R Bodle and S Sina, 'A Treaty on Plastic Waste' (ecologic 2019) Discussion Paper.

B Fliess et al., ‘The Use of International Standards in Technical Regulation’ (OECD 2010) OECD Trade Policy Papers No 2.

CIEL, 'Fossils, Plastics & Petrochemical Feedstocks’ (CIEL 2017) Fueling Plastics – Series.

CIEL, ‘How Fracked Gas, Cheap Oil and Unburnable Coal Are Driving the Plastics Boom’ (CIEL 2017) Fueling Plastics – Series.

CIEL, ‘Plastic Industry Awareness of the Ocean Plastics Problem’ (CIEL 2017) Fueling Plastics – Series.

CIEL, ‘Untested Assumptions and Unanswered Questions in the Plastics Boom’ (CIEL 2018) Fueling Plastics – Series.

CIEL, ‘Toward a New Global Convention with a Multi-Layered Governance Approach to Address Plastic Pollution’ (CIEL 2018)

CIEL, ‘Plastic & Health: The Hidden Costs of a Plastic Planet’ (CIEL 2019)

CIEL, EIA and GAIA, ‘Convention on Plastic Pollution: Towards a New Global Agreement to Address Plastic Pollution’ (2020)

EC, ’Guidance on the Interpretation of Key Provisions of Directive 2008/98/EC’ (2012)

EC, ‘Ecodesign Your Future: How Ecodesign Can Help the Environment by Making Products Smarter’ (2012)

EC, ‘Commission Staff Working Document Accompanying the Document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Implementation of the Circular Economy Package: Options to Address the Interface between Chemical, Product and Waste Legislation’ (2018) SWD/2018/020 Final.

EC, ‘Leading the Way to a Global Circular Economy: State of Play and Outlook’ (2020) Commission Staff Document SWD(2020) 100 Final.

Econsense – Forum for Sustainable Development of German Business, ‘Assessing Environmental and Social Impacts: Information and Guidance for Organizations’ (2015)

EMF, ‘Towards the Circular Economy Vol. 1 – Economic and Business Rationale for an Accelerated Transition’ (2013)

EMF, 'Towards the Circular Economy Vol. 3: Accelerating the Scale-up across Global Supply Chains' (2013)

EMF, 'The New Plastics Economy – Catalysing Action' (2017)

The Global Fund, 'Bylaws of the Global Fund to Fight AIDS, Tuberculosis and Malaria' (2016)

T Graff Hugo, 'The Case for a Treaty on Marine Plastics Pollution' (Norwegian Academy of International Law 2018)

IMO, 'Implications of the United Nations Convention on the Law of the Sea for the International Maritime Organization' (2014) LEG/MISC.8

Institution for European Environmental Policy, 'Policy Approaches to Incentivize Sustainable Plastic Design' (2018)

G James, 'The Plastics Landscape: Regulations, Policies and Influencers' (UNPRI 2019)

M Jervan, 'The Prohibition of Transboundary Environmental Harm. An Analysis of the Contribution of the International Court of Justice to the Development of the No-Harm Rule' (2014) PluriCourts Research Paper No. 14-17.

S Karsten, 'Trade Policies for a Circular Economy: What Can We Learn from WTO Experience? (WTO 2020) WTO Staff Working Paper No. ERSD-2020-10.

Law of the Sea Bulletin, No. 79 (1996)

A McCarthy and P Börkey, 'Extended Producer Responsibility (EPR) and the Impact on Online Sales: Policy Highlights' (OECD Publishing 2018) OECD Environment Working Papers.

A Medinilla, 'Understanding the International Congo-Ubangui-Sangha Commission (CICOS)' (ECDPM 2017)

National Academy of Sciences Ocean Affairs Board, 'Background Papers for a Workshop on Inputs, Fates and Effects of Petroleum in the Marine Environment' (National Academies Press 1973)

P ten Brink et al., 'Plastics Marine Litter and Circular Economy' (2016) A Briefing by IEEP for the MAVA Foundation.

Ocean Conservancy and McKinsey Center for Business and Environment, 'Stemming the Tide: Land-Based Strategies for a Plastic-Free Ocean' (2015)

OECD, ‘Recommendation of the Council on Guiding Principles concerning International Economic Aspects of Environmental Policies. Annex Guiding Principles Concerning the International Economic Aspects of Environmental Policies’ (1OECD 2021)

OECD, ’Extended Producer Responsibility: Updated Guidance for Efficient Waste Management’ (2016)

OECD, ‘International Trade and the Transition to a Circular Economy: Policy Highlights’ (2018)

OECD, ‘Improving Plastics Management: Trends, Policy Responses, and the Role of International Co-operation and Trade’ (2018) 12 OECD Environment Policy Papers.

OECD, ‘Improving Markets for Recycled Plastics: Trends, Prospects and Policy Responses’ (OECD Publishing 2018)

P Pauw et al., ‘Different Perspectives on Differentiated Responsibilities: a State-of-the-Art Review of the Notion of Common but Differentiated Responsibilities in International Negotiations’ (German Development Institute 2014) Discussion Paper No 6/2014.

AG Pheifer, ‘Barriers & Enablers to Circular Business Models’ (ValueC 2017) A Whitepaper.

Press Release, ’Secretary-General, Secretary-General Proposes Global Fund for Fight Against HIV-AIDS and other Infectious Diseases at African Leaders Summit’ (26 April 2001) UN Doc SG/SM/7779/Rev.1

F Preston et al., ‘An Inclusive Circular Economy – Priorities for Developing Countries’ (2019) Chatham House Research Paper.

S Radelet, ‘The Global Fund to Fight AIDS, Tuberculosis and Malaria: Progress, Potential, and Challenges for the Future’ (Center for Global Development 2004)

K Raubenheimer and N Urho, ‘Possible Elements of a New Global Agreement to Prevent Plastic Pollution’ (Nordic Council of Ministers 2020)

Rizos et al. ‘The Circular Economy: A Review of Definitions, Processes and Impacts’ (CEPS Research Report 2017)

N Simon and ML Schulte, ‘Strengthening Plastic Governance: Towards a New Global Convention’ (adelphi 2017)

C Sherrington, ‘Plastics in the Marine Environment’ Eunomia Research & Consulting Ltd (2016)

C Sherrington et al., 'Study to Support the Development of Measures to Combat a Range of Marine Litter Sources' (Eunomia Research & Consulting Ltd 2016)

Secretariat of the Convention on Biological Diversity and the Scientific and Technical Advisory Panel of the Global Environment Facility, 'Impacts of Marine Debris on Biodiversity: Current Status Potential Solutions' (2012) 67 Technical Series.

M Sell and N Pajunen, 'The Circular Economy – What's Trade Got to Do with It? (14 September 2018) International Centre for Trade and Sustainable Development. https://ictsd.iisd.org/opinion/the-circular-economy-

N Simon and ML Schulte, 'Stopping Global Plastic Pollution: The Case for an International Convention' (adelphi 2017) 43 Heinrich Böll Stiftung Publication Series Ecology.

N Simon et al., 'No More Plastics in the Ocean: Gaps in Global Plastic Governance and Options for a Legally Binding Agreement to Eliminate Marine Plastic Pollution' (adelphi 2018) Discussion Paper.

WR Stahel and G Reday, 'The Potential for Substituting Manpower for Energy' (Research Contract No 76/l3-V/343/78-EN, Programme of Research and Actions on the Development of the Labour Market, DGV, Commission of the European Communities. Final Report 30 July 1977, Study No 76/13)

P ten Brink et al., Circular Economy Measures to Keep Plastics and Their Value in the Economy, Avoid Waste and Reduce Marine Litter' (Kiel Institute for the World Economy 2018) Economics Discussion Papers No 2018-3.

I Tessnow-von Wysocki, 'International Cooperation for the Protection of Global Public Goods: Towards a Global Plastics Treaty' (Freie Universität Berlin 2019) 2 University Alliance for Sustainability Working Paper Series.

F Thevenon et al., 'Plastic Debris in the Ocean: The Characterization of Marine Plastics and their Environmental Impacts' (IUCN 2014) Situation Analysis Report

UNIDO, 'Addressing the challenge of Marine Plastic Litter using Circular Economy Methods: Relevant Considerations' (2019) A Working Paper.

United States International Trade Commission, 'Remanufactured Goods: An Overview of the U.S. and Global Industries, Markets and Trade' (USITC Publication 4356, 2012) Investigation No 332-525.

E Watkins et al., 'EPR in the EU Plastics Strategy and the Circular Economy: A Focus on Plastic Packaging' (IEEP 2017)

World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, 'The New Plastics Economy – Rethinking the Future of Plastics' (2016)

WWF, Ellen MacArthur Foundation and Boston Consulting Group, 'Business Case for a UN Treaty on Plastic Pollution' (2020)

S Yamaguchi, 'International Trade and the Transition to a More Resource Efficient and Circular Economy: A Concept Paper' (OECD Publishing 2018) OECD Trade and Environment Working Papers.

Other Sources

A Hoe Lim (Director of the Trade and Environment Division of the WTO), 'How Can Trade Agreements Promote Sustainable and Circular Trade?' (Helsinki, Finland 4.6.2019) World Circular Economy Forum (WCEF) https://www.youtube.com/watch?v=B6dhmfm5wpI&feature=youtu.be

A Cox (Deputy Director of the Environment Directorate, OECD), 'International Trade in Circular Economy Goods and Services' (Helsinki 4.6.2019) World Circular Economy Forum (WCEF) https://www.youtube.com/watch?v=B6dhmfm5wpI&feature=youtu.be

Websites

The Basel Convention, 'Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal' http://www.basel.int/Countries/StatusofRatifications/TheProtocol/tabid/1345/Default.aspx

K Bru, 'Plasthvalen Rørte en Hel Verden' (Bergens Avisen, 21 January 2018) https://www.ba.no/plasthvalen/forurensning/miljovern/plasthvalen-rorte-en-hel-verden/s/5-8-726208

Clean Seas https://www.cleanseas.org

COBSEA, 'Sweden and UN Environment announce $6 Million Project to Beat Plastic Pollution in Southeast Asia' (10 September 2018) https://www.unenvironment.org/cobsea/news/story/sweden-and-un-environment-announce-6-million-project-beat-plastic-pollution-southeast

Cradle to Cradle Products Innovation Institute, 'Cradle to Cradle Certified™' https://www.c2ccertified.org/get-certified/product-certification

Croner-i, 'New International Standards on Circular Economy Proposed' (7 August 2018) https://app.croneri.co.uk/whats-new/new-international-standards-circular-economy-proposed

The Daily Records, 'Top 10 Best Plastic Companies in the World' (2 January 2019) http://www.thedailyrecords.com/2018-2019-2020-2021/world-famous-top-10-list/highest-selling-brands-products-companies-reviews/best-plastic-companies-world-largest-manufacturing/6843/

EC, 'Directive 2008/98/EC on Waste (Waste Framework Directive)' http://ec.europa.eu/environment/waste/framework/

EC, 'Waste Framework Directive: End of Waste Criteria' http://ec.europa.eu/environment/waste/framework/end_of_waste.htm

EC, 'Global Alliance on Circular Economy and Resource Efficiency' https://ec.europa.eu/environment/international_issues/gacere.html

ESA, 'ESA Investigating Detection of Floating Plastic Litter from Orbit' (19 March 2018) https://www.esa.int/Enabling_Support/Preparing_for_the_Future/Discovery_and_Preparation/ESA_investigating_detection_of_floating_plastic_litter_from_orbit

ESA, 'A Step Forward in Detecting Plastic Marine Litter from Space' (1 July 2020) https://www.esa.int/Enabling_Support/Preparing_for_the_Future/Discovery_and_Preparation/A_step_forward_in_detecting_plastic_marine_litter_from_space

EMF, 'Global Commitment' https://www.ellenmacarthurfoundation.org/our-work/activities/new-plastics-economy/global-commitment

EMF, 'Schools of Thought' https://www.ellenmacarthurfoundation.org/circular-economy/concept/schools-of-thought

EMF, 'What Is the Circular Economy?' https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy

EMF, 'Infographic: Circular Economy System Diagram' https://www.ellenmacarthurfoundation.org/circular-economy/concept/infographic

L Hook and J Reed, 'Why the World's Recycling System Stopped Working (Financial Times Magazine Environment, 25 October 2018) https://www.ft.com/content/360e2524-d71a-11e8-a854-33d6f82e62f8

The Global Fund, 'Board' https://www.theglobalfund.org/en/board/

The Global Fund, 'Funding Model' https://www.theglobalfund.org/en/funding-model/

The Global Fund, 'Resource Mobilization' https://www.theglobalfund.org/en/replenishment/

The Global Fund, 'Global Fund Overview' https://www.theglobalfund.org/en/overview/

Global Ghost Gear Initiative, 'IUU and Ghost Gear: What Are the Links?' (31 May 2017) https://www.ghostgear.org/news/2017/5/31/iuu-and-ghost-gear-what-are-the-links

GPML, 'Our Members' https://www.gpmarinelitter.org/who-we-are/our-members

The Global Partnership on Marine litter Network, 'Regional Nodes' https://marinelitternetwork.engr.uga.edu/regional-nodes/

Government.no, 'Norway Pushing for Stronger Global Control of Plastic Waste' (2 May 2019) https://www.regjeringen.no/en/aktuelt/basel-convention/id2643569/

The Greatest Engineering Achievements, 'Petroleum Technology History Part 2 – Refining Byproducts' http://greatachievements.org/?id=3679

GRID-Arendal, Which Plastics Float and Which Sink in Seawater' (2016) https://www.grida.no/resources/6930

GRID-Arendal, 'Global Plastic Production and Future Trends' (2018) <http://www.grida.no/resources/6923>

GRID-Arendal, 'Marine Plastics Global Policy Timeline' (2018) https://www.grida.no/resources/6916

GRID-Arendal, 'Plasticized Animals Species – Entangled' (2018) https://www.grida.no/resources/6910

GRID-Arendal, 'Plasticized Animal Species – Ingestion' (2018) https://www.grida.no/resources/6927

IISD Reporting Services, 'Summary of the Third Session of the United Nations Environment Assembly: 4-6 December 2017' (9 December 2017) 16 Earth Negotiations Bulletin 143. http://enb.iisd.org/unep/oecpr3-unea3/

IISD Reporting Services, 'UNEA-4 Highlights' (13 March 2019) 16 Earth Negotiations Bulletin 150. http://enb.iisd.org/unep/oecpr4-unea4/

IISD Reporting Services, 'Summary of the 5th Meeting of the UN Environment Assembly: 22-23 February 2021' (2021) 16 Earth Negotiations Bulletin 156. https://enb.iisd.org/sites/default/files/2021-02/enb16156e_0.pdf

IMO, 'Map of the Parties to the London Convention/Protocol' (February 2019) https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Parties%20to%20the%20LCLP%20February%202019.pdf

IMO, 'Member State Audit Scheme' https://www.imo.org/en/OurWork/MSAS/Pages/Default.aspx

IMO, 'Status of Treaties' (12 February 2021) https://wwwcdn.imo.org/localresources/en/About/Conventions/StatusOfConventions/Status%20-%202021.pdf

Investopedia, 'Value Chain vs. Supply Chain: What's the difference? https://www.investopedia.com/ask/answers/043015/what-difference-between-value-chain-and-supply-chain.asp

Investopedia, 'Upstream vs. Downstream Oil & Gas Operations: What's the Difference' https://www.investopedia.com/ask/answers/060215/what-difference-between-upstream-and-downstream-oil-and-gas-operations.asp

ISO, 'Standards in Our World' https://www.iso.org/sites/ConsumersStandards/1_standards.html

ISO, 'Technical Committees: ISO/TC 323 Circular Economy' https://www.iso.org/committee/7203984.html

ISO, 'ISO/TR 23891:2020 Plastics – Recycling and Recovery – Necessity of standards' https://www.iso.org/standard/77294.html?browse=tc

IRP, 'Glossary' https://www.resourcepanel.org/glossary

K Evans, 'Whale That Had to Be Euthanized Found with 30 Plastic Bags in Its Stomach' (IFL Science!, 3 February 2017) http://www.iflscience.com/plants-and-animals/whale-that-had-to-be-euthanized-found-with-30-plastic-bags-in-its-stomach/

M Kuijpers, 'Circular Economy: Ancient Populations Pioneered the Idea of Recycling Waste' (The Conversation, 9 January 2019) http://theconversation.com/circular-economy-ancient-populations-pioneered-the-idea-of-recycling-waste-107332

Lorraine Chow, 'Whale Found with 30+ Plastic Bags in Its Stomach' (EcoWatch, 6 February 2017) http://www.ecowatch.com/whale-dead-plastic-bags-2242936742.html

National Reporting for the Fourth Inter-Governmental Review (IGR) of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) https://docs.google.com/forms/d/e/1FAIpQLSe7_sa3L12Zx8JKwUxI-1goiQqvIBetvtSz1GB2ggtlFTsuDQ/viewform

NBI, https://nilebasin.org

NBI, 'Transboundary Policies' https://nilebasin.org/transboundary-policies

P Guest, 'Singapore Fund Raises $106 Million to Tackle Plastic Pollution' (Nikkei Asian Review, 4 December 2019) https://asia.nikkei.com/Spotlight/Environment/Singapore-fund-raises-106-million-to-tackle-plastic-pollution

Mekong River Commission, 'About' https://www.mrcmekong.org/about/mrc/

Mekong River Commission, 'Actions to Address Mekong Plastic Pollution Take Shape' (13 February 2020) http://www.mrcmekong.org/news-and-events/news/actions-to-address-mekong-plastic-pollution-take-shape/

Mekong River Commission, 'New Strategy to Address Mekong Wide Challenges Near Finishing Line' (12 June 2020) http://www.mrcmekong.org/news-and-events/news/bds-20200612/

PlasticsEurope, 'The World Plastics Production 1950-2015' https://committee.iso.org/files/live/sites/tc61/files/The%20Plastic%20Industry%20Berlin%20Aug%202016%20-%20Copy.pdf

Recycling Today, 'Process Aims to Recycle Thermoset Plastic Scrap' (27 October 2020) https://www.recyclingtoday.com/article/process-aims-to-recycle-thermoset-plastic-scrap/

UNEP, 'Possible options for the future of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities: An Analysis' http://wedocs.unep.org/bitstream/handle/20.500.11822/27513/GPA%20Option%20Paper%2026%20Feb%202019.pdf?sequence=6&isAllowed=y

UNEP, 'Beat Pollution' https://www.unep.org/beatpollution/

The Ocean Cleanup, 'FAQ' https://theoceancleanup.com/faq/

The Ocean Cleanup, 'River Plastic Emissions to the World's Oceans' https://www.theoceancleanup.com/sources/

The Ocean Cleanup, 'Chasing Plastics: How to Close the Ocean Plastic Mass Balance' (2019) https://theoceancleanup.com/updates/chasing-plastics-how-to-close-the-ocean-plastic-mass-balance/

Statista, 'Global Plastics Production 1950-2019' https://www.statista.com/statistics/282732/global-production-of-plastics-since-1950/.

TOPIOS, 'Tracking of Plastic in Our Oceans' http://topios.org/index.html

UN Environment, 'Governing the Global Programme of Action' https://www.unenvironment.org/explore-topics/oceans-seas/what-we-do/addressing-land-based-pollution/governing-global-programme

UN Environment, 'Why Does Working with Regional Seas Matter?' https://www.unenvironment.org/explore-topics/oceans-seas/what-we-do/working-regional-seas/why-does-working-regional-seas-matter

United Nations Treaty Collection, 'Depositary: Status of Treaties' https://treaties.un.org/Pages/ParticipationStatus.aspx?clang=_en

WR Stahel, 'Reuse is the Key to the Circular Economy' (10 September 2014) https://ec.europa.eu/environment/ecoap/about-eco-innovation/experts-interviews/reuse-is-the-key-to-the-circular-economy_en

'Whale Found off the West Coast of Norway with 30 Plastics Bags in Its Stomach' (The Nordic Page Norway) <http://www.tnp.no/norway/panorama/5450-norwegian-whale-found-off-the-west-coast-with-30-plastic-bags-in-its-stomach>

The World Bank, 'Data Catalog: Population Estimates and Projections' (2019) https://datacatalog.worldbank.org/dataset/population-estimates-and-projections

SAICM, 'Fifth Session of the International Conference for Chemicals Management (ICCM5) [Postponed]' http://www.saicm.org/About/ICCM/ICCM5/tabid/8207/Default.aspx

The Stockholm Convention, 'All POPs Listed in the Stockholm Convention' http://chm.pops.int/TheConvention/ThePOPs/AllPOPs/tabid/2509/Default.aspx

World Customs Organization, 'What is the Harmonized System (HS)?' http://www.wcoomd.org/en/topics/nomenclature/overview/what-is-the-harmonized-system.aspx

World Circular Economy Forum (WCEF), 'Circularity in Global Value Chains' (Yokohama, Japan 23.10.2018) https://www.sitra.fi/en/articles/circularity-global-value-chains/

World Circular Economy Forum (WCEF), 'International Trade in Circular Economy Goods and Services' (Helsinki, Finland 4.6.2019) https://www.youtube.com/watch?v=B6dhmfm5wpI&feature=youtu.be

WWF, 'World Leaders Fail to Address Plastic Crisis, Says WWF' (16 March 2019) https://wwf.panda.org/wwf_news/?344671/World-leaders-fail-to-address-plastic-crisis-says-WWF

ZAMCOM 'About ZAMCOM', http://www.zambezicommission.org/about-zamcom/about-zamcom