Faculty of Humanities and Social Sciences

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The Human Right to Health and Marine Biodiversity Nexus: An Integrated Approach for a Healthy Future

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DECLARATION OF AUTHENTICITY AND AUTHOR'S RIGHTS

This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

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Date: 27 March 2023

PREVIOUSLY PUBLISHED WORK

Prior to submission of this thesis, the author has submitted portions of his doctoral research in the following resources:

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Blog posts

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Hamley G, 'Marine Biodiversity: An Underappreciated Foundation for Human Rights' (*One Ocean Hub*, May 4, 2020) <https://oneoceanhub.org/marine-biodiversity-an-underappreciated-foundation-for-human-rights/> accessed 23 December 2022.

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I dedicate this thesis to my uncle, David Hamley, who shared my profound love for the natural world.

CONTENTS

LIST OF ABBREVIATIONS

AAAQ	Availability, accessibility, acceptability and quality
ABNJ	Areas beyond national jurisdiction
AR6	Sixth Assessment Report of the Intergovernmental Panel on Climate Change
ASEAN	Association of Southeast Asian Nations
BBNJ	Biological diversity of areas beyond national jurisdiction
CBD	Convention on Biological Diversity
CEDAW	Convention on the Elimination of All Forms of Discrimination Against Women
CERD	Convention on the Elimination of Racial Discrimination
CIFOR	Center for International Forestry Research
COP	Conference of the Parties
CRC	Convention on the Rights of the Child
CRC Committee	Committee on the Rights of the Child
CRPD	Convention on the Rights of Persons with Disabilities
DSM	Deep seabed mining
ECF	Environmental Compensation Fund
EEZ	Exclusive economic zone
EIA	Environmental impact assessment
EIS	Environmental Impact Statement
ESC rights	Economic, social and cultural rights
ESCR Committee	Economic, Social and Cultural Rights Committee
FAO	Food and Agriculture Organization of the United Nations
HAB	Harmful algal bloom
HIA	Health impact assessment
HRBA	Human rights-based approach
HRC	Human Rights Committee
HRIA	Human rights impact assessment
ICCPR	International Covenant on Civil and Political Rights
ICESCR	International Covenant on Economic, Social and Cultural Rights
ICJ	International Court of Justice
IHRL	International human rights law
IIED	International Institute for Environment and Development

ILC	International Law Commission
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
ISA	International Seabed Authority
ITLOS	International Tribunal for the Law of the Sea
IUCN	International Union for Conservation of Nature
LTC	Legal and Technical Commission of the ISA
MCO	Minimum core obligation
MPA	Marine protected area
NBSAP	National Biodiversity Strategy and Action Plan
OECD	Organisation for Economic Co-operation and Development
OHCHR	United Nations Human Rights Office of the High Commissioner
OIE*	World Organisation for Animal Health
PES	Payments for ecosystem services
ROV	Remote operated vehicle
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNGA	United Nations General Assembly
WHA	World Health Assembly
WHO	World Health Organization
WOAH	World Organisation for Animal Health
WWF	World Wildlife Fund

*Rebranded from ‘OIE’ to ‘WOAH’ in May 2022.

TABLE OF CASES

TABLE OF LEGAL INSTRUMENTS

International

Regional

National

ABSTRACT

It is now widely acknowledged within the scientific community that human and ocean health are intrinsically linked. Marine biodiversity underpins essential ecosystem services including providing food, nutrition, and biomedical inputs, and supporting the regulation of Earth's climate. Yet despite a network of international and domestic law designed to protect our ocean, marine biodiversity is rapidly declining, driven by myriad anthropogenic factors including overfishing, habitat destruction and climate change. Faced with this troubling reality, in this thesis I explore how the human health and marine biodiversity nexus can be better recognised in international law to maximise health benefits and address trade-offs and drivers for health risks and marine biodiversity loss. I pioneer the argument that marine biodiversity plays an intrinsic role in facilitating the realisation of the right to health, given the many ways marine ecosystem services support enjoyment of the highest attainable standard of health. Based on this relationship, I contend that the right to health enshrined in international human rights law places obligations on States regarding governance of the marine environment. Having identified and discussed these obligations, I use deep seabed mining (DSM) in areas beyond national jurisdiction (ABNJ) as a case study to test my approach. I demonstrate that, considering the potential for DSM to undermine human health by harming marine biodiversity, the draft legal regime for DSM currently being developed by the International Seabed Authority must address the human right to health. As I demonstrate in this thesis, at the time of writing there are notable incompatibilities between the two regimes. My research contributes to existing scholarship on the human rights and marine biodiversity interface by unpacking critical synergies between regimes for the protection of both the human right to health and the marine environment.

Thesis word count: 98,450

Chapter 1

INTRODUCTION

1. Context

In recent years there has been growing recognition of the importance of marine biodiversity for human health and wellbeing.[1] This is part of a larger paradigm shift towards understanding and protecting the intrinsic relationship between human and environmental health (including biodiversity),[2] which is enshrined in various integrated management models including the 'ecosystem-based' and 'One Health' approaches.[3]

[1]See eg Josep Lloret, 'Human Health Benefits Supplied by Mediterranean Marine Biodiversity' (2010) 60 Marine Pollution Bulletin 1640; Michael Moore and others, 'Linking Oceans and Human Health: A Strategic Research Priority for Europe' (European Marine Board 2013) <http://marineboard.eu/publication/linking-oceans-and-human-health-strategic-research-priority-europe> accessed 22 December 2022; Mathew White and others, 'Potential Benefits of Blue Space for Human Health and Wellbeing' in Simon Bell, Friedrich Kuhlmann and Mathew White (eds), *Urban Blue Spaces: Planning and Design for Water, Health and Wellbeing* (Routledge 2022); Michael Depledge and others, 'Time and Tide (Impact of the Global Ocean on Health and Wellbeing)' (2019) 366 British Medical Journal 179.

[2]Convention on Biological Diversity (CBD), 'Conference of the Parties to the CBD Decision XIII/6' (14 December 2016) UN Doc CBD/COP/DEC/XIII/6; Cristina Romanelli and others, 'Connecting Global Priorities: Biodiversity and Human Health: a State of Knowledge Review' (World Health Organization (WHO) 2015); UNEP, 'Healthy Environment, Healthy People' (United Nations Environment Programme (UNEP) 2016) <https://wedocs.unep.org/bitstream/handle/20.500.11822/17602/K1602727%20INF%205%20Eng.pdf?sequence=1&isAllowed=y> accessed 22 December 2022.

[3]The 'ecosystem-based' approach, which is a '*strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way*', is endorsed by CBD, 'Report of the Fifth Meeting of the Conference of the Parties to the Convention on Biological Diversity' (15-26 May 2000) UN Doc UNEP/CBD/COP/5/23, Dec V/6 para 1 and Annex. The 'One Health' approach, which promotes the integrated management of ecosystems, human settlements and livestock, is endorsed by CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) preamble and Annex.

Marine biodiversity accounts for approximately 25 percent of known species globally,[4] and it is estimated that as much as 90 percent of marine species have not yet been discovered.[5] It contributes to human health in a variety of ways including as a source of nutrition (fish is a significant source of animal protein for over three billion people worldwide, in some cases accounting for as much as half of total animal protein intake),[6] biomedical discovery (including emerging treatments for cancer, schizophrenia, Alzheimer's disease, and chronic pain),[7] mental wellbeing,[8] and an array of other essential ecosystem services (for example, marine ecosystems produce more than 50 percent of the atmospheric oxygen, and the ocean contains approximately sixty times more carbon than the atmosphere thus playing a crucial role in regulating atmospheric carbon dioxide concentration).[9] Furthermore, since the overwhelming majority of marine biodiversity has not yet been discovered,[10] there is potential for a wealth of further benefits for human health and wellbeing.

Despite strong human dependence on marine resources and ecosystem services, marine biodiversity continues to decline rapidly, driven by various anthropogenic factors such as unsustainable fishing practices, pollution, marine habitat destruction and climate change.[11] Research suggests that between 1970 and 2012, the abundance of marine populations (i.e., the count of individual living organisms) has declined by 36 percent, at an average rate of one percent loss per year.[12] Overall, scientists estimate that human actions are destroying biodiversity up to one thousand times faster than natural rates of biodiversity loss.[13] Furthermore, research demonstrates that the degradation of marine biodiversity is impairing ecosystem services, with knock-on implications for human health.[14]

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[4]Camilo Mora and others, 'How Many Species are There on Earth and in the Ocean?' (2011) 9 PLoS Biology e1001127 <https://doi.org/10.1371/journal.pbio.1001127> accessed 23 December 2022.

[5]Thomas Luypaert and others, 'Chapter 4: Status of Marine Biodiversity in the Anthropocene' in Simon Jungblut, Viola Liebich and Maya Bode-Dalby (eds), *YOUMARES 9 - The Oceans: Our Research, Our Future: Proceedings of the 2018 conference for YOUng MArine RESearcher in Oldenburg, Germany* (1st edn, Springer International Publishing 2020), 60.

[6]Food and Agriculture Organization of the United Nations (FAO), *The State of World Fisheries and Aquaculture: Towards Blue Transformation* (FAO 'The State of the World' series 2022), xx.

[7]Marcel Jaspars and others, 'The Marine Biodiscovery Pipeline and Ocean Medicines of Tomorrow' (2016) 96 Journal of the Marine Biological Association of the United Kingdom 151.

[8]Lora Fleming and others, 'Fostering Human Health Through Ocean Sustainability in the 21st Century' (2019) 1 People and nature (Hoboken, NJ) 276, 279.

[9]Yadigar Sekerci and Sergei Petrovskii, 'Mathematical Modelling of Plankton-oxygen Dynamics Under the Climate Change' (2015) 77 Bulletin of Mathematical Biology 2325, 2325; Akira Oka, 'Ocean Carbon Pump Decomposition and its Application to CMIP5 Earth System Model Simulations' (2020) 7 Progress in Earth and Planetary Science 25 <https://doi.org/10.1186/s40645-020-00338-y> accessed 23 December 2022, 1.

[10]Paul Snelgrove, 'An Ocean of Discovery: Biodiversity Beyond the Census of Marine Life' (2016) 82 PLANTA MED 790, 790.

[11]World Wildlife Fund (WWF), *Living Planet Report - 2016: Risk and Resilience in a New Era* (WWF 2016), 39 and 42.

[12]Ibid 38.

[13]Dilys Roe, Nathalie Seddon and Joanna Elliott, *Biodiversity Loss is a Development Issue: A Rapid Review of Evidence* (International Institute for Environment and Development (IIED) Issue Paper #19 2019), 4.

[14]Siân E. Rees and others, 'Emerging Themes to Support Ambitious UK Marine Biodiversity Conservation' (2020) 117 Marine policy 103864 <https://doi.org/10.1016/j.marpol.2020.103864> accessed 23 December 2022, 1.

Notwithstanding the clear relationship between human health and marine biodiversity, legal frameworks governing the two fields have largely developed in parallel, with little done at an operational, legal, or academic level towards alignment.[15] For example, the United Nations Convention on the Law of the Sea (UNCLOS), the primary international framework governing protection of the marine environment, only contains one reference to 'human health' as a parameter by which to define 'pollution'.[16] The significance of the human health and biodiversity nexus and the need to strengthen its integrated management were recognised by the Conference of the Parties (COP) to the Convention on Biological Diversity (CBD) in 2016. Through Decision XIII/6, the CBD COP called on States and other organisations to 'promote the understanding of health and biodiversity linkages with a view to maximising health benefits, addressing trade-offs, and where possible, addressing common drivers for health risks and biodiversity loss'.[17] In this thesis, I respond to the CBD COP's above call to action by answering the following research question:

> *How can the human health and marine biodiversity nexus be better reflected in international law to maximise health benefits, and address trade-offs and common drivers for health risks and marine biodiversity loss?*

The primary legal framework that I use to answer this question is international human rights law (IHRL) — specifically the human right to health. I lay out the reasons for using this framework in detail in Chapters 2 and 3.[18] IHRL has emerged as an important legal framework for protecting the interface between human and environmental health, as evidenced by the United Nations General Assembly's (UNGA's) recent recognition of a stand-alone right to a healthy environment.[19] I contend that the right to health is ideally situated to protect against outcomes that, through loss and degradation of marine biodiversity, yield adverse human health outcomes.[20] In this thesis, I unpack the right to health in light of the nexus between human health and marine biodiversity. In doing so I demonstrate that, by adopting an evolutionary interpretation of the right to health that is consistent with international law and scientific literature, this right gives rise to a package of State obligations concerning protection of the marine environment. This original contribution to academic discourse drives greater clarity on the relationship between IHRL and biodiversity.

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[15]Audrey Legat, Veronica French and Niall McDonough, 'An Economic Perspective on Oceans and Human Health' (2016) 96 Marine Biological Association of the United Kingdom Journal of the Marine Biological Association of the United Kingdom 13, 13; Moore and others (n 1) Foreword; Romanelli and others (n 2) 41.

[16]United Nations Convention on the Law of the Sea (adopted 10 December 1982, entered into force 16 November 1994) 1833 UNTS 397 (UNCLOS) art 1(4).

[17]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para 2.

[18]Unless stated otherwise, any reference to the right to health in the context of this thesis is to the embodiment of the right under international human rights law, and not domestic law.

[19]United Nations General Assembly (UNGA), 'The Human Right to a Clean, Healthy and Sustainable Environment' (2022) UN Doc A/76/L.75.

[20]See ch 3 sec 1.

Before commencing my legal analysis into the human rights and biodiversity interface, I first substantiate the foundational assumption underlying this research: that a relationship exists between human health and marine biodiversity. The following section therefore comprises an overview of existing scientific knowledge concerning the human health and marine biodiversity nexus.

2. The human health and marine biodiversity nexus

My research focuses on the interaction between human health and marine biodiversity. As stated in the constitution of the World Health Organization (WHO), 'human health' may be defined as 'a state of complete physical, mental and social wellbeing and not merely the absence of disease and infirmity'.[21] Based on an adaption of Article 2 of the CBD, 'marine biodiversity' can be defined as 'the variability among living organisms from (…) marine, and other aquatic ecosystems and ecological complexes of which they are part: this includes biodiversity within species, between species, and of ecosystems'.[22] Therefore, marine biodiversity encompasses the diversity of genetic characteristics within an individual species (genetic diversity), the diversity of species present within any given community (species diversity) and, at the largest scale, the diversity of ecosystems present within the ocean (ecosystem diversity).

In recent years, a body of scientific literature has developed on the relationship between human health and biodiversity.[23] Nonetheless, existing knowledge is far from comprehensive, and the understanding of the connections between health and marine biodiversity lags behind understanding of health linkages to terrestrial biodiversity.[24] Lloret et al. noted that 'living marine resources have strong links with human health and wellbeing that are complex, still not well understood, and that are being modified by global change'.[25] Fleming et al. also contended that 'better understanding and management of these interactions are a global priority that require a global political focus and worldwide participation'.[26]

Despite pervading knowledge gaps, several aspects of this human health and marine biodiversity nexus are beginning to crystallise. Sections 2.1 to 2.3 below provide an overview of the current state of knowledge

[21]'Constitution' (*WHO*, ND) <www.who.int/about/governance/constitution> accessed 18 December 2022.
[22]Convention on Biological Diversity (adopted 5 June 1992, entered into force 29 December 1993) 1760 UNTS 79 (CBD) art 2.
[23]Romanelli and others (n 2); Melissa Marselle and others, 'Pathways Linking Biodiversity to Human Health: A Conceptual Framework' (2021) 150 Environ Int 106420 <https://doi.org/10.1016/j.envint.2021.106420> accessed 23 December 2022; Moore and others (n 1).
[24] Lloret (n 1) 1640.
[25]Josep Lloret and others, 'Challenging the Links Between Seafood and Human Health in the Context of Global Change' (2016) 96 Journal of the Marine Biological Association of the United Kingdom 29, 29.
[26]Fleming and others (n 8) 279.

regarding human impacts on marine biodiversity and marine biodiversity impacts on human health. When considering the impacts of marine biodiversity on human health, the academic literature highlights a complex network of interactions. For the purposes of this section, such interactions are grouped according to their effects: those that may generally be considered beneficial to human health (Section 2.2), and those that may generally be considered harmful to human health (Section 2.3). From a scientific perspective, such a binary division could be considered an oversimplification. However, the purpose of this section is to demonstrate conclusively that a nexus does exist between human health and marine biodiversity, the existence of which is necessary to contextualise and support the legal analysis contained in subsequent chapters. This does not necessitate an exhaustive exploration of the nuances and uncertainties of all interactions, and this purpose is better served by relative conciseness and clarity.

2.1. Human impacts on marine biodiversity

It is now widely understood that human activities negatively impact marine biodiversity in several ways, including through extractive industries, fishing, anthropogenic climate change, tourism and both marine- and land-based pollution. Many of these drivers of harm occur simultaneously, yielding cumulative impacts greater than the sum of their parts.[27] Moreover, literature indicates that the scale of many of these impacts is intensifying.[28] On the other hand, research does not reveal literature showing any positive impacts on the health and wellbeing of marine biodiversity due to human interaction, compared to a scenario in which we have no interaction with the marine environment. Logically therefore, from the perspective of the wellbeing of marine biodiversity, the best approach that humans can adopt is a zero-contact policy whereby the marine environment is left entirely to its own devices. Obviously, in practice this is not a realistic proposition given the extent to which we rely on the ocean as a source of natural resources and ecosystem services. Faced with this reality, humans can support the health of marine biodiversity and ocean health more broadly through a range of area-based management tools, including marine protected areas and marine spatial planning.[29] On this point, significant steps are currently being taken by States under the 'Intergovernmental Conference on an international legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national

[27]Casey C. O'Hara, Melanie Frazier and Benjamin S. Halpern, 'At-risk Marine Biodiversity Faces Extensive, Expanding, and Intensifying Human Impacts' (2021) 372 Science 84, 84-85.
[28]Ibid 85.
[29]Ray Hilborn, 'Marine Biodiversity Needs More Than Protection' (2016) 535 Nature 224, 224. Hilborn et al. argue that, despite the widespread support that marine protected areas (MPAs) have received in recent years, they alone cannot achieve effective conservation of marine biodiversity for myriad reasons, including the migratory nature of many marine species.

jurisdiction' (BBNJ).[30] Once finalised, the BBNJ Treaty will, hopefully, strengthen protection afforded to marine biodiversity in areas beyond national jurisdiction, which account for 95 percent of the ocean by volume.[31]

Minimising human impacts on marine biodiversity is not only important from an ecocentric standpoint, but also from an anthropocentric one. The harm we inflict on marine biodiversity can yield knock-on harm to human health by way of a negative feedback loop.[32] The most stark example of this feedback loop is the array of negative impacts that humans are likely to face from changes in marine biodiversity due to human-induced climate change, such as greater frequency of harmful algal blooms and increased food safety risks from seafood.[33] Fleming et al. observed that 'many of the risks to human health are a direct product of the ways in which we try to exploit ocean resources.[34] This negative feedback loop is addressed further in Section 2.3 below. In the remainder of this section, I highlight some of the key drivers of harm to marine biodiversity, specifically: pollution, fisheries, climate change and aquaculture.

2.1.1. *Pollution*

UNCLOS defines marine pollution as:

> 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, hinderance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities.[35]

In practical terms, marine pollution takes a range of forms, including solid matter (particularly plastics), nutrients, pesticides, disinfectants, pharmaceuticals, radionuclides, living organisms, light and noise.[36] The activities that generate such pollution are numerous and diverse, including fisheries, mineral extraction and

[30]UNGA, 'International Legally Binding Instrument Under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction' (24 December 2017) UN Doc A/RES/72/249.
[31]Common Oceans Areas Beyond National Jurisdiction (ABNJ) Program, 'Global Sustainable Fisheries Management and Biodiversity Conservation in the Areas Beyond National Jurisdiction' (FAO 2018) <www.fao.org/publications/card/en/c/CA0994EN/> accessed 22 December 2022, 1.
[32]Fleming and others (n 8) 277.
[33]Lloret and others (n 25).
[34]Fleming and others (n 8) 278.
[35]UNCLOS (n 16) art 1(4).
[36]Moore and others (n 1) 27-36; Lora Fleming and others, 'Oceans and Human Health: A Rising Tide of Challenges and Opportunities for Europe' (2014) 99 Marine Environmental Research 16, 17.

tourism, as well as a host of terrestrial activities such as soil and nutrient runoff from agriculture, sewage waste and waste from landfill.[37] Indeed, as much as 77 percent of pollutants in the coastal marine environment derive from terrestrial sources.[38] In addition to tangible forms of terrestrial pollution such as marine plastic, the introduction of chemicals (including pharmaceutical products) and nutrients (particularly from agricultural fertilisers) into the marine environment is capable of causing significant ecosystem disruption, including through eutrophication (i.e., interruption of the marine nutrient balance), which in turn may trigger harmful algal blooms (discussed further in Section 2.3.1 below) and oxygen depletion.[39]

One of the more recently recognised forms of marine pollution causing harm to marine biodiversity is anthropogenic underwater noise. While the issue was first considered as early as the 1940s, the rate of publications on the issue has increased drastically since the 1990s, as has the breadth of the research focus.[40] Williams et al. noted that 'underwater noise from shipping is increasingly recognised as a significant and pervasive pollutant with the potential to impact marine ecosystems on a global scale'.[41] Other primary sources of underwater noise include offshore construction, military activities, and recreational pursuits.

Invasive alien species can be considered a form of biological pollution[42] and are another human-driven change to marine biodiversity and marine ecosystems globally. The International Union for Conservation of Nature (IUCN) estimates that as many as 7,000 invasive species may be transported in ships' ballast tanks daily, which may include harmful bacteria such as cholera.[43] While scientists agree that invasive alien species are capable of altering native marine biodiversity, and there are instances in which such species were the likely cause of significant ecosystem disturbances,[44] to date scientists have not been able to quantify the impacts caused by invasive alien species nor establish causality between a decline in native

[37]Moore and others (n 1) 27-36.
[38]Angel Borja and others, 'Moving Toward an Agenda on Ocean Health and Human Health in Europe' (2020) 7 Frontiers in Marine Science article 37 <https://doi.org/10.3389/fmars.2020.00037> accessed 23 December 2022, 4.
[39]Paulo Antunes Horta and others, 'Marine Eutrophication: Overview from Now to the Future' in Donat-P Häder, E Walter Helbling and Virginia E Villafañe (eds), *Anthropogenic Pollution of Aquatic Ecosystems* (Springer 2021), 158.
[40]Rob Williams and others, 'Impacts of Anthropogenic Noise on Marine Life: Publication Patterns, New Discoveries, and Future Directions in Research and Management' (2015) 115 Ocean and Coastal Management 17, 17-24.
[41]Ibid 17-18.
[42]Anna Occhipinti-Ambrogi, 'Biopollution by Invasive Marine Non-Indigenous Species: A Review Of Potential Adverse Ecological Effects in a Changing Climate' (2021) 18 Int J Environ Res Public Health 4268 <https://doi.org/10.3390/ijerph18084268> accessed 23 December 2022, 1.
[43]Robin Craig, 'Marine Biodiversity, Climate Change, and Governance of the Oceans' (2012) 4 Diversity 224, 227; IUCN, 'Marine Menace: Invasive Alien Species in the Marine Environment' (IUCN 2009) <www.iucn.org/content/marine-menace-alien-invasive-species-marine-environment> accessed 22 December 2022.
[44]For example, introduction of the comb jelly into the black sea via ship ballast tanks caused significant ecosystem disruption resulting from significant reduction in anchovy populations (Craig (n 43) 227).

populations and the introduction of an invasive species.[45] As such, it is difficult to gauge the precise extent to which the anthropogenic introduction of invasive alien species impacts marine biodiversity. However, some consider it a significant cause for concern: Occhipinti-Ambrogi contended that 'biological pollution caused by the introduction of non-native species is considered one of the main threats to the environmental health of the oceans'.[46]

While it is not possible within the scope of this analysis to address every category of marine pollution in turn, one that has been the subject of increasing research in recent years, and which merits further consideration, is marine plastics. Review of available academic literature reveals research on the impacts of marine plastics as early as the 1970s,[47] and this research has accelerated at an exponential rate in recent years. Collectively, the academic literature paints a disturbing picture. Moore et al. highlighted that 'floating microplastics (>5nm) affect 86 percent of all sea turtle species, 44 percent of all seabird species, and 43 percent of all marine mammal species'.[48] Plastics may cause harm or death to marine biodiversity in many ways, including entanglement, digestion, toxicity, carcinogenesis and physical harm.[49] Furthermore, while plastics have been in use for less than 100 years, they are estimated to take between 450 to 1000 years to degrade at sea, and some may not degrade at all, but will simply break down into microscopic particles.[50] While the literature is less advanced regarding the impacts of microplastics, consensus is once again emerging that such particles cause significant negative impacts for marine biodiversity and, in turn, for human health.[51]

2.1.2. *Fisheries*

The importance of fish and other marine resources as a source of human nutrition cannot be denied. However, the value of fisheries for human health and wellbeing is discussed in Section 2.2.1 below. This section considers the impact of fisheries on marine biodiversity. While some argue that fisheries conducted at a sustainable level need not necessarily negatively impact marine biodiversity,[52] it is widely

[45]Bella Galil, 'Loss or Gain? Invasive Aliens and Biodiversity in the Mediterranean Sea' (2007) 55 Marine Pollution Bulletin 314, 314-315; Irina Olenina and others, 'Assessing Impacts of Invasive Phytoplankton: The Baltic Sea Case' (2010) 60 Marine Pollution Bulletin 1691, 1691.
[46]Occhipinti-Ambrogi (n 42) 1.
[47]Eg Edward Carpenter and others, 'Polystyrene Spherules in Coastal Waters' (1972) 178 Science 749.
[48]Moore and others (n 1) 32.
[49]Salud Deudero and Carme Alomar, 'Mediterranean Marine Biodiversity Under Threat: Reviewing Influence of Marine Litter on Species' (2015) 98 Marine Pollution Bulletin 58, 58.
[50]Thomas Appleby and others, 'The Marine Biology of Law and Human Health' (2016) 96 Journal of the Marine Biological Association of the United Kingdom 19, 23.
[51]Moore and others (n 1) 33; Appleby and others (n 50) 24; Shivika Sharma and Subhankar Chatterjee, 'Microplastic Pollution, a Threat to Marine Ecosystem and Human Health: A Short Review' (2017) 24 Environmental Science and Pollution Research 21530.
[52]Eg Hilborn (n 29).

acknowledged that not all fishing activities are being undertaken at a sustainable level.[53] The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) concluded in 2019 that fisheries has been the strongest driver of harm to marine biodiversity over the past 50 years, including impacts on target species, non-target species and habitats.[54] The Food and Agriculture Organization of the United Nations (FAO) reported that, in 2019, only 82.5 percent of fish caught and landed were from biologically sustainable stocks, although this was a 3.8 percent increase on 2017 figures.[55] However, FAO also concluded in 2019 that only 64.6 percent of fish stocks were within biologically sustainable levels, down from 65.8 percent in 2017.[56]

Key drivers of biodiversity loss as a result of fisheries include overfishing of targeted species to the point of stock collapse, bycatch of non-target species, and habitat destruction through various means such as blast fishing and trawling.[57] Furthermore, habitat fragmentation due to destructive fishing techniques has a significant impact on seabed biodiversity and ecosystem function.[58] As with other biodiversity considerations, there has been a much-needed shift in thinking in recent decades towards an ecosystem approach in the context of fisheries and away from solely tracking fisheries activities by single species' populations.[59]

2.1.3. *Climate change*

Climate change is a multifaceted and complex issue, and its interconnection to marine biodiversity and human health is no exception. In this context, there is a bidirectional consideration, namely the impact of human-induced climate change on marine biodiversity, and the subsequent impacts to human health due to changes in marine biodiversity as a result of climate change.

The former is considered in brief here, while the latter is addressed in greater detail in Section 2.3.5 below. A seminal work in global climate science is the series of reports by the Intergovernmental Panel on Climate Change (IPCC). Their Sixth Assessment Report (AR6) is a consolidation of global expertise and research on the observed and anticipated changes to the climate as well as the subsequent risks and impacts (to humans, other species and the environment), and is a key resource on the intersection of climate change,

[53]FAO (n 6) xvi.
[54]IPBES, *Global Assessment Report on Biodiversity and Ecosystem Services, Summary for Policymakers* (IPBES 2019), 28.
[55]FAO (n 6) xvi.
[56]Ibid 46.
[57]Craig (n 43) 226-227.
[58]Simon Thrush, Kari Ellingsen and Kathryn Davis, 'Implications of Fisheries Impacts to Seabed Biodiversity and Ecosystem-based Management' (2016) 73 ICES Journal of Marine Science i44, i45.
[59]Felicia Coleman and Susan Williams, 'Overexploiting Marine Ecosystem Engineers: Potential Consequences for Biodiversity' (2002) 17 Trends in Ecology and Evolution 40, 43.

oceans and marine biodiversity.[60] Climate change is impacting the ocean and marine biodiversity in numerous ways, including through ocean warming, deoxygenation, sea level rise and ocean acidification.[61] The IPCC determined in AR6, at the surface of the ocean, the temperature has increased by an average of 0.88 degrees Celsius between 1850-1900 and 2011-2020, and 0.6 degrees of this increase occurred since 1980.[62] Moreover, in addition to global persistent temperature increases, marine heatwaves have doubled in frequency compared to pre-industrial levels and have also become more intense and longer-lasting.[63] These elevated temperatures impact ecosystem composition and function in multiple ways, including through increased mortality, expansion of species ranges both poleward and into deeper waters in search of cooler temperatures, and changes to rates of growth, photosynthesis and metabolism.[64] Corals are particularly vulnerable to temperature increases: it is projected that over 99 percent of corals will be lost if global temperature rise exceeds two degrees Celsius above pre-industrial levels.[65] As coral reefs are home to approximately 25 percent of all marine biodiversity, the gravity of this impact cannot be overstated.[66]

In addition to the direct consequences of ocean temperature rise, warmer ocean waters are also driving deoxygenation by decreasing the solubility of oxygen in seawater, resulting in a two percent loss of total dissolved oxygen in the upper ocean between 1970 and 2010.[67] This can lead to areas with insufficient oxygen to sustain established ecosystems.[68] Mobile species may migrate to more oxygen rich environments, while less mobile species may experience reduced growth, reproduction and survival rates.[69]

Climate change is also driving a rise in sea level through glacial melt and thermal expansion of the ocean, resulting in a coastal squeeze and landward migration of coastal marine biodiversity, with significant harm to fragile coastal ecosystems such as wetlands and mangroves.[70] The IPCC concluded that, between 1901

[60]IPCC, *Climate Change 2022: Impacts, Adaption and Vulnerability* (IPCC Sixth Assessment Report 2022). This is by no means a comprehensive list of the ways in which climate change is impacting the oceans, and the various outputs of the IPCC should be consulted for complete coverage on the topic.
[61]IPCC, 'The Ocean and Cryosphere in a Changing Climate: Special Report of the Intergovernmental Panel on Climate Change' (IPCC 2022) <www.ipcc.ch/srocc/> accessed 22 December 2022, Summary for Policymakers, 7.
[62]IPCC, *Climate Change 2021: The Physical Science Basis* (IPCC Sixth Assessment Report 2021), ch 9 1214.
[63]Ibid.
[64]Gabriel Jorda And Others, 'Ocean Warming Compresses the Three-Dimensional Habitat of Marine Life' (2020) 4 Nat Ecol Evol 109, 109; Helmut Hillebrand and others, 'Chapter 18: Climate Change: Warming Impacts on Marine Biodiversity' in Markus Salomon and Till Markus (eds), *Handbook on Marine Environment Protection: Science, Impacts and Sustainable Management* (Springer International Publishing 2018).
[65]IPCC, *Climate Change 2022: Impacts, Adaption and Vulnerability* (n 60) ch 3 42-45.
[66]WWF (n 11) 42.
[67]IPCC, *Climate Change 2021: The Physical Science Basis* (n 62) ch 5 714.
[68]Karin Limburg, Denise Breitburg and Dennis Swaney, 'Oxygen Deoxygenation: A Primer' (2020) 2 One Earth 5, 25-27.
[69]Ibid.
[70]IPCC, *Climate Change 2021: The Physical Science Basis* (n 62) ch 9 1216; Sinéad Borchert and others, 'Coastal Wetland Adaptation to Sea Level Rise: Quantifying Potential for Landward Migration and Coastal Squeeze' (2018) 55 The Journal of applied

and 2018, the mean global sea level has risen by 0.2 metres, which is faster than any equivalent period over the past three millennia.[71] This is anticipated to reach between 0.38-0.77 metres by 2100.[72]

Oceanic absorption of excess atmospheric carbon dioxide is also driving acidification of the ocean. While this process begins at the ocean surface, the IPCC determined that ocean acidification has now spread to depths surpassing 2000 metres.[73] Ocean acidification is anticipated to impact marine biodiversity in various ways, but species most impacted will include highly calcified corals, molluscs, and echinoderms.[74] It is reasonable to assume that this will, in turn, impact the stability of the ecosystems and food webs in which they live.

2.1.4. *Aquaculture*

Aquaculture presents a valuable solution to help meet the food demands of the rising global population, and in 2020 aquaculture accounted for 49 percent of total fisheries and aquaculture production worldwide.[75] However, in recent years, scientists have afforded greater consideration to the potential impacts of aquaculture activities on native marine biodiversity.[76] Specific drivers of marine biodiversity loss as a result of aquaculture include habitat loss, pollution, introduction of escaped fish into native ecosystems, and increased spread of parasites and diseases from farmed fish to native ecosystems.[77] While the aforementioned negative impacts cannot be ignored, Diana proposed that aquaculture could also have positive impacts on marine biodiversity by reducing pressure on wild stocks, and by spill-over of effluents and waste from aquaculture which could stimulate local fish population growth.[78]

2.2. Human health benefits derived from marine biodiversity

Humans derive an indeterminable range of health benefits from the ocean, which may collectively be referred to as 'marine ecosystem services'.[79] Marine biodiversity provides the building blocks for the

ecology 2876; Sofia Ehsan and others, 'Current And Potential Impacts of Sea Level Rise in the Coastal Areas of Malaysia' (2019) 228 IOP Conf Ser: Earth Environ Sci 12023.

[71]IPCC, *Climate Change 2021: The Physical Science Basis* (n 62) ch 9 1216.

[72]Ibid.

[73]Ibid ch 5 677.

[74]IPCC, *Climate Change 2014: Impacts, Adaption and Vulnerability* (IPCC Fifth Assessment Report, 2014), ch 6 415; James Harrison, *Saving the Oceans Through Law: The International Legal Framework for the Protection of the Marine Environment* (1st edn, Oxford University Press 2017), 247.

[75]FAO (n 6) 33.

[76]Tiptiwa Sampantamit and others, 'Aquaculture Production and its Environmental Sustainability in Thailand: Challenges and Potential Solutions' (2020) 12 Sustainability <https://doi.org/10.3390/su12052010> accessed 23 December 2022; James Diana, 'Aquaculture Production and Biodiversity Conservation' (2009) 59 BioScience 27.

[77]Lloret and others (n 25) 32.

[78]Diana (n 76).

[79]Rashid Hassan, Robert Scholes and Neville Ash (eds), *Ecosystems and Human Wellbeing: Current State and Trends, Volume 1* (Millennium Ecosystem Assessment 2005), vii.

ecosystem functions that deliver these ecosystem services.[80] While the literature demonstrates multiple ways to further subcategorise ecosystem services, the most widely used methodology (as set out in the 2005 Millennium Ecosystem Assessment) breaks them down into provisioning services (i.e., material goods derived from ecosystems, such as food, fresh water and genetic resources), regulating services (i.e., ecosystem functions that regulate the conditions necessary for human survival and wellbeing, such as climate regulation and water purification), supporting services (i.e., ecosystem functions that support the delivery of provisioning, regulating and cultural services, such as photosynthesis and primary production) and cultural services (i.e., non-material value derived from ecosystems, such as ecotourism and mental health benefits from access to nature).[81]

It is now well-established that ecological communities with greater biodiversity (as opposed to simply a large quantity of biomass regardless of biological diversity) experience enhanced ecosystem function and thus delivery of ecosystem services.[82] Conversely, degradation or loss of marine biodiversity undermines the ability of ecosystems to sustain essential ecosystem services.[83] In addition to enabling the ecosystem functions that give rise to ecosystem services, marine biodiversity also promotes ecosystem stability, granting ecosystems greater resilience to withstand pressure from stressors such as fisheries and climate change.[84]

Given the breadth of ecosystem services that marine biodiversity facilitates, it is outside the scope of this section to offer an exhaustive list or indeed to provide a comprehensive overview of the ecosystem services that I do consider here. Instead, in the remainder of this section I summarise a selection of essential ecosystem services to demonstrate the fundamental role that marine biodiversity plays in supporting human health and wellbeing.

2.2.1. *Food and Nutrition*

An essential provisioning ecosystem service facilitated by marine biodiversity is the provision of food and nutrition. Seafood accounts for approximately six percent of animal protein consumed globally,[85] and as

[80]WHO, 'Health, Environment and Climate Change: Human Health and Biodiversity, Report by The Director-General' (29 March 2018) World Health Assembly Doc. A71/11 para 4; Caroline Hattam and others, 'Marine Ecosystem Services: Linking Indicators to Their Classification' (2015) 49 Ecological indicators 61, 63.
[81]Hassan, Scholes and Ash (eds) (n 79) 28; Hattam and others 62; Sandra Quijas and Patricia Balvanera, 'Biodiversity and Ecosystem Services' in Simon A. Levin (ed), *Encyclopedia of Biodiversity* (2nd edn, Elsevier 2013).
[82]Joey R. Bernhardt and Mary I. O'Connor, 'Aquatic Biodiversity Enhances Multiple Nutritional Benefits to Humans' (2021) 118 Proc Natl Acad Sci U S A <https://doi.org/10.1073/pnas.1917487118> accessed 23 December 2022, 2.
[83]Luypaert and others (n 5) 73.
[84]Ibid 58.
[85]Harry Aiking, 'Future Protein Supply' (2011) 22 Trends in Food Science & Technology 112, 114.

much as 25 percent of the protein consumed by people in Low Income Food Deficit Countries.[86] In addition to providing protein, seafood also serves as a key source of nutrients, vitamins, and amino acids, including iodine, iron, omega 3 fatty acids, selenium and vitamin D.[87]

The biological diversity of marine ecosystems strongly influences the nutritional value that such ecosystems can offer in several ways. Firstly, research indicates that biologically diverse ecosystems offer greater nutritional value to humans than less biologically diverse ecosystems, because nutrient concentrations differ between species.[88] Therefore a more diverse seafood diet yields greater nutritional value for consumers.[89] Secondly, greater diversity in marine ecosystems both increases biomass production and strengthens ecosystem resilience, therefore rendering ecosystems more resilient to human exploitation.[90]

Despite the extent of human dependence on marine biodiversity for food and nutrition, unsustainable fishing practices and other human impacts threaten fish stocks globally. Lloret et al. concluded that while loss of fish stocks does not pose a food security risk to developed countries, it does pose a risk to human health through reduced availability and intake of omega 3.[91] By contrast, for developing countries, the collapse of fish stocks poses significant threats to both food security and human health.[92]

2.2.2. *The carbon cycle*

The ocean plays a fundamental role in the carbon cycle, and thus in regulating Earth's climate.[93] To contextualise the ocean's contribution, it is estimated to store up to 60 times as much carbon as the atmosphere and has absorbed up to 30 percent of carbon dioxide emissions since the beginning of the industrial revolution.[94] Marine biodiversity provides several essential regulating ecosystem services that support the carbon cycle. Phytoplankton are responsible for producing approximately 70 percent of the

[86]Lloret and others (n 25) 29.
[87]Hauke Kite-Powell and others, 'Linking the Oceans to Public Health: Current Efforts and Future Directions' (2008) 7 Environmental Health S6, 9 [page numbers cited for this article correspond to the PDF version of the article downloaded from the journal website].
[88]Bernhardt and O'Connor (n 82) 1 and 3.
[89]Ibid.
[90]Ibid 2.
[91]Lloret and others (n 25) 31.
[92]Ibid.
[93]Bethan O'Leary and Callum Roberts, 'Ecological Connectivity Across Ocean Depths: Implications for Protected Area Design' (2018) 15 Global Ecology and Conservation e00431 <https://doi.org/10.1016/j.gecco.2018.e00431> accessed 23 December 2022, 3.
[94]Oka (n 9) 1; Nicolas Gruber and others, 'The Oceanic Sink for Anthropogenic CO2 from 1994 to 2007' (2019) 363 SCIENCE 1193, 1193 and 1198; Di Jin, Porter Hoagland and Ken Buesseler, 'The Value of Scientific Research on the Ocean's Biological Carbon Pump' (2020) 749 Sci Total Environ 141357 <https://doi.org/10.1016/j.scitotenv.2020.141357> accessed 23 December 2022, 2-3.

oxygen in our atmosphere.[95] It remains to be seen how global climate change will impact their photosynthetic activity and rates of atmospheric oxygen production.[96] In addition to producing oxygen, the carbon stored by phytoplankton enters the marine food web and a portion of this becomes sequestered in seafloor sediment by way of a process called the biological ocean pump.[97] It is estimated that phytoplankton embeds approximately 100 million tonnes of carbon dioxide into organic matter each day, of which around one fifth is sequestered in seabed sediment.[98] Therefore, marine biodiversity supports the carbon cycle through, inter alia, cycling of carbon to produce atmospheric oxygen, in addition to facilitating carbon sequestration.

2.2.3. *Biomedical discovery*

Another important provisioning ecosystem service provided by marine biodiversity is its contribution to the development and production of inputs to medicines. Biodiversity offers invaluable insights and provides active ingredients that support biomedical and pharmaceutical developments. Three quarters of all antibacterials approved by the US Food and Drug Administration between 1981 and 2010 were derived from natural products.[99] Marine species in particular demonstrate strong potential for medical breakthroughs, and many of the pharmacologically active compounds they produce are unique to marine organisms.[100] Indeed, the medical product Yondelis (trabectedin), which has been approved for use in Europe, the United Kingdom and the United States of America as an antitumor chemotherapy drug, derives from the Caribbean Ascidian, which is a marine filter-feeder.[101]

Furthermore, increasing capacity for exploration of the deep seabed is opening access to an even broader range of natural resources with potential pharmaceutical uses. For example, of 188 natural marine products discovered for the first time in deep water (from 50 to 5000 metres below the surface) between 2009 and 2013, approximately half demonstrated anti-cancer potential.[102] Despite the readily apparent benefits that biodiversity offers in the realm of biomedical discovery, Romanelli et al. noted that 'ironically, in many

[95]Colin Reynolds, *The Ecology of Phytoplankton* (Cambridge: Cambridge University Press 2006), 3 and 94; Sekerci and Petrovskii (n 9) 2326.
[96]Sekerci and Petrovskii (n 9) 2347.
[97]Jin, Hoagland and Buesseler (n 94) 2; Andrew Chin and Katelyn Hari, 'Predicting the Impacts of Mining Deep Sea Polymetallic Nodules in the Pacific Ocean: A Review of Scientific Literature' (Deep Sea Mining Campaign and MiningWatch Canada 2020) <https://miningwatch.ca/publications/2020/5/19/predicting-impacts-mining-deep-sea-polymetallic-nodules-pacific-ocean-review> accessed 22 December 2022, 38.
[98]O'Leary and Roberts (n 93) 3–4.
[99]Romanelli and others (n 2) 164.
[100]Lloret (n 1) 1642.
[101]Ibid.
[102]Harriet Harden-Davies, 'Deep-sea Genetic Resources: New Frontiers for Science and Stewardship in Areas Beyond National Jurisdiction' (2017) 137 Deep-Sea Research Part II 504, 506.

instances, the very organisms that have given humanity vital insights into human diseases, or are the sources of human medications, are endangered with extinction because of human actions'.[103]

2.2.4. *Mental health and wellbeing*

An important cultural ecosystem service that the ocean provides is the mental health benefits derived from proximity to marine and coastal environments — a relationship commonly referred to as the 'blue gym effect'.[104] While there has been more research conducted to date on the mental health benefits derived from nature generally or terrestrial green space, research indicates that people who live closer to coasts report better mental health and lower stress than those based inland,[105] and laboratory tests reveal that people tend to find marine aquatic scenes more restorative than other environments.[106]

It is difficult to pinpoint whether these health benefits may be attributed to marine biodiversity per se, or whether they simply may be attributed to the marine or coastal environment generally, regardless of how biologically diverse the environment is. Cook et al. observed that '[t]here is little empirical evidence that biodiversity specifically (rather than natural environments in general) contributes directly to human health and wellbeing'.[107] Conversely, Marselle et al. concluded that across various studies, species richness and abundance of birds, plants, trees and fish have all been associated with reduced physiological stress.[108] Additionally, Fleming et al. found that 'people seem to derive more mental health benefits from spending time in higher quality (e.g., more biodiverse) marine environments'.[109] However, they also noted that most research on the blue gym effect to-date has taken place in high income countries and there is a vacuum of research into the health benefits of increasing and protecting access to marine environments in lower- and middle-income countries.[110] It is therefore difficult to conclude with certainty whether biodiversity per se is a direct driver of the blue gym effect, but there is evidence to suggest that there may be a direct relationship, and therefore the potential linkage between mental health and marine biodiversity should not be disregarded.

[103]Romanelli and others (n 2) 164.
[104]White and others (n 1); Moore and others (n 1) 60-63.
[105]Appleby and others (n 50) 24.
[106]Moore and others (n 1) 62.
[107]Penny Cook, Michelle Howarth and C. Philip Wheater, 'Chapter 11: Biodiversity and Health in the Face of Climate Change: Implications for Public Health' in Melissa R. Marselle and others (eds), *Biodiversity and Health in the Face of Climate Change* (Springer 2019), 255.
[108]Marselle and others (n 23) 9.
[109]Fleming and others (n 8) 279.
[110]Ibid.

2.3. Human health risks derived from marine biodiversity

While Section 2.2 above reviewed several of the key ecosystem services that marine biodiversity facilitates, this section offers an overview of some of the health risks that it presents. This does not constitute an exhaustive analysis and is instead intended to demonstrate the gravity and complexity of the nexus that exists between marine biodiversity and human health.

Many of the drivers of harm to human health are interconnected, thus making it difficult to divide them neatly into distinct groups. Regardless, such subdivision is necessary to promote coherence and an understanding of the various drivers of the resulting health risks. Furthermore, the state of scientific knowledge regarding linkages between marine biodiversity and public health varies. Issues such as harmful algal blooms and food safety risks from shellfish are relatively well understood, while other issues such as the effects of exposure to various types of pollution and the knock-on impacts of climate change for human health are less developed.[111]

Finally, as already mentioned earlier in this section, several of the negative impacts addressed below demonstrate a negative feedback loop whereby human activities cause harm to marine biodiversity which, as a result, also presents risks to human health.[112] Where relevant, this will be highlighted in the following sections. In this regard, it is important to reiterate the inequity with which environmental burdens are felt across the world, including the impacts of climate change and marine biodiversity loss. As Fleming et al. noted concerning small island States, low-income economies and poor coastal populations, 'they have contributed the least to the problem but are the most at risk, and they are without the resources to respond'.[113] This inequity carries through many of the health risks highlighted below.

2.3.1. *Harmful algal blooms*

Algae is an essential component of marine ecosystems; it plays an important role in the carbon cycle and also constitutes the base of many marine food webs.[114] However, an overabundance of algae (which may be caused by natural or anthropogenic forces) can trigger harmful algal blooms (HABs), which can present threats, both to humans and other marine biodiversity, through the release of harmful toxins.[115] Exposure

[111]Kite-Powell and others (n 87) 1.
[112]Fleming and others (n 8) 277.
[113]Lora Fleming and others, 'The Ocean Decade-Opportunities for Oceans and Human Health Programs to Contribute to Public Health' (2021) 111 Am J Public Health 808, 809.
[114]Elisa Berdalet and others, 'Marine Harmful Algal Blooms, Human Health and Wellbeing: Challenges and Opportunities in the 21st Century' (2016) 96 J Mar Biol Ass 61, 61.
[115]Ibid.

to such toxins has been linked to instances of skin and liver damage and certain cancers.[116] As of 2013, six percent of all known algae species are toxic or harmful.[117] Additionally, while algae (as a photosynthetic organism) is a key source of oxygen during the day, such blooms consume large quantities of oxygen during the night when photosynthesis cannot occur. This can cause significant harm to nearby marine life by depleting oxygen supplies in the water.[118]

As an example of the negative feedback loop mentioned above, the potential risks posed by HABs are expected to be exacerbated by climate change, as scientists believe increasing water temperatures could increase the frequency and severity of such blooms.[119] Additionally, in recent years, geoengineers have been experimenting with stimulating algal blooms through depositing significant quantities of iron into the marine environment. This practice, known as ocean iron fertilisation, may offer one possible solution to mitigate the effects of anthropogenic climate change by stimulating algal growth and the resultant sequestration of carbon dioxide from the atmosphere. However, emerging research suggests that ocean iron fertilisation may also stimulate the production of toxic algae that poses significant health risks to both marine and human life.[120]

2.3.2. *Food safety*

While marine life constitutes a significant source of protein and nutrients, seafood consumption also presents an array of health risks. Pathogens and poisons commonly found in seafood include parasites, pollutants (including heavy metals and persistent organic pollutants) and biotoxins.[121] In total, seafood consumption is estimated to account for 11 percent, 20 percent, and 70 percent of food-related illnesses in the US, Australia, and Japan respectively, costing the global economy $16 billion USD annually.[122] Globalisation and increased international trade of seafood products is further increasing the opportunity for cross-border transmission and spread of infectious agents from seafood.[123] In particular, shellfish are known to present an array of health risks because many species obtain their food by filtering large quantities of

[116]Moore and others (n 1) 37.
[117]Ibid.
[118]Lloret and others (n 25) 34.
[119]Steven Kibler and others, 'Effects of Ocean Warming on Growth and Distribution of Dinoflagellates Associated with Ciguatera Fish Poisoning in the Caribbean' (2015) 316 Ecological Modelling 194; Zhi Zhu and others, 'Understanding the Blob Bloom: Warming Increases Toxicity and Abundance of the Harmful Bloom Diatom Pseudo-nitzschia in California Coastal Waters' (2017) 67 Harmful Algae 36; Lloret and others (n 25) 34.
[120]Charles Trick and others, 'Iron Enrichment Stimulates Toxic Diatom Production in High-nitrate, Low-chlorophyll Areas' (2010) 107 Proceedings of the National Academy of Sciences 5887.
[121]Lloret and others (n 25) 30.
[122]Robert Bowen, Harlyn Halvorson and Michael Depledge, 'The Oceans and Human Health' (2006) 53 Marine Pollution Bulletin 541, 542.
[123]Lahsen Ababouch, 'Assuring Fish Safety and Quality in International Fish Trade' (2006) 53 Mar Pollut Bull 561, 561.

water, thus accumulating large concentrations of pathogens and poisons in their alimentary tract over time.[124] Shellfish consumption is a known source of norovirus and hepatitis A, both of which can present serious risks to sufferers.[125]

The issue of food safety is another example of the aforementioned negative feedback loop. For example, mercury is used in a variety of industrial processes and practices such as mining, which often results in its release into the environment.[126] Resultant bioaccumulation of mercury in predatory fish such as tuna and swordfish has caused concern in recent years and has been linked to cardiovascular disease in adults and impaired neurological development in children.[127] Moreover, food safety risks from seafood are not limited to a select few species, and research indicates that while more biodiverse marine ecosystems offer greater nutritional value, they also accrue higher concentrations of pollutants as various species absorb different pollutants at different rates.[128]

2.3.3. *Pollution*

As addressed in Section 2.1.1 above, human activities continue to pollute the marine environment in a variety of ways, including sewage, chemical contaminants from agricultural and industrial practices, litter, nanoparticles and radionuclides.[129] Each of these pollutants bring a range of both common and unique risks to human and biodiversity health. Furthermore, marine pollution presents further-reaching implications for human health beyond just food safety risks. For example, the release of human faecal matter into the marine environment from sewerage systems and wastewater treatment plants creates a variety of public health issues linked to the recreational use of the marine coastal environment. These are in addition to the risks posed by the consumption of contaminated seafood.[130] Shuval estimated that 'there are in excess of 120 million cases of gastrointestinal disease and in excess of 50 million cases of more severe respiratory diseases caused by swimming and bathing in wastewater-polluted coastal waters'.[131] Additionally, various anthropogenic chemicals are known to disrupt hormonal (endocrine) systems in numerous species, thus

[124]Lora Fleming and others, 'Oceans and Human Health: Emerging Public Health Risks in the Marine Environment' (2006) 53 Marine Pollution Bulletin 545, 551.
[125]Moore and others (n 1) 44.
[126]Fleming and others (n 124) 553.
[127]Lloret and others (n 25) 30.
[128]Bernhardt and O'Connor (n 82) 5.
[129]Michael Moore, Richard Owen and Michael Depledge, 'Scientific Challenges and Policy Needs' in Ronald Hester and Roy Harrison (eds), *Marine Pollution and Human Health*, vol 33 (The Royal Society of Chemistry 2011), 132.
[130]Moore and others (n 1) 43.
[131]Hillel Shuval, 'Estimating the Global Burden of Thalassogenic Diseases: Human Infectious Diseases Caused by Wastewater Pollution of the Marine Environment' (2003) 1 Journal of Water and Health 53, 62.

altering animal reproductive capacities.[132] While knowledge of this process is most developed in terrestrial species, this is also understood to pose risks to marine species, which in turn may threaten food security.[133]

There is a rapidly expanding body of research on marine plastic pollution, which I do not intend to address in detail here. For current purposes, suffice it to note that marine plastic pollution impacts marine biodiversity in several ways that threaten human health. Firstly, by driving increased species mortality through ingestion, suffocation and entanglement, plastic pollution threatens to reduce marine biomass — meaning that there are fewer resources available to meet human needs as a food source. Secondly, plastics enter marine food webs, presenting a food safety risk for humans when contaminated seafood enters the human food chain.[134] While there is still uncertainty regarding the precise nature and scale of the risks that this presents to humans,[135] evidence suggests that, amongst other things, consumption may present risks to women's reproductive health as a source of endocrine disruptors.[136] Thirdly, marine plastics may threaten essential regulating ecosystem services, such as the production of atmospheric oxygen.[137] Finally, there is evidence to suggest that marine plastics may serve as a vector for increasing the range and spread of marine pathogens.[138]

Literature highlights several challenges in understanding and responding to public health risks from pollutants. In general, there is currently limited understanding of the tangible impacts that pollutants have on marine ecosystems, in addition to challenges in assessing and quantifying these impacts.[139] Linked to this dearth of knowledge, Moore et al. noted that 'long-term and chronic exposure to environmental stress, including chemical pollutants or other anthropogenic factors, will seldom result in rapid and catastrophic change'.[140] Scientific understanding of various stressors such as nanoparticles is especially weak.[141] Without knowing the consequences of such stressors for marine ecosystems, it is even more challenging to understand the knock-on implications for human health.

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[132]Moore, Owen and Depledge (n 129) 143.
[133]Ibid.
[134]Madeleine Smith and others, 'Microplastics in Seafood and the Implications for Human Health' (2018) 5 Curr Envir Health Rpt 375, 380-382.
[135]Ibid.
[136]Elizabeth Royte, 'We Know Plastic Is Harming Marine Life. What About Us?' (*National Geographic*, 2018) <www.nationalgeographic.com/magazine/article/plastic-planet-health-pollution-waste-microplastics> accessed 18 December 2022.
[137]Lina Zeldovich, 'Is Plastic Pollution Depriving Us of Oxygen?' (*JSTOR Daily*, 4 June 2019) <https://daily.jstor.org/is-plastic-pollution-depriving-us-of-oxygen/> accessed 18 December 2022.
[138]Robyn Wright and others, 'Marine Plastic Debris: A New Surface for Microbial Colonization' (2020) 54 Environ Sci Technol 11657, 11665–11666; Jake Bowley and others, 'Oceanic Hitchhikers – Assessing Pathogen Risks from Marine Microplastic' (2021) 29 Trends Microbiol 107, 107.
[139]Moore and others (n 1) 28.
[140]Moore, Owen and Depledge (n 129) 132.
[141]Ibid 139.

2.3.4. *Waterborne pathogens*

While several sources of waterborne pathogens are discussed above (i.e., HABs, food safety risks from seafood and pollution), there remains an array of other naturally occurring waterborne pathogens and poisons not yet addressed; including various parasites, bacteria, viruses and biotoxins. Potential exposure pathways are numerous and include ingestion of or skin contact with contaminated water, or inhalation of aerosols.[142] Some of the most widely known waterborne pathogens include cholera, salmonellosis, hepatitis and viral gastroenteritis.[143] While an analysis of these is beyond the scope of this thesis, it is sufficient for current purposes to note these additional sources of public health risks from marine biodiversity, in order to clearly demonstrate the complexity of the human health and marine biodiversity nexus.

2.3.5. *Climate change*

Some of the impacts of anthropocentric climate change on the marine environment are covered in Section 2.1.3 above. By contrast, this section is concerned with the knock-on effects that such impacts may have for human health. At this stage, the precise consequences for human health are not yet clear since both the effects of climate change on marine biodiversity and our understanding of the consequences of those impacts for human health are still developing. Indeed, the IPCC has observed that while climate change drives loss of marine biodiversity, it is unclear to what extent this will impair ecosystem function and the delivery of ecosystem services, since 'ecological functions sometimes remain, despite changes in species assemblages'.[144] As a preliminary observation, it is important to note that, in practice, climate change can serve as a catalyst to the issues already mentioned in Sections 2.3.1, 2.3.2 and 2.3.4 above. Regardless, it is worthwhile addressing climate change separately to better understand how it can drive such impacts, and the extent to which it may already be giving rise to public health risks vis-à-vis marine biodiversity.

As mentioned in Section 2.1.3 above, ocean warming will likely result in many changes that could be detrimental to human health. The threats posed by increased incidences and severity of HABs is self-explanatory. However, in addition to biological threats from algal blooms, ocean warming is also expected to facilitate the growth and spread of various other waterborne pathogens, thus affecting the manner in which they occur and the response required.[145] For example, increasing water temperatures have already resulted in the emergence of toxic dinoflagellate species and ciguatoxic fish in subtropical and temperate regions, which were previously only found in tropical waters.[146] This has been followed by an increase in

[142]Kite-Powell and others (n 87) 3.
[143]Ibid 6-7.
[144]IPCC, *Climate Change 2022: Impacts, Adaption and Vulnerability* (n 60) ch 3, 104.
[145]Moore, Owen and Depledge (n 129) 137.
[146]Lloret and others (n 25) 34.

ciguatera outbreaks in Europe in recent years.[147] Similarly, migration of puffer fish into the eastern Mediterranean facilitated by warmer waters has been linked to increased health risks in the region from tetrodotoxin, a neurotoxin found in puffer fish.[148] Changes to fish migration patterns may have further impacts on fisheries practices and consequently on food security and food safety.

The loss of coral reefs from bleaching triggered by increased water temperatures and ocean acidification also presents grave risks for marine and human health. Coral reefs are home to approximately 25 percent of all marine life,[149] and have been estimated to provide $30 million USD annually in goods and services, including fisheries and coastal protection.[150] Considering that more than 99 percent of coral reefs will be lost if global temperature rise exceeds two degrees Celsius,[151] this presents significant risks to the continued delivery of a variety of essential ecosystem services. Additionally, ocean acidification is expected to affect various species of zooplankton and phytoplankton, with negative impacts for higher trophic levels and potential knock-on impacts for fisheries.[152]

The above overview and mapping of interactions between humans, human health and marine biodiversity therefore reveal a rich patchwork of interactions that have significant implications for both human and ocean health on a global scale. It is against this backdrop that, through this thesis, I propose a science-based interpretation of IHRL that appropriately recognises, manages and protects these relationships. In the following section, I set out the specific objective and scope of my thesis.

3. Objectives and scope of the thesis

The scientific literature summarised in the previous section demonstrates that there is an intrinsic and complex relationship between human health and marine biodiversity, which necessitates prompt legal action to safeguard beneficial linkages and to minimise potentially harmful ones. As I explore in depth throughout this thesis, it is apparent that while there is a strong scientific awareness of the importance of the nexus between marine biodiversity and human health, by and large legal and policy frameworks are lagging in their ability to protect this nexus from the various stressors highlighted above. Hildebrand

[147]Ibid.
[148]Ibid.
[149]WWF (n 11) 42.
[150]Quach Thi Khanh Ngoc, 'Assessing the Value of Coral Reefs in the Face of Climate Change: the Evidence from Nha Trang Bay, Vietnam' (2019) 35 ECOSYST SERV 99, 99.
[151]IPCC, *Climate Change 2022: Impacts, Adaption and Vulnerability* (n 60) ch 3 42-45.
[152]Lloret and others (n 25) 35.

eloquently frames the issue as 'The ocean and coastal areas of the world are changing, but we — as societies, economies and individual decision-makers — for the most part, are not'.[153]

The scientific literature reviewed in the previous section also highlights that, although notable progress has been made in recent years to advance awareness and understanding of these complex relationships, many uncertainties remain and there is much work to be done to better understand these interactions. Nonetheless, these gaps in scientific knowledge should not be used as grounds to delay policy and legislative action. On the contrary, they underscore the need for urgency as the current understanding of human health and marine biodiversity linkages may only represent the tip of the iceberg, with multitudes of high-stakes interactions yet to be understood and protected. Fortunately, international law is already tailored to overcoming challenges presented by scientific uncertainty. The precautionary principle, discussed in detail in later chapters, now represents a core legal norm to guide States in managing human interactions with the environment. Furthermore, international law has already embraced the interconnectedness of life on earth through, amongst other things, the ecosystem approach and the One Health approach.[154] As discussed by Trouwborst, both the precautionary principle and the ecosystem approach were created to facilitate the 'effective conservation and sustainable use of natural resources, biological diversity and the achievement of sustainable development'.[155] Thus, international law is suitably placed to acknowledge and protect the various tenets of the human health and marine biodiversity nexus. Therefore, as noted in the opening paragraphs of this chapter, the overarching question guiding my research is: How can the human health and marine biodiversity nexus be better reflected in international law to maximise health benefits, and address trade-offs and common drivers for health risks and marine biodiversity loss?

This question contains three underlying assumptions: (a) a relationship (i.e., nexus) does exist between human health and marine biodiversity; (b) this nexus is not adequately reflected in legal and policy frameworks governing human health and ocean management; and (c) there is scope to improve the awareness and protection of this nexus in law. Assumption (a) is substantiated in Section 2 above. Assumptions (b) and (c) are addressed throughout the remainder of this thesis. As a starting point, these assumptions give rise to the question: how should this nexus be reflected in law? 'International law' is a broad term that encompasses numerous distinct bodies of law, several of which could potentially be

[153]Lawrence Hildebrand, 'Educating the Ocean Leaders of Today for the Ocean of Tomorrow' in Dirk Werle and others (eds), *The Future of Ocean Governance and Capacity Development: Essays in Honor of Elisabeth Mann Borgese* (Brill Nijhoff 2018), 100.
[154]Jonathan Atkins and others, 'Management of the Marine Wnvironment: Integrating Ecosystem Services and Societal Benefits with the DPSIR Framework in a Systems Approach' (2011) 62 Marine Pollution Bulletin 215, 215.
[155]Arie Trouwborst, 'The Precautionary Principle and the Ecosystem Approach in International Law: Differences, Similarities and Linkages' (2009) 18 Review of European Community & International Environmental Law 26, 26.

mobilised to protect the human health and marine biodiversity nexus.[156] However in recent years, IHRL has evolved into a powerful tool to protect interconnections and interdependencies between humans and the natural environment, and is thus the body of law that I focus my research on.[157] In particular, I focus on the human right to health under IHRL, which I contend is well suited to afford legal recognition and protection to the nexus between marine biodiversity and human health.[158]

On this basis, the objective of this thesis is to develop a framework for the protection of the human health and marine biodiversity nexus under the right to health. To this end, I begin my research with an analysis of whether there is any pre-existing recognition, either in primary or secondary sources, of the importance of marine biodiversity for enjoyment of the right to health. From this baseline, I proceed to strengthen this relationship by highlighting the precise linkages between marine biodiversity and the various facets of the right to health. Once I establish that marine biodiversity is an important factor supporting enjoyment of the right to health, I analyse the resulting obligations that States (as duty bearers under IHRL) are subject to regarding management of the marine environment. I conclude that States are subject to a package of obligations under the right to health concerning protection of marine biodiversity. Finally, I demonstrate the value of these findings by applying them to a case study on deep seabed mining (DSM) in the Area.[159]

In selecting an appropriate case study, my key considerations were originality, personal interest and the potential to generate a paradigm shift around an issue or activity that poses a high risk to both human health and marine biodiversity. For these reasons, I posit that DSM offers a valuable and timely choice.[160] Scientific knowledge of marine biodiversity and specifically deep-sea benthic ecosystems is in its infancy. A ten-year marine census, which concluded in 2010 and involved almost 3000 researchers from 80 countries, determined that potentially as much as 90 percent of marine species remain undiscovered, while only a few percent of the deep sea's content has been analysed.[161] Nonetheless, as aptly noted by National Geographic, 'the race is on to mine the deep sea'.[162] The International Seabed Authority (ISA) — the regulatory body governing DSM in the Area — is currently in the advanced stages of developing the

[156]See ch 2 for further discussion on this point.
[157]For more information on the evolution of human rights and the environment, see Alan Boyle, 'Human Rights and the Environment: Where Next?' (2012) 23 European Journal Of International Law 613. My rationale for selecting international human rights law, rather than any other facet of international law, is set out in ch 2 sec 1.
[158]My rationale for selecting the human right to health is set out in ch 3 sec 1.
[159]The 'Area' is defined in Article 1(1) of UNCLOS (n 16) as 'the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction'.
[160]For more detailed discussion on case study selection, see ch 5 sec 2.
[161]Snelgrove (n 10).
[162]Jon Letman, 'The Race Is On to Mine the Deep Sea — But Scientists Are Wary' (*National Geographic*, 29 August 2018) <www.nationalgeographic.com/environment/2018/08/news-race-to-mine-deep-sea-drones-seafloor-environmental-impact/> accessed 18 December 2022.

regulatory regime which, once complete, paves the way for seabed mining to commence. This has raised widespread concern about the potential irreparable impacts of such activities on benthic ecosystems and the potential loss of a plethora of yet-undiscovered species.[163] The prevailing uncertainties regarding the environmental impacts of DSM has led various multinational companies and national governments to call for a moratorium on DSM until the risks are fully understood.[164] As stated by oceanographer Craig Smith, '[d]eep-sea mining could end up having the largest footprint of any single human activity on the planet in terms of area of impact'.[165] With the potential environmental impacts of seabed mining in mind, I evaluate whether the evolutionary interpretation of the right to health that I set out in Chapters 3 and 4 would require stronger protections for both ocean and human health than are currently found within the regulatory regime for DSM being developed under the ISA.

With any course of research, one must establish reasonable limitations on scope, whether such limitations are based on permissible length of research outputs, time or resource constraints, or areas of expertise. Given the interconnectedness of our increasingly globalised world and the complexity of causal links that connect decisions made at an international level to results felt at a local level, any exercise in setting boundaries necessarily means opting to exclude issues that are nonetheless important and relevant. For current purposes, the scope of this thesis is constrained to the discipline of international law and does not extend to the analysis of national legal frameworks, although such an examination would complement this body of research well. By extension, any consideration of the right to health refers to the encapsulation of the right under IHRL, and not under national law. Furthermore, this research focuses on developing an evolutionary interpretation of the right to health. Due to space and time constraints, I do not explore the enforceability of such an interpretation thereof. However, I acknowledge that this is an essential complementary line of research to operationalise my findings in this thesis. Finally, any consideration of obligations arising from the right to health is constrained to the obligations on States as the primary duty bearers under IHRL. This thesis does not consider the obligations that IHRL may impose on non-State

[163]Kathryn Miller and others, 'An Overview of Seabed Mining Including the Current State of Development, Environmental Impacts, and Knowledge Gaps' (2018) 4 Front Mar Sci <https://doi.org/10.3389/fmars.2017.00418> accessed 23 December 2022.
[164]Helen Reid, 'Google, BMW, AB Volvo, Samsung Back Environmental Call for Pause on Deep-sea Mining' (*Reuters,* 31 March 2021) <www.reuters.com/business/sustainable-business/google-bmw-volvo-samsung-sdi-sign-up-wwf-call-temporary-ban-deep-sea-mining-2021-03-31/> accessed 21 December 2022; Nic MacLellan, 'Fiji: Prime Minister Calls for 10-Year Moratorium on Seabed Mining to Allow Proper Scientific Research' (*Centre de Ressources sur les Entreprises et les Droits de l'Homme,* 20 August 2019) <www.business-humanrights.org/fr/derni%C3%A8res-actualit%C3%A9s/fiji-prime-minister-calls-for-10-year-moratorium-on-seabed-mining-to-allow-proper-scientific-research/> accessed 21 December 2022; Todd Woody, 'More Governments are Turning Against the Rush to Mine the Deep Sea' (*Bloomberg UK,* 7 November 2022) <www.bloomberg.com/news/articles/2022-11-07/more-governments-are-turning-against-the-rush-to-mine-the-deep-sea?leadSource=uverify%20wall> accessed 21 December 2022.
[165]Letman (n 162).

actors. Nonetheless, again I recognise this as an important and rapidly developing field of research that would complement my analysis in this thesis.

4. Contribution to field of study

My research provides an original and timely contribution to existing academic literature and the ongoing debate concerning the relationship between human rights and international environmental law. The timeliness of this research is exemplified by documents produced by both the former United Nations (UN) Special Rapporteur on Human Rights and the Environment,[166] and the CBD COP.[167] These documents reiterate the intrinsic connections between biodiversity and human rights, and biodiversity and human health, respectively, and call for further action to understand and respect these connections. Moreover, improved understanding of the nexus between human rights and biodiversity would support countries in realising several Sustainable Development Goals.[168]

In recent decades, a body of academic literature has developed on the intersection of human rights and the environment, with particular focus on a right to a healthy environment.[169] However, to date, relatively little academic research has been conducted on the intersection of human rights and biodiversity specifically (as distinct from the environment), and even less on the intersection of biodiversity and the right to health. A 2017 report by former UN Special Rapporteur Knox on the intersection of human rights and biodiversity constitutes one of the benchmark bodies of research in this area.[170] My research expands the body of literature in this area by exploring the connections between marine biodiversity and the right to health and offering clarity on the obligations that this relationship may impose on States as duty bearers under IHRL. It is important to note that, while my research focuses explicitly on the intersection of marine biodiversity and the right to health, any findings could potentially be extrapolated out to apply to all biodiversity generally. However, as I have conducted my research with an exclusive focus on marine biodiversity, I

[166]United Nations Human Rights Committee (HRC), 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) UN Doc. A/HRC/34/49.
[167]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2).
[168]The connection between the biodiversity and health nexus and the Sustainable Development Goals (SDGs) is highlighted in ibid (n 2) Preamble. SGDs supported by this research would include: Goal 2 ('end hunger achieve food security and improved nutrition and promote sustainable agriculture'), Goal 3 ('Ensure healthy lives and promote wellbeing for all at all ages'), and Goal 14 ('Conserve and sustainably use the oceans, seas and marine resources for sustainable development').
[169]See eg Dinah Shelton, 'Human Rights, Environmental Rights, and the Right to Environment' (1991) 28 Stanford Journal of International Law 103; Boyle (n 157); John Knox, 'The Past, Present, and Future of Human Rights and the Environment' (2018) 53 Wake Forest Law Review 649.
[170]HRC (n 166). See also Elisa Morgera, 'Dawn of a New Day? The Evolving Relationship Between the Convention on Biological Diversity and International Human Rights Law' (2018) 53 Wake Forest Law Review 691; Elisa Morgera, 'Fair and Equitable Benefit-Sharing at the Cross-Roads of the Human Right to Science and International Biodiversity Law' (2015) 4 Laws 803.

would not wish to declare my findings relevant to both marine and terrestrial biodiversity alike without conducting a subsequent course of analysis to substantiate such a claim.

Finally, my case study on DSM in the Area also offers a valuable contribution as, at the time of writing, there is a small emerging body of literature on the potential human rights implications of seabed mining.[171] Moreover, many companies and national governments are now calling for a moratorium on DSM until the totality of its impacts are better understood.[172] Most recently, French President Emmanuel Macron has called for a complete ban on DSM at the 27th Conference of the Parties to the CBD, in November 2022.[173] My research in Chapter 5 builds on existing scientific literature regarding the anticipated environmental impacts of seabed mining, and further explores the potential for these impacts to bear knock-on implications for human health and enjoyment of the right to health. In doing so, I highlight areas of inconsistency between IHRL and the draft regulatory regime for seabed mining under the ISA and offer policy recommendations on how inconsistencies maybe be rectified.

5. Thesis structure

This thesis comprises six chapters, inclusive of this introductory chapter. Subsequent chapters are structured as follows. In Chapter 2, entitled 'Conceptual Framework: The Case for a Human Rights Perspective and an Assessment of the Current Context', I fulfil two objectives. First, I set out my rationale for adopting a human rights framework through which to afford legal recognition to the human health and marine biodiversity nexus. Second, I explore the extent to which marine biodiversity has already been acknowledged as a core contributor to the realisation of human rights. The second section is broken down further into two component parts: an analysis of the confluence between human rights and environmental issues generally, followed by an analysis of the confluence between human rights and biodiversity, with a particular focus on marine biodiversity. I conclude that IHRL demonstrates a stronger awareness of the interconnections between human rights and the environment in general terms than of the interconnections between human rights and biodiversity. Furthermore, international biodiversity law and international health law demonstrate a stronger awareness of the human health and marine biodiversity nexus than IHRL.

[171]Julian Aguon and Julie Hunter, 'Second Wave Due Diligence: The Case for Incorporating Free, Prior, and Informed Consent into the Deep Sea Mining Regulatory Regime' (2019) 38 Stanford environmental law journal 3; Elisa Morgera and Hannah Lily, 'Public Participation at the International Seabed Authority: An International Human Rights Law Analysis' (2022) 31 Review of European Community & international environmental law 374; Katherine Seto and others, 'Seabed Mining Equity Dilemmas in the Pacific' (*Eco-Business,* 2 February 2022) <www.eco-business.com/opinion/seabed-mining-equity-dilemmas-in-the-pacific/> accessed 21 December 2022.
[172]Reid (n 164); MacLellan (n 164).
[173]Woody (n 164).

In Chapter 3, entitled 'Mapping the Overlap Between the Human Right to Health and Marine Biodiversity', I analyse the interconnections between the human right to health under IHRL and marine biodiversity. The purpose of this analysis is to ascertain whether the right to health can be interpreted in a manner that affords stronger protection to the human health and marine biodiversity nexus. To this end, this chapter comprises two sections. In the first section, I explore whether the human health and marine biodiversity nexus could justify extension of the right to health to include State obligations towards protection of marine biodiversity. I conclude that there are several lines of argument to support the conclusion that full realisation of the right to health requires States to act to protect the human health and marine biodiversity nexus. In the second section I build on this conclusion by conducting a systematic analysis of existing State obligations under the right to health to identify which of these could obligate States to take action towards better governance of marine biodiversity, or indeed give rise to new obligations under the right to health. I conclude that the human health and marine biodiversity nexus gives rise to a series of State obligations concerning the governance of marine biodiversity.

In Chapter 4, entitled 'Evaluating Marine Biodiversity Obligations Under the Right to Health', I build on the findings of Chapter 3. I synthesise the areas of overlap between the right to health and marine biodiversity, which I identify in Chapter 3, into a structured package of State obligations concerning management of the human health and marine biodiversity nexus. Specifically, In Chapter 4 I define three distinct groups of obligations: foundational, immediate and non-immediate obligations. For each obligation, I analyse its basis and normative content and, where possible, offers suggestions on how States may take steps towards its fulfilment.

Chapter 5 is entitled 'the Role of the Right to Health in Shaping the Regulatory Framework for Deep Seabed Mining in the Area'. In this chapter I build on the findings of Chapter 4 by applying the obligations defined therein to a case study on DSM in the Area. In doing so, I demonstrate that the regulatory regime being developed within the ISA to govern the exploitation of seabed mineral resources does not conform with the State obligations under the right to health, as outlined in Chapter 4. Through this process, I showcase how recognising the human health and marine biodiversity nexus as an intrinsic part of the right to health has the potential to generate a paradigm shift in how we think about ocean governance.

In Chapter 6, I summarise the key findings of my research, reiterate its contributions to the wider body of academic literature, and highlight additional complementary areas for future research.

Chapter 2

CONCEPTUAL FRAMEWORK: THE CASE FOR A HUMAN RIGHTS PERSPECTIVE AND AN ASSESSMENT OF THE CURRENT CONTEXT

As discussed in Chapter 1, there is a significant and developing body of scientific literature mapping out the interactions between humans and marine biodiversity, and the consequent impacts for human health.[174] My objectives for this chapter are twofold. First, I provide my rationale for adopting a human rights perspective to promote stronger recognition of the health and marine biodiversity nexus in law. Second, to discern the degree of alignment between the science and the law, I investigate the extent to which this nexus is already reflected within international human rights law (IHRL). To do so, I assess the extent to which the de facto relationship between environmental issues and the enjoyment of human rights is reflected in IHRL, and then proceed to assess how the relationship between biodiversity and human rights is reflected within IHRL. I conclude that, while environmental issues generally are now widely recognised as human rights issues, recognition of the role played by biodiversity (and marine biodiversity in particular) is in its infancy. Nonetheless, the role of biodiversity in supporting enjoyment of human rights is also starting to gain traction, with a body of pertinent State obligations emerging within both IHRL and international biodiversity law.

1. The case for a human rights perspective

In this section, I demonstrate why a human rights perspective offers a powerful tool that is well-suited to strengthen recognition of the human health and marine biodiversity nexus in law. I begin by critiquing the merits of a human rights perspective. I then proceed to highlight other complementary legal frameworks

[174] See ch 1 sec 2.

and mechanisms that could be used to protect human health and marine biodiversity linkages, including international environmental law, private law and rights of nature.

Before embarking on this analysis, I must highlight two key points. First, while I contend that IHRL is a valuable tool for protecting the interface between humans and the natural environment, I by no means consider IHRL a panacea for all environmental issues. Therefore, the approach I propose in this thesis should not be misinterpreted as being exclusive of or superior to other approaches. On the contrary, considering the scale of the environmental challenges we face today, such as global climate change, biodiversity loss and pollution, and their resultant impacts on human wellbeing, it would be naïve to assume that any one solution is capable of adequately addressing these myriad challenges. Instead, as discussed throughout this section, I argue that each body of law has both strengths and weaknesses and that collectively they have the potential to operate synergistically to protect the human health and biodiversity interface. Therefore, my research supplements and complements alternative bodies of law (discussed in Section 1.2 below) by providing an elevated impetus for biodiversity conservation and identifying synergies between different areas of governance (e.g., ocean governance and public health).

Second, in this section I discuss the merits of using a human rights perspective to strengthen protection of the human health and marine biodiversity nexus. I have consciously opted for the term 'human rights perspective' and avoided the widely-used term 'human rights-based approach' (HRBA), the latter of which continues to generate a large body of scholarly debate.[175] I have done so because while there is not yet consensus concerning the precise form or content of an HRBA,[176] the term is increasingly used to refer to the application of the holistic package of rights and responsibilities under IHRL in a specific context or to a particular issue, thus enabling rights holders to realise the full extent of their entitlements, or supporting duty bearers to meet the full extent of their responsibilities.[177] By contrast, in this thesis I focus exclusively on the human right to health. Therefore, while I acknowledge the wealth of debate concerning HRBAs, I neither engage nor associate with it here, since I adopt a narrower focus that only considers the right to

[175]See eg Jessica Campese and others, *Rights-based Approaches: Exploring Issues and Opportunities for Conservation* (Center for International Forestry Research (CIFOR) 2009); Choondassery Yesudas, 'Rights-based Approach: The Hub of Sustainable Development' (2017) 8 Discourse and Communication for Sustainable Education 17; Puneet Pathak, 'Human Rights Approach to Environmental Protection' (2014) 7 OIDA International Journal of Sustainable Development 17.

[176]Morten Broberg and Hans-Otto Sano, 'Strengths and Weaknesses in a Human Rights-Based Approach to International Development – an Analysis of a Rights-Based Approach to Development Assistance Based on Practical Experiences' (2018) 22 The international journal of human rights 664, 665.

[177]Ibid 667-668; UNGA, 'Technical Guidance on the Application of a Human Rights-Based Approach to The Implementation of Policies and Programmes to Reduce and Eliminate Preventable Mortality and Morbidity of Children Under 5 Years of Age' (2014) UN Doc A/HRC/27/31, paras 18-21.

health — an issue which may or may not be subsumed under the broader category of HRBAs depending on the perspective of the reader.

1.1. Critiquing the merits of using human rights to protect the human health and marine biodiversity nexus

In this section, I address three advantages and two potential disadvantages of using IHRL as a tool for environmental protection. The three advantages of human rights that I discuss are the legal and socio-political priority status that they are generally afforded, their focus on promoting equitable decision-making processes in addition to substantive outcomes, and the availability of recourse mechanisms to enable individuals to challenge infringements of their rights. The two characteristics of human rights that are commonly perceived as disadvantages are their inherently anthropocentric nature, and the broad and sometimes vague language of human rights provisions. Nonetheless, for reasons discussed in this section, I posit that, on balance, IHRL holds significant potential as a tool to protect marine biodiversity and the ecosystem services that it provides.

Perhaps the most obvious advantage of using human rights to drive protection of biodiversity is the priority status that they are afforded at both a national and international level, meaning issues captured under the umbrella of human rights are elevated above competing legal norms and policy considerations. As stated by Kotzé: '[h]uman rights, when they lay claim to a value or good, that claim or value is automatically raised to an elevated juridical level (usually to the constitutional level), thus affording greater protection, but simultaneously also a greater justificatory basis to claim entitlements'.[178]

Thus, by attaching marine biodiversity to the human rights agenda, marine protection is automatically escalated up the political agenda. Tasioulas observed that:

> Human rights discourse is distinctive in that it concerns not mere interests to be factored into a cost-benefit analysis, but rather universal rights that impose obligations on others and which are, therefore, not readily susceptible to trade-offs against countervailing considerations.[179]

[178]Louis Kotzé, 'Human Rights and the Environment in the Anthropocene' (2014) 1 The Anthropocene Review 252, 253.
[179]John Tasioulas, 'The Minimum Core of the Human Right to Health' (The World Bank 2017) <https://elibrary.worldbank.org/doi/pdf/10.1596/29143> accessed 22 December 2022, 24.

Legal scholars suggest that this priority status afforded to human rights has a basis both in law and in socio-political forces.[180] At a national level, legal priority stems from the fact that human rights are often embodied in national constitutions, thus granting them constitutional supremacy. Today, nearly all constitutions worldwide promise to protect rights and fundamental freedoms to some extent.[181] It is a basic principle of constitutional law that the constitution is the supreme legal instrument within national legal frameworks and that any other legal instruments, decisions or actions that contradict the constitution are void.[182]

While there is therefore a clear legal basis for human rights to be afforded legal priority in national legal frameworks, it is less clear that they enjoy automatic legal priority in international law. Unlike the hierarchical nature of national legal frameworks, international law generally employs a flatter structure in which one body of international law does not often enjoy automatic priority over others. The exception to this rule is legal norms that are deemed peremptory norms of general international law (*jus cogens*): norms that are universally obligatory and may only be limited or modified by subsequent norms that also enjoy the status of *jus cogens*.[183] The list of norms that may be considered peremptory in international law remains a heated subject of debate and, while several human rights are widely understood to have attained this status (e.g., the prohibitions against torture, inhuman and degrading punishment, and slavery), it is similarly well understood that this does not extend to the majority of IHRL, including the rights to life or health.[184] Nonetheless, while there is little tangible legal basis on which to grant the collective body of human rights priority status in international law, that does not mean that they are perceived as equal to other legal norms in practice. Indeed, much of the weight that human rights are afforded derives not from their legal status, but from their socio-political standing. As posited by Shelton, 'human rights are seen as maximum claims on society, elevating concern for the environment above a mere policy choice that may be modified or discarded at will'.[185] Thus, by classifying protection of marine biodiversity as a human rights issue, it

[180]Dinah Shelton, 'Human rights and the environment: Problems and possibilities' (2008) 38 Environmental policy and law 41, 44; Daniel Bodansky, 'Introduction: Climate Change and Human Rights: Unpacking the Issues' (2010) 38 Ga J Int'l & Comp L 511, 514.
[181]Wayne Sandholtz, 'Treaties, Constitutions, Courts, and Human Rights' (2012) 11 Journal of Human Rights 17, 19.
[182]David Boyd, *The Environmental Rights Revolution: A Global Study of Constitutions, Human Rights, and the Environment* (UBC Press 2012), 28-29.
[183]Vienna Convention on the Law of Treaties (adopted 23 May 1969, entered into force 27 January 1980) 1155 UNTS 331 (Vienna Convention) art 53.
[184]Erika De Wet, 'Jus Cogens and Obligations Erga Omnes' in Dinah Shelton (ed), *The Oxford Handbook of International Human Rights Law* (Oxford University Press 2013), 546.
[185]Shelton, 'Human Rights and the Environment: Problems and Possibilities' (n 180) 44.

assumes an elevated position in public perception and policy discourse, taking on a moral imperative as well as a legal one that further incentivises government action.[186]

Another core strength of human rights, in addition to the priority that they are often afforded, is their focus on promoting not only substantive outcomes, but also equitable decision-making processes.[187] The Aarhus Convention pioneered a now widely-accepted three-pillar model for participation in environmental decision making that mandates stakeholder access to environmental information, public participation in environmental decision making and access to justice.[188] This model has now been deemed a general State obligation under IHRL,[189] and declared by some to be an 'emerging customary duty under international law'.[190] The procedural rights afforded by IHRL promote democratic values in environmental governance and help grant a voice to groups that have traditionally been excluded from decision-making processes.[191] This is particularly important considering that many vulnerable and traditionally marginalised groups, including indigenous peoples, women and children, often face the highest risks from environmental harm.[192] Strengthening the relationship between human rights and environmental concerns provides such groups with tools to seek recourse through both national and international platforms,[193] circumventing the potentially exclusive issue of standing that applies to much conventional environmental law at national and international levels.[194]

Finally, another strength of linking environmental issues to IHRL is that doing so unlocks recourse mechanisms established under international human rights treaties, enabling individuals to challenge infringements of their rights.[195] Many consider this a notable advantage over international environmental law frameworks which generally lack equivalent mechanisms for individual recourse.[196] Nonetheless, a counterpoint to this perceived advantage may be that that while IHRL offers mechanisms for individuals to

[186]Ibid; Bodansky (n 180) 518; Paul Gready, 'Rights-Based Approaches to Development: What is the Value-Added?' (2008) 18 Development in practice 735, 737.
[187]Shelton, 'Human Rights and the Environment: Problems and Possibilities' (n 180) 44.
[188]Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (adopted 25 June 1998, entered into force 30 October 2001) 2161 UNTS 445 (Aarhus Convention), arts 4-9.
[189]HRC (n 166) para 27.
[190]Jeff Ardron, Henry Ruhl and Daniel Jones, 'Incorporating Transparency Into the Governance of Deep-Seabed Mining in the Area Beyond National Jurisdiction' (2018) 89 Marine policy 58, 63; Klaas Willaert, 'Public Participation in the Context of Deep Sea Mining: Luxury or Legal Obligation?' (2020) 198 Ocean & Coastal Management 105368 <https://doi.org/10.1016/j.ocecoaman.2020.105368> accessed 22 December 2022, 4.
[191]Jonas Ebbesson, 'Public Participation' in Lavanya Rajamani and Jacqueline Peel (eds), *The Oxford Handbook of International Environmental Law* (Oxford University Press 2021), 352; Gready (n 186) 742.
[192]IPBES (n 54) 15; Pathak (n 175) 18.
[193]Pathak (n 175) 18.
[194]Ibid 19.
[195]Shelton, 'Human Rights and the Environment: Problems and Possibilities' (n 180) 44; Bodansky (n 180) 517.
[196]Shelton, 'Human Rights and the Environment: Problems and Possibilities' (n 180) 44.

seek recourse for infringements of their rights, international human rights bodies have a limited remedial mandate, leaving offending States free to disregard any findings of rights infringements.[197] While the truth of this counterpoint cannot be denied, the same can be said of much of public international law, and the political pressure that comes with the finding of a human rights infringement should not be underestimated.

While there are therefore multiple advantages to applying a human rights perspective to environmental issues, such an approach is not without criticism. The basis for one of the most frequently cited criticisms is visible in the words of Principle 1 of the Stockholm Declaration: 'an environment of a quality *that permits a life of dignity and wellbeing*'.[198] Namely, some perceive human rights as fundamentally anthropocentric by only ascribing value to nature based on its contribution to human wellbeing, rather than recognising any intrinsic value in non-human life.[199] For example, Joshi expressed the view that the emergence of human rights:

> silently advocates a world order which places intrinsic human existence at the top of the ladder, establishing the position that humans are the masters and owners of the earth by making the existence of other living beings merely instrumental — in the service and for the use of superior human beings.[200]

This perspective positions a healthy environment simply as another precondition of human wellbeing, along with adequate food, clean water and shelter.[201] This, Kotzé argued, represents an anthropocentric and utilitarian perspective on environment-oriented rights, where such rights serve to 'improve access to and expand human claims to resources with a view to ensuring economic development'.[202] By contrast, Kotzé suggested that:

> An ecocentric formulation of environment-related rights instead sees the environment as a condition to life, thus placing limitations on individual freedoms. Stopping short of giving rights to the environment (…) ecocentric rights accordingly are more inclined towards limitations of human entitlements to resources.[203]

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[197]Ibid.
[198] Emphasis added.
[199]Anna Grear, 'Human Rights and the Environment: A Tale of Ambivalence and Hope' in Douglas Fisher (ed), *Research Handbook on Fundamental Concepts of Environmental Law* (Edward Elgar Publishing 2016), 152; Susana Borràs, 'New Transitions from Human Rights to the Environment to the Rights of Nature' (2016) 5 Transnational Environmental Law 113, 115.
[200]Pooran Joshi, 'Human Rights, Wild Life and Environment Protection' (2017) 47 Social Change 1, 1-2.
[201]Kotzé (n 178) 258.
[202]Ibid.
[203]Ibid.

He further stated:

> An ecological reorientation of rights evinces the potential that human rights could have to refocus attention away from serving human needs exclusively, to an approach that instead seeks to ensure care for human wellbeing, while simultaneously respecting the limits of Earth's life-supporting systems and the ecological integrity of other species.[204]

In line with this ecological reorientation of rights, recent decades have witnessed a paradigm shift in understanding of the importance of a healthy environment for the fulfilment and protection of human rights. The traditional view granting humans the moral prerogative to use the natural world as necessary to maintain human wellbeing is giving way to a more progressive perspective that places humans as a component part of the wider natural environment and recognises the direct relationship between human and environmental health. This is evidenced by the emergence of the human right to a healthy environment, in addition to the reframing of existing human rights to acknowledge their intrinsic link to environmental health.[205] In June 2022, the UN General Assembly adopted a milestone resolution officially recognising a human right to a clean, healthy and sustainable environment for all.[206] As stated by Westra, '[a] position which places "human interests," let alone human rights, in conflict with ecological concerns is both misguided and ultimately hazardous to the very human rights it intends to privilege'.[207]

In the interests of clarity, I posit that this reinterpretation of human rights to position humans as a symbiotic component of the natural world rather than entitled owners of natural resources, while undoubtedly positive, does not strictly divest human rights of their anthropocentric label. One possible test would be to determine whether the 'greening' of human rights could conceivably afford legal protection to components of nature that have no known or perceived benefit to humankind: a question which I propose must be answered in the negative. Nonetheless, I do not suggest that this renders a human rights perspective unsuitable to address environmental issues generally, or the human health and marine biodiversity nexus specifically. On the contrary, it is a positive development that demonstrates the dynamic nature of human rights and their ability to adapt to take account of changing circumstances and improved scientific knowledge. The practical

[204]Ibid 265.
[205]John Knox, 'The United Nations Mandate on Human Rights and the Environment' (2017) 42 Revue Juridique de l'Environnement 251.
[206]UNGA, 'The Human Right to a Clean, Healthy and Sustainable Environment' (n 19).
[207]Laura Westra, 'Ecological Integrity and Biological Integrity: The Right to Life and the Right to Health in Law' (2009) 18 Transnational Law & Contemporary Problems 3, 18.

outcome is that human rights are now better positioned than ever before to address the mutual interests of humans and the environment, rather than the former at the expense of the latter. Furthermore, human rights frameworks serve an important role in helping to translate ecological concerns into terms that are applicable to humans, thus granting those concerns greater consideration and weight within existing governance structures.[208]

Finally, the relevance of the anthropocentric argument is diminished by the fact that my research focuses on the intersection of human health and environmental protection. Thus, the objective of my research is not purely to mobilise human rights to achieve environmental ends, but rather to yield mutual benefits for both humans and marine biodiversity to the extent that they overlap. Specifically, within the scope of my research I do not engage with the question of whether human rights could or should be used to protect the natural environment outside the sphere of human interest or influence.

In addition to criticism that human rights are fundamentally anthropocentric and thus ill-suited to addressing environmental issues, they also receive criticism for being vague because they do not prescribe in detail what level of environmental protection is required.[209] While this may be true, this overlooks the role and value of human rights. The often sparse nature of human rights provisions grants them the flexibility to remain relevant in an ever-changing world, enabling them to meet new challenges and factor in advancing knowledge and science.[210] In the context of environmental issues, one may argue that the role of human rights is to set baselines and targets that then guide government priorities and law making.[211] Viewed thusly, human rights must exist in a mutually supportive manner with other bodies of environmental law to achieve common ends. For example, human rights law sets government agendas and raises environmental issues on the priority list, while environmental regulation establishes the tangible regulatory frameworks required to achieve the level of environmental quality necessary for full realisation of human rights. Moreover, at an international level, human rights law and environmental law operate harmoniously to tie together all stakeholders; human rights creating vertical rights and responsibilities between States and individuals within their jurisdiction, and international environmental law creating horizontal ties between States. On this basis, IHRL and international environmental law are logical allies. That is not to say, of course, that environmental and human rights goals always align. However, as our understanding of the ties between environmental and human health develops (as embodied in contemporary integrated management models

[208]Kotzé (n 178) 262.
[209]Boyd (n 182) 33.
[210]Ibid 34.
[211]Shelton, 'Human Rights and the Environment: Problems and Possibilities' (n 180) 46.

such as the ecosystem approach and the One Health approach) there is hope that grounds for such conflict will continue to diminish.

In summary, I contend that human rights offer a valuable framework through which to address environmental issues (including the human health and marine biodiversity nexus), on the basis that they have the potential to prioritise environmental issues in government agendas, to promote democratic and inclusive values in environmental decision-making, and to unlock additional mechanisms for individuals to seek recourse for environmental harm. Conversely, a human rights perspective may be criticised for its inherently anthropocentric nature and the broad language in which they may be framed. However, the potential for their anthropogenic character to limit the environmental protection they may offer wanes as our understanding of earth systems deepens, and the expansive nature of human rights empowers them to remain relevant and impactful in an evolving world.

1.2. Complementary legal frameworks to protect the human health and marine biodiversity nexus

Having discussed the pros and cons of employing human rights law to tackle environmental issues, in this section I briefly highlight several alternative and complementary legal frameworks that may be used to protect the environment generally, and the nexus between human health and marine biodiversity specifically. In particular, I consider environmental law, private law and rights of nature. For each, I highlight comparative strengths and weaknesses, and suggest how they may operate in a mutually supportive manner.

As the name suggests, environmental law is the foundational legal framework for environmental protection. It establishes necessary infrastructure to regulate potentially harmful human activities by, amongst other things, establishing regulatory bodies, prescribing decision-making processes, and enabling ongoing monitoring and inspection of such activities. Moreover, it establishes baselines and precise standards, such as water quality standards or maximum permissible levels of harm from industry. As such, environmental law can operate in harmony with human rights law by providing the tools required to achieve levels of environmental protection necessary for full enjoyment of human rights. The issue of marine biodiversity conservation is no exception, and at the time of writing, States are negotiating an international treaty for the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (ABNJ).[212] However, history has demonstrated that, while environmental law has achieved several victories

[212]UNGA, 'International legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction' (n 30).

for the environment, overall it has proven insufficient to stem the tide of environmental degradation.[213] Thus, as environmental law helps pursue ends required for the full enjoyment of human rights, human rights law also plays an essential role in raising the political incentive to develop and effectively implement environmental law, while also helping to inform the substance of environmental law by requiring mechanisms that guarantee rights holders access to environmental information, participation in environmental decision making and access to justice.[214] Together, environmental and human rights law achieve a degree of protection for human and environmental wellbeing that is greater than each could achieve alone.

Private law also offers a potential avenue for environmental protection through the use of market mechanisms such as payments for ecosystem services (PES) programmes. On the one hand, mechanisms like PES offer a valuable tool for environmental protection by creating a direct financial incentive for humans to act in a sustainable manner and assigning a financial value to ecosystem services that may otherwise be undervalued and overlooked.[215] However, unless designed and implemented carefully, such mechanisms risk perpetuating environmental injustice by enabling wealthy land owners to accrue additional wealth, while those who worked the land that is now subject to conservation are forced to find another source of income, without any remuneration for the loss of their employment.[216] Conservation contracts are also often criticised for their lack of transparency as most of them are private.[217] Therefore, while conservation contracts such as PES programmes can offer a valuable tool to complement both human rights and environmental law in the protection of the natural environment and the ecosystem services humans enjoy, I contend they can also contravene an array of human rights, including the rights to food and to work, procedural environmental rights, and myriad indigenous and cultural rights. Nonetheless, provided necessary safeguards are met, PES and other market mechanisms can play a valuable role in protecting ecosystem services necessary for the enjoyment of human rights.

The final alternative and complementary legal framework that I consider is a movement towards establishing rights of nature. This movement arises from a growing understanding of the interconnectedness of all life on Earth and the inherent value of nature, twinned with a desire to recontextualise humankind

[213]David R. Boyd, *The Rights of Nature: A Legal Revolution That Could Save the World* (ECW Press 2017), preface.
[214]HRC (n 166) para 27.
[215]Tanya Hayes and others, 'Can Conservation Contracts Co-exist with Change? Payment for Ecosystem Services in the Context of Adaptive Decision-Making and Sustainability' (2014) 55 Environmental Management 69, 70.
[216]Francesca McGrath, Luis Carrasco and Beria Leimona, 'How auctions to allocate payments for ecosystem services contracts impact social equity' (2017) 25 Ecosystem services 44, 45.
[217]Marcos Orellana and others, 'Global Environmental Protection and Transnational Conservation Contracts', *American Society of International Law Proceedings of the Annual Meeting* (Cambridge University Press 2012), 507-508.

within the global ecosphere.[218] As noted by Boyd, humans are interdependent with nature, not independent from it.[219] Therefore, it is essential that our legal system evolves from traditional models that view the natural world as the dominion of humankind, towards more contemporary models that instead afford appropriate legal value to non-human life. To date, rights of nature have been established within several national legal frameworks. In 2008, Ecuador became the first country to codify rights of nature into its national constitution[220] and several other countries, including Bolivia and Uganda, have also since taken legislative action to attribute rights to nature.[221] Where such rights are embedded in national constitutions, they will hold the same constitutional priority status that human rights are often afforded in national law. At an international level however, rights of nature do not yet enjoy a comparable level of acceptance to human rights and, as with any body of law, their ability to drive change must be preceded by a period of development during which the normative content of such rights is established and their degree of acceptance reinforced. Thus, in the short term, we must look to more mature legal frameworks, such as human rights law, to protect the natural environment and its interface with humankind. However, over the long term, rights of nature have the potential to drive much-needed global systemic change regarding how we perceive and protect the natural world, and they may do so operating in parallel with environmental law, private law and human rights law.

In summary, it is clear that there are multiple bodies of law, several of which I considered in this section, that have the potential to operate in harmony to protect the environment (including marine biodiversity) and essential ecosystem services. For the reasons highlighted in this section above, in this thesis I focus specifically on the potential role of IHRL in this capacity. In the next section, I showcase the extent to which the nexus between human health and biodiversity is already recognised and protected by IHRL. This serves as the baseline on which my research builds.

2. The confluence of the human health and marine biodiversity nexus with human rights law

Based on the intrinsic human health and marine biodiversity nexus highlighted in the previous chapter, in this section I demonstrate that State obligations under IHRL to respect, protect and fulfil the right of everyone to the enjoyment of the highest attainable standard of physical and mental health (i.e., the right to health) must logically extend to the protection of marine biodiversity. In the remainder of this section, I

[218]Harriet Harden-Davies and others, 'Rights of Nature: Perspectives for Global Ocean Stewardship' (2020) 122 Marine Policy 104059 <https://doi.org/10.1016/j.marpol.2020.104059> accessed 23 December 2022, 1-2.
[219]Boyd (n 213) 9.
[220]Nathalie Rühs and Aled Jones, 'The Implementation of Earth Jurisprudence Through Substantive Constitutional Rights of Nature' (2016) 8 Sustainability 174 <https://doi.org/10.3390/su8020174> accessed 23 December 2022, 10.
[221]Harden-Davies and others (n 218) 1-2.

begin with an assessment of the extent to which environmental issues are recognised as human rights concerns. I then narrow my focus to analyse whether biodiversity — in particular marine biodiversity — is acknowledged as a core component underpinning the enjoyment of human rights generally. In Chapter 3, I narrow my scope further to assess the current legal relationship between the right to health and marine biodiversity, and present my rationale for strengthening this relationship.

2.1. Human rights and the environment

The objective of this section is to examine the extent to which IHRL currently acknowledges the relevance of environmental factors for enjoyment of human rights. I demonstrate that three distinct approaches have emerged towards integrating environmental factors into IHRL: 'greening' of existing human rights, establishing procedural environmental rights, and developing a stand-alone right to a healthy environment. This analysis is an important backdrop for Section 2.2. where I narrow my focus further to assess the extent to which biodiversity is recognised as foundational to the enjoyment of human rights.

2.1.1. *Demystifying the concepts of the 'environment' and 'biodiversity'*

Before I examine the degree of connectivity between IHRL and the environment, I must first consider what the term 'environment' encompasses, followed by a brief comparison to the term 'biodiversity'. This is an essential prerequisite to any argument that advocates for legal recognition of biodiversity within the sphere of IHRL, as an interlinked but distinct concept from the environment. The key conclusion I substantiate below is that, while biodiversity and the environment are closely related, they are distinct concepts and must not be considered interchangeable in every instance. Therefore, while State obligations towards the environment under IHRL may potentially extend to biodiversity, one should not automatically assume that obligations concerning the environment may automatically be extended to biodiversity in every instance. In each situation, one must ascertain the precise meaning of 'environment' to determine whether the corresponding legal norm can be extended to biodiversity.

Despite the breadth and prominence of international environmental law today, there is no universal or readily available definition of what the term 'environment' encompasses. While environmental treaties often specify the environmental impact that they seek to protect against, they generally do not define the term 'environment' itself, and any definition that may be inferred from their text would likely only elucidate the meaning within the context of each specific treaty.[222]

[222]Patricia Birnie, Alan Boyle and Catherine Redgwell, *International Law and the Environment* (3rd edn, Oxford University Press 2009), 5.

Moreover, any legal reference to the 'environment' should not be presumed to be synonymous with the scientific conception of the natural environment, or 'nature'. The latter is widely recognised as a 'balance or some sort of equilibrium state unless disturbed by some external force, whether by human or some other exotic species'.[223] While the concept of the 'environment' may indeed include the natural environment, it also encompasses concepts such as the socially constructed environment, which comprises the built environment such as roads and buildings, and social environments such as the constructs of wealth, poverty and ethnicity.[224] At the interface of these natural and social environments lies an area of mutual influence, where human environments and activities impact on the natural environment and vice versa.

It is this interface that environmental law often seeks to regulate: to manage human interactions with their environment — natural or otherwise — that can cause harm to humans. In many instances, the harm is usually caused by human action, such as unsustainable exploitation of natural resources, pollution, emission of greenhouse gases, production and use of chemicals and other toxic substances, and disposal of waste. Therefore, the environment, within the context of environmental law, does not only refer to the natural environment, but also to socially constructed environments and any unit of space that falls within the direct sphere of human interest. This understanding is reflected in the preamble to the 1972 Declaration of the United Nations Conference on the Human Environment (the Stockholm Declaration), which reads: 'both aspects of man's environment, the natural and the man-made, are essential to his wellbeing and to the enjoyment of basic human rights'.[225] Therefore, in comparing the term 'environment' as used in a legal sense to the term 'natural environment' as used in a scientific sense, it is apparent that the former is broader insomuch as it also includes artificial or socially constructed environments. This distinction is important when considering how biodiversity relates to the term 'environment' as used in a legal sense.

Unlike the term 'environment', the term 'biodiversity' enjoys greater clarity and is defined within the Convention on Biological Diversity (CBD) as 'the variability among living organisms from all sources' including 'diversity within species, between species and of ecosystems'.[226] Biodiversity is not synonymous with 'biological resources'. The latter are the tangible living organisms that collectively compose ecosystems.[227] Biodiversity, however, is an intangible attribute of nature that refers to the diversity of living

[223]Kevin. Archer, 'Chapter 45: Social Constructions of the Environment' in J. P. Stoltman (ed), *21st Century Geography: A Reference Handbook*, vol 2 (SAGE Publications, Inc. 2012), 502.
[224]Ibid 499.
[225]Stockholm Declaration on the Human Environment, in Report of the United Nations Conference on the Human Environment, (1972) UN Doc. A/CONF. 48/14/REV1, at 2 and Corr. 1 (Stockholm Declaration) preamble.
[226]CBD (n 22) art 2.
[227]Ibid.

organisms, their genetic resources and the ecosystems that they compose.[228] Biodiversity facilitates ecosystem resilience by enabling ecosystems to adapt to changing circumstances and thus continue to provide ecosystem services necessary for the maintenance of life on earth.[229] To protect biodiversity, it is essential to protect the tangible biological resources themselves in addition to the balance of the ecosystems that they comprise. In summary, biodiversity is a core attribute of the natural environment, and a more specific term than 'environment'. This is an important distinction to bear in mind and one that I revisit as necessary throughout the remainder of this chapter when considering whether environmental obligations under IHRL may also extend to biodiversity.

2.1.2. *The current degree of interconnection between human rights and the environment*

Human health and wellbeing is fundamentally and intrinsically linked to the environment (including the natural environment and biodiversity) via a complex network of interactions. The natural environment provides the basic ecosystem services necessary for human survival, in addition to natural resources that facilitate economic growth and poverty eradication. Conversely, the natural environment can also present significant threats to human wellbeing in various ways, from extreme weather events to a diverse and evolving array of pathogens. Moreover, actions to protect the natural environment (such as establishment of conservation areas) can also impact the enjoyment of human rights if improperly managed, for example by resulting in the unlawful acquisition of land for conservation and the forced displacement of people living on such land.[230] And yet, science notwithstanding, the integration of environmental considerations into IHRL is a relatively recent development. The 1948 Universal Declaration on Human Rights (UDHR) does not contain the words 'environment' or 'nature', let alone 'biodiversity' or 'ecosystem'. At the time of its drafting, there was little appreciation for the harm that humans are capable of inflicting on the world around them and, by extension, themselves.[231]

The 1960s witnessed a surge in understanding of environmental science and Earth systems, and the concurrent emergence of environmental law as a distinct field.[232] Yet, within the field of IHRL, there was little reflection of this increased understanding within the International Covenant on Civil and Political Rights (ICCPR) and the International Covenant on Economic, Social and Cultural Rights (ICESCR), which were adopted in 1966. The only tangible acknowledgement of the human and environment interface within either of these landmark instruments is in Article 12(2)(b) of the ICESCR regarding the right to health,

[228]Ibid.
[229]HRC (n 166) para 10.
[230]Ibid para 58.
[231]HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2012) UN Doc A/HRC/22/43, para 7.
[232]Grear (n 199) 149.

which provides that steps to be taken by States towards the realisation of the right to health shall include '[t]he improvement of all aspects of environmental and industrial hygiene'. Nonetheless, the significance of this statement should not be underestimated, as it heralds the beginning of a paradigm shift in the relationship between human rights and environmental law and constitutes the first acknowledgement of this relationship in an international legally binding instrument. The text of Article 12(2)(b) of ICESCR reflects a budding recognition of a direct causal relationship between environmental factors and the enjoyment of human rights.[233]

The next substantive association between environmental health and human rights can be traced to Principle 1 of the 1972 Stockholm Declaration, which stated that '[m]an has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and wellbeing'.[234] As noted by Grear, 'according to this formulation, a healthy environment is understood to be a precondition for the fulfilment of human rights'.[235] Since the Stockholm Declaration, recognition of the human rights and environment nexus has developed significantly and it is now widely accepted that a healthy environment is a prerequisite to the full enjoyment of various human rights.[236] This was concisely summarised by Vice President Justice Weeramantry in his separate opinion in the *Gabcikovo-Nagymaros* case heard by the International Court of Justice:

> The protection of the environment is (…) a vital part of contemporary human rights doctrine, for it is *sine qua non* for numerous human rights such as the right to health and the right to life itself. It is scarcely necessary to elaborate on this, as damage to the environment can impair and undermine all the human rights spoken of in the *Universal Declaration on Human Rights* and in other human rights instruments.[237]

To date, legal academic discourse generally acknowledges three distinct approaches to integrating human rights and environmental factors.[238] The first hinges on the recognition that environmental protection is key

[233]Committee on Economic, Social and Cultural Rights (ESCR Committee), 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (11 August 2000) UN Doc E/C.12/2000/4, para 15.
[234]Grear (n 199) 151.
[235]Ibid.
[236]Bridget Lewis, 'Environmental Rights or a Right to the Environment? Exploring the Nexus Between Human Rights and Environmental Protection' (2012) 8 Macquarie Journal of International and Comparative Environmental Law 36, 37.
[237]*Gabcikovo-Nagymaros Project (Hungary v Slovakia) (Separate Opinion of Vice-President Weeramantry)*, [1997] ICJ Rep 92, as cited in ibid, 37-38.
[238]Alan Boyle and Michael Anderson, *Human Rights Approaches to Environmental Protection* (Oxford University Press 1996), 4; Dinah Shelton, 'Human Rights, Health and Environmental Protection: Linkages in Law and Practice' (2007) 1 Hum Rts & Int'l Legal Discourse 9, 10; Linda Leib, *Human Rights and the Environment: Philosophical, Theoretical and Legal Perspectives* (BRILL 2011), 71.

to the realisation of existing substantive human rights, such as the rights to life, to health and to food and water; this is reflected in Principle 1 of the Stockholm Declaration.[239] On this basis, the first approach promotes the 'greening' of existing human rights to tackle environmental threats to enjoyment of human rights.[240] This approach has since been reinforced in multiple human rights instruments and by human rights bodies, and over time has grown with the state of scientific knowledge to reflect a strong awareness of the human-environment nexus. The 1989 Convention on the Rights of the Child recognises that environmental pollution threatens children's enjoyment of the right to health.[241] More recently, the 2012 Association of Southeast Asian Nations (ASEAN) Human Rights Declaration acknowledges that protection and sustainable use of the environment is essential for enjoyment of all the fundamental rights protected within the Declaration, including the rights to life, health, an adequate standard of living, and development.[242]

In 2018, the Human Rights Commission stated in its General Comment No.36 that:

> Environmental degradation, climate change and unsustainable development constitute some of the most pressing and serious threats to the ability of present and future generations to enjoy the right to life. (…) Implementation of the obligation to respect and ensure the right to life, and in particular life with dignity, depends, inter alia, on measures taken by States parties to preserve the environment and protect it against harm, pollution and climate change caused by public and private actors.[243]

This statement represents one of the most advanced and holistic acknowledgements of the human rights and environment nexus by a human rights treaty body to date. While general comments are not inherently legally binding, the unique position held by human rights treaty bodies as the primary interpreters of such treaties means that their outputs can represent 'subsequent practice' in accordance with Article 31(3)(b) of

[239]Shelton, 'Human Rights, Health and Environmental Protection: Linkages in Law and Practice' (n 238) 10; Grear (n 199) 151; Leib (n 238) 71.
[240]Leib (n 238) 71-72.
[241]Convention on the Rights of the Child (adopted 20 November 1989, entered into force 2 September 1990) 1577 UNTS 3 (CRC) art 24(2)(c). At the time of finalising this thesis, the Committee on the Rights of the Child has opened global consultation on the first draft of General Comment No.26, entitled 'Children's Rights and the Environment With a Special Focus on Climate Change' <www.ohchr.org/en/documents/general-comments-and-recommendations/draft-general-comment-no-26-childrens-rights-and> accessed 22 December 2022. This draft general comment contains several significant pronouncements on the importance of a healthy environment, including biodiversity, for the enjoyment of a variety of human rights.
[242]'ASEAN Human Rights Declaration' (adopted 18 November 2012) <https://aichr.org/key-documents/> accessed 23 December 2022, art 36.
[243]HRC, 'General Comment No.36 on Article 6 of the International Covenant on Civil and Political Rights, on the Right to Life' (2018) UN Doc CCPR/C/GC/36, para 62.

the Vienna Convention on the Law of Treaties.[244] As such, general comments can provide context for interpreting and expanding the normative content of human rights treaty obligations.

The second approach to integrating human rights and environmental factors hinges on the realisation that environmental harm and the consequences of decision making pertaining to environmental management can adversely impact a broad range of actors. Thus, everyone should have the right to participate in environmental decision making. This approach therefore revolves around the establishment of procedural environmental rights.[245] This is clearly supported in Principle 10 of the 1992 Rio Declaration on Environment and Development, which states that:

> Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.[246]

While Principle 10 is an important milestone in the emergence of procedural environmental rights, it is notable that the text does not explicitly frame access to information, public participation and access to justice as 'rights'. Nonetheless, the principles it created were restated in human rights language in the 1998 Aarhus Convention, solidifying their nature as legally binding human rights; these include the right of access to environmental information, the right to participation in environmental decision making and the right to access to justice concerning environmental matters.[247] As of 16 October 2017 there were 47 parties to the Convention[248] and, since its entry into force, the Aarhus Convention Compliance Committee has issued numerous findings on compliance by Parties.[249]

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[244]Kerstin Mechlem, 'Treaty bodies and the interpretation of human rights' (2009) 42 Vanderbilt Journal of Transnational Law 905, 920.
[245]Leib (n 238) 71; Shelton, 'Human Rights, Health and Environmental Protection: Linkages in Law and Practice' (n 238) 10.
[246]Rio Declaration on Environment and Development in 'Report of the United Nations Conference on Environment and Development' (12 August 1992) UN Doc A/CONF.151/26/vol I principle 10.
[247]Aarhus Convention (n 188) arts 4, 6 and 9, respectively.
[248]'Aarhus Convention – Status of Ratification' (*United Nations Economic Commission for Europe (UNECE),* 24 October 2022) <www.unece.org/env/pp/ratification.html> accessed 18 December 2022.
[249]'Aarhus Convention – Compliance Committee Background' (*UNECE,* ND) <www.unece.org/env/pp/ccbackground.html> accessed 18 December 2022.

The third approach to integration of human rights and environmental issues that has emerged is the recognition of a stand-alone right to a healthy environment. In 1976, Portugal became the first country to embed a right to a healthy environment in its constitution, prescribing that 'everyone shall possess the right to a healthy and ecologically balanced living environment and the duty to defend it'.[250] This was followed in 1981 by the African Charter on Human and People's Rights, which became the first international agreement to recognise such a right: '[a]ll peoples shall have the right to a general satisfactory environment favourable to their development'.[251] As of 2018, more than 150 countries recognise the right to a healthy environment, either in their national constitution or in a regional agreement.[252] At a national level, constitutional environmental rights have played an instrumental role in influencing legislative and policy-making processes in many countries, often resulting in the enactment of national legislation to flesh out the right and clarify State obligations and rights holders' entitlements.[253] There now exists a large body of national legislation based on the right to a healthy environment which, in many instances, has been decided in favour of the claimants.[254] At an international level, in June 2022, the United Nations General Assembly (UNGA) adopted a milestone resolution officially recognising a human right to a clean, healthy and sustainable environment for all.[255]

Considering these developments, it is becoming increasingly difficult to argue against the existence of a right to a healthy environment. Given the UNGA's recent explicit acknowledgement of the right, the narrative at the level of international law may now shift from debating whether the right exists, to debating its precise normative content. There is a wealth of literature on the merits of such a right, and it is not considered in detail here.[256] Suffice it to say that significant steps have been taken towards recognising and implementing a right to a healthy environment at a national level. At an international level, notable progress has been made in recognising the existence of the right and further work remains to give it sufficient form and normative content to enable its enforcement.

To summarise, significant steps have been taken to reflect the human and environment nexus within IHRL, resulting in the emergence of three distinct paths: 'greening' of existing substantive rights, establishing procedural environmental rights, and establishing a stand-alone right to a healthy environment. In the next

[250]Constituição da República Portuguesa, VII Revisão Constitucional [2005] art 66 (PRT).
[251]African Charter on Human and Peoples' Rights (published 27 June 1981, entered into force 21 October 1986), 21 ILM 58, art 24.
[252]Knox, 'The Past, Present, and Future of Human Rights and the Environment' (n 169) 654.
[253]Boyd (n 182) 214-215.
[254]See ibid chs 5-10.
[255]UNGA, 'The Human Right to a Clean, Healthy and Sustainable Environment' (n 19).
[256]See John Knox and Ramin Pejan (eds), *The Human Right to a Healthy Environment* (Cambridge University Press 2018).

section, I narrow my focus to explore the extent to which the interconnection between biodiversity — particularly marine biodiversity — and human rights is recognised within both international human rights law and international biodiversity law.

2.2. Human rights and marine biodiversity

2.2.1. *Why it is essential to acknowledge the interconnection between human rights and marine biodiversity*

Before exploring the degree of interconnection between human rights and marine biodiversity, I first consider why explicit consideration should be given to biodiversity — specifically marine biodiversity — within IHRL, in addition to existing measures to promote environmental protection as discussed in the previous section. As demonstrated in detail in Chapter 1, biodiversity is essential for human wellbeing and, by extension, enjoyment of a range of human rights including the rights to life, health, food and an adequate standard of living.[257] Thus, loss, degradation or mismanagement of biodiversity threatens the enjoyment of such rights.[258] Furthermore, the impacts of biodiversity loss are not expected to be distributed evenly.[259] Vulnerable groups are likely to suffer more from biodiversity loss due to reduced access to the basic resources they need to sustain themselves. Their lack of financial resources diminishes their ability to adapt and acquire other resources to meet the same needs. Indigenous communities may also depend on biodiversity for traditional cultural practices or medicines. Thus, biodiversity loss threatens to hit the most vulnerable groups of society the hardest, and potentially increase existing inequalities.[260] It is clear that steps must be taken to protect biodiversity to facilitate full enjoyment of human rights. This is discussed in greater detail in Chapter 3 in the context of marine biodiversity and the human right to health.

One may ask why explicit consideration should be given to biodiversity when there is already an established body of IHRL concerning protection of the environment more broadly. As established in Section 2.1.1 above, biodiversity is an interlinked but distinct concept from the environment. Therefore, measures that promote environmental protection may not adequately protect the core characteristics of biodiversity, such as the genetic diversity within species or the delicate balance within and between ecosystems. For example, a plantation forest or well-cultivated agricultural region may meet all applicable environmental standards

[257]HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166) 3.
[258]Ibid.
[259]IPBES (n 54) 15.
[260]HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166) 9.

to be considered a 'healthy environment', while simultaneously failing to protect the variability among living organisms — whether at a genetic, species or ecosystem level.[261] In response to such a hypothetical scenario, one may argue that, in light of growing human awareness of the connectivity between different species and ecosystems, it is increasingly challenging to interpret the term 'healthy environment' in a manner that fails to take account of biodiversity. While this may be true, duty bearers that are obligated to facilitate a healthy environment would likely not adopt such an expansive interpretation since, in doing so, they increase the degree of effort required to satisfy their obligation. Therefore, it is important that IHRL evolves to incorporate explicit obligations concerning biodiversity that take full account of biodiversity's unique characteristics and interface with the full spectrum of human rights. This would afford stronger protection to essential human rights and biodiversity linkages, in addition to providing greater legal clarity concerning the precise nature of State obligations under IHRL concerning biodiversity management.

The preceding paragraphs demonstrate why explicit consideration should be given to the role that biodiversity plays in supporting enjoyment of human rights under IHRL, separate from the environment more generally. I contend that there is a need to narrow the lens even further and consider the roles that terrestrial and marine biodiversity, respectively, play in supporting enjoyment of human rights. In subsequent chapters of this thesis, I exclusively consider the relationship between marine biodiversity and the right to health. My rationale for focusing on the marine context and distinguishing this from consideration of terrestrial biodiversity is threefold. First, the interconnectedness of the marine environment and the migratory nature of much marine life means that efforts to protect marine biodiversity must be transboundary in nature, requiring collaboration at an international level. Second, the ability of marine currents to transport matter over great distances means that the negative impacts of human activity in or around the marine environment can be felt great distances away, and activities carried out in one State can easily impact on the marine environment in others.[262] Third, terrestrial and marine biodiversity are generally governed by different legal regimes. Almost all terrestrial species fall within the territory and therefore jurisdiction of an individual State. By contrast, under the United Nations Convention on the Law of the Sea (UNCLOS), any marine living resources outside areas of national jurisdiction are deemed common property.[263] ABNJ account for 64 percent of the ocean by surface area and over 95 percent by volume,[264] and are home to a large proportion of marine biodiversity. This means that any biodiversity in ABNJ is considered common property and outside the responsibility of any individual State. History has

[261]Westra (n 207) 8.
[262]Harrison (n 74) 2.
[263]UNCLOS (n 16). art 116.
[264]'Areas Beyond National Jurisdiction' (*Global Environment Facility*, ND) <www.thegef.org/topics/areas-beyond-national-jurisdiction> accessed 18 December 2022.

demonstrated the potential tragedy of common property regimes, which have traditionally resulted in overexploitation of a free resource, devoid of any sense of individual State responsibility or stewardship.

The result of the above is that marine biodiversity is subject to less protection than terrestrial biodiversity, and yet is no less susceptible to harm. Varying levels of protection have been afforded through the emergence of regional seas agreements, and there remains hope that the ongoing intergovernmental negotiations on conservation and sustainable use of marine biodiversity beyond national jurisdiction (the BBNJ Treaty) will significantly reinforce existing protection measures. Despite these steps, marine biodiversity remains subject to significant risk, particularly as we move closer towards the possibility of operationalising deep seabed mining in ABNJ.[265]

In summary, I contend that there is value in considering the role that biodiversity plays in supporting the enjoyment of human rights, distinct from the separate body of law and legal discourse on the intersection of human rights and the environment. Furthermore, I assert that, due to its unique characteristics, there is value in focusing on marine biodiversity, to which I turn my attention in the remaining chapters of this thesis. I also acknowledge that there is value in assessing the precise relationship between terrestrial biodiversity and human rights, but this task falls outside the scope of this thesis.

2.2.2. *The current degree of interconnection between human rights and marine biodiversity*

In this section, I assess the extent to which the interconnection between marine biodiversity and human rights is currently recognised in international law, with particular attention to both IHRL and international biodiversity law. I demonstrate that, while progress is needed within both bodies of law, international biodiversity law shows a more advanced recognition of this nexus than IHRL.

Just as biodiversity protection lags behind environmental protection, the same is true of the integration of biodiversity into IHRL. While significant developments have been made in recent years to acknowledge and protect the linkages between human rights and the environment, to date there has been notably less attention given to the human rights and biodiversity interface. Nonetheless, in recent years a small but valuable body of literature has emerged.[266] Foremost amongst these is a 2017 report by John Knox, in his capacity as former UN Special Rapporteur on Human Rights and the Environment.[267] This report constitutes

[265]Lloret and others (n 25).
[266]See eg Morgera, 'Dawn of a New Day? The Evolving Relationship Between the Convention on Biological Diversity and International Human Rights Law' (n 170).
[267]HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166).

one of the most comprehensive and focused bodies of research on the intersection of IHRL and biodiversity to date, and for this reason I refer to it frequently in this section. In his landmark report, Knox stressed that 'although the importance of a healthy environment for the enjoyment of human rights is widely recognised, the relationship between human rights and biodiversity remains less well understood'.[268] A review of key IHRL instruments reveals only one explicit reference to biodiversity: in the 2018 United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas (the Peasants Declaration). Article 20(1) of the Declaration reads:

> States shall take appropriate measures, in accordance with their relevant international obligations, to prevent the depletion and ensure the conservation and sustainable use of biodiversity in order to promote and protect the full enjoyment of the rights of peasants and other people working in rural areas.

While the declaration is not legally binding, the mention of biodiversity nonetheless signifies a growing recognition of the role that biodiversity plays in supporting human rights and can be considered comparable to the role that Principle 1 of the Stockholm Declaration played in moving forward the human rights and environment nexus. Review of the general comments of the various human rights treaty bodies returns similarly sparse results. Within the body of over 180 general comments issued by eight human rights treaty bodies, only a handful contain cursory references to either 'biodiversity' or 'biological diversity'.[269]

On its face, this paints a rather bleak outlook for State obligations to protect biodiversity under IHRL. However, in his 2017 report, Knox asserted that because the maintenance of a healthy environment is dependent on biodiversity, human rights obligations pertaining to the environment are also capable of extending to biodiversity.[270] While this statement is obviously not legally binding, I contend that it is legally coherent when analysed in accordance with the rules of treaty interpretation laid out in Article 31 of the Vienna Convention. Amongst other factors, Article 31(1) requires that treaty provisions must be interpreted while taking account of their object and purpose. The objective, or 'object and purpose', of an obligation

[268]Ibid para 9.

[269]ESCR Committee, 'General Comment No.15: The Right to Water (Arts. 11 and 12)' (20 January 2003) UN Doc E/C.12/2002/11, para 28; ESCR Committee, 'General Comment No.17: The Right of Everyone to Benefit From the Protection of the Moral and Material Interests Resulting From any Scientific, Literary or Artistic Production of Which He or She is the Author (Article 15, Paragraph 1 (C), of the Covenant)' (12 January 2006) UN Doc E/C.12/GC/17, para 38; ESCR Committee, 'General Comment No.25 on Science and Economic, Social and Cultural Rights (article 15 (1) (b), (2), (3) and (4) of the International Covenant on Economic, Social and Cultural Rights)' (30 April 2020) UN Doc E/C.12/GC/25, paras 64 and 81; Committee on the Elimination of Discrimination Against Women (CEDAW Committee), 'General Recommendation No.34 (2016) on the Rights of Rural Women' (7 March 2016) UN Doc CEDAW/C/GC/34, para 12.

[270]HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166) para 26.

to protect the natural environment or to provide a healthy environment in the context of human rights law is to ensure environmental conditions (including continued delivery of ecosystem services) that are conducive of human wellbeing and that facilitate sustainable development. One could therefore argue that it may not be possible to achieve such an objective without also protecting biodiversity, as it is the foundation for delivery of ecosystem services. I say 'may' because, as discussed in Section 2.1.1, while biodiversity is an intrinsic foundation of a healthy natural environment, it may be less relevant in the context of the built or social environment, such as obligations pertaining to the workplace environment, for example. Therefore, as already highlighted, it is important to exercise caution when assessing the potential for environmental obligations under IHRL to extend to biodiversity.

With that in mind, Knox's assertion that environmental obligations may extend to biodiversity is significant as it unlocks a package of biodiversity-related obligations under IHRL. Specifically, Knox posited that this gives rise to two primary streams of State obligations relating to the conservation and sustainable use of biodiversity: procedural obligations and substantive obligations.[271] He further stressed that States have heightened obligations towards groups that are particularly vulnerable to environmental harm, including women, children and indigenous peoples.[272] Procedural obligations include those enshrined within the Aarhus convention: to undertake environmental impact assessments and make environmental information available to the public, to facilitate public participation in environmental decision making, and to provide access to remedies for harm.[273] These obligations only extend to measures that impact biodiversity to the extent that they threaten the enjoyment of a right that is dependent on biodiversity.[274]

Substantive obligations deriving from the human rights and biodiversity nexus will vary depending on the situation in question.[275] There are nonetheless several clearly discernible general obligations. States are obligated to take steps to protect biodiversity in order to protect dependent human rights from infringement,[276] and to cooperate with other States to the extent necessary to achieve the requisite degree of protection.[277] To facilitate awareness and responsiveness to measures that threaten the human rights and biodiversity nexus, States are also obligated to implement appropriate legal and institutional frameworks that 'effectively protect against environmental harm that interferes with the enjoyment of human rights'.[278]

[271]Ibid paras 27-48.
[272]Ibid paras 49-64.
[273]Ibid para 27.
[274]Ibid para 28.
[275]Ibid para 35.
[276]Ibid para 33.
[277]Ibid para 36.
[278]Ibid para 69.

The general nature of these obligations makes it difficult to derive their normative content and scope, and further work is required to add substance to the nature of these obligations. Nonetheless, they represent a valuable starting point in the development of biodiversity-related human rights obligations. It is beyond the scope of this research to clarify the nature of the full body of obligations that derive from the biodiversity and human rights nexus in light of Special Rapporteur Knox's assertion. However, in Chapters 3 and 4 I explore in detail the biodiversity-related obligations pertaining to the right to health specifically, which stem from Articles 2(1) and 12 of the ICESCR.

Cumulatively, the above reveals a handful of explicit references to the human rights and biodiversity nexus, signifying an emerging awareness of this relationship, as well as a package of biodiversity-related human rights obligations deriving from pre-existing environmental obligations. Notably, to date any references to biodiversity in the context of human rights do not draw a distinction between terrestrial and marine biodiversity.

In addition to the above advancements towards recognising the human rights and biodiversity nexus, progress has also been made in recognising the important role that biodiversity plays for indigenous and rural communities. In recent years, a significant body of academic research has emerged highlighting the importance of biodiversity for the cultural practices of indigenous communities and the important role traditional knowledge plays in conserving biodiversity.[279] The ESCR Committee has also acknowledged on multiple occasions the importance of biodiversity for indigenous communities' rights to natural resources and that loss of biodiversity can violate indigenous peoples' rights.[280]

Other human rights treaty bodies have also recognised the importance of biodiversity for other vulnerable groups. The Committee on the Rights of the Child (CRC) has acknowledged the harm that loss of biodiversity may have on children's enjoyment of their rights.[281] The former UN Special Rapporteur on the Right to Food, Olivier De Schutter, also highlighted the importance of crop diversity and agrobiodiversity for the protection of the right to food, particularly for low income smallholder farmers.[282] He further noted that State recognition of the rights of farmers relating to plant genetic resources for food and agriculture,

[279]See eg Morgera, 'Dawn of a New Day? The Evolving Relationship Between the Convention on Biological Diversity and International Human Rights Law' (n 170).
[280]ESCR Committee, 'Concluding Observations of the ESCR Committee: Democratic Republic of Congo' (2009) UN Doc E/C.12/COD/CO/4, para 14; ESCR Committee, 'Concluding Observations of the ESCR Committee: Cambodia' (2009) UN Doc E/C.12/KHM/CO/1, para 15, as cited in Jérémie Gilbert, *Natural Resources and Human Rights: An Appraisal* (Oxford University Press 2018), 164 and 165.
[281]CRC Committee, 'Concluding Observations: Seychelles' (2012) UN Doc CRC/C/SYC/CO/2-4, para 7, as cited in Gilbert (n 280) 165.
[282]UNGA, 'Report of the Special Rapporteur on the Right to Food' (23 July 2009) UN Doc A/64/170, para 56.

under Article 9 of the International Treaty on Plant Genetic Resources for Food and Agriculture, is essential to protect agrobiodiversity.[283] Collectively, the unique and essential role that biodiversity plays in the protection of human and cultural rights and traditional knowledge of indigenous and local communities has triggered the emergence of a new legal concept known as biocultural rights. This term refers to a body of norms that recognise the rights of indigenous and local communities to continue to practice their cultural traditions and enjoy stewardship over their land and natural resources, recognising the mutual benefits of this relationship for their communities and for biodiversity.[284]

The above analysis demonstrates a budding awareness of the connections between biodiversity and human rights within the body of IHRL, but this currently falls short of affording the level of protection required to maintain this important relationship. Moreover, and importantly for the purposes of this research, there is currently no discernible recognition of the value of marine biodiversity specifically to human wellbeing within the body of IHRL.

There are, however, two primary legal avenues through which the nexus can be acknowledged in law. One is IHRL, which seeks to protect the human health and welfare side of the nexus. The other is international biodiversity law, which seeks to protect the biodiversity side of the nexus. It is therefore necessary to assess the extent to which the biodiversity and human rights nexus is recognised in international biodiversity law, of which decisions of the CBD Conference of the Parties (COP) comprise a significant part. These CBD decisions, in addition to various World Health Assembly (WHA) resolutions, demonstrate an awareness of the role of biodiversity in the fulfilment of human rights generally, even though this may not be framed in human rights terms.[285] This includes as a source of essential ecosystem services, in addition to the specific and unique values biodiversity holds for distinct social groups, such as indigenous communities, and the potentially uneven distribution of impacts from the loss of biodiversity.[286] Various CBD decisions recognise that agricultural biodiversity specifically is 'essential to satisfy basic human needs for food and livelihood security'.[287] Although the value of biodiversity is not framed in human rights language, 'basic human needs' in this case clearly equates to various fundamental rights such as the rights to life, health and food.

[283]Ibid para 43.
[284]Gilbert (n 280) 166; See also Giulia Sajeva, 'Rights With Limits: Biocultural Rights – Between Self-Determination and Conservation of the Environment' (2015) 6 Journal of Human Rights and the Environment 30.
[285]See eg CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2), preamble para (a); WHO (n 80), para 4.
[286]See CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2); WHO (n 80).
[287]CBD, 'Report of the Fifth Meeting of the Conference of the Parties to the Convention on Biological Diversity' (n 3) Annex III Decision V/5, appendix para 2(a). See also: CBD, 'Conference of the Parties to the CBD Decision VII/23' (13 April 2004) UN Doc UNEP/CBD/COP/DEC/VII/23, Annex para 1.

In addition to the value that humans derive from biodiversity, the CBD also acknowledges the valuable role that farmers, indigenous and local communities play in the conservation and sustainable use of agricultural biodiversity, and the consequent need to involve such actors in decision making in light of their mutually supportive relationships with biodiversity.[288] Again, while not framed in human rights terms, this language highlights the need to involve individuals in decision making pertaining to biodiversity, in line with the right to participate in environmental decision making as protected in Article 6 of the Aarhus Convention. Similar indications of the substantive and procedural obligations on States can be found in CBD decisions pertaining to forest biodiversity, acknowledging that such biodiversity is essential for the livelihoods and survival of numerous indigenous and rural communities, and such communities must be consulted in decision-making processes.[289]

The CBD COP acknowledged that geography, wealth and gender contribute to disparities in biodiversity dependence. Island States in particular depend on biodiversity to provide key ecosystem services that protect them from the impacts of 'natural and anthropogenic disasters and extreme events' and that support 'sustainable livelihoods, local food security and health care, especially of poor people'.[290] The COP acknowledged that impacts of biodiversity loss are felt most strongly by groups that may not have access to alternative livelihoods beyond those provided by biodiversity and ecosystem services, such as indigenous and rural communities, rural women and people living in poverty.[291] The negative impacts of climate change on biodiversity exert further pressure on these already vulnerable groups.[292] Again, although human rights are not expressly mentioned throughout these COP decisions, the issues and connections raised bear significant human rights implications, threatening the enjoyment of substantive rights such as the rights to life, health and food, to procedural environmental rights and even cultural rights in the case of indigenous communities that have strong cultural ties to biodiversity. Furthermore, Decision XII/7, concerning mainstreaming gender considerations, expressly recognises 'the link between biodiversity and the provision of basic human rights, such as access to water'.[293]

Unlike IHRL, the CBD went one step further and acknowledges the value of marine biodiversity specifically to human wellbeing. It specifically highlighted the threat that the loss of coral reefs poses to

[288]CBD, 'Report of the Fifth Meeting of the Conference of the Parties to the Convention on Biological Diversity' (n 3) Annex III Decision V/5, para 5.
[289]Ibid Annex III Decision V/4, preamble.
[290]CBD, 'Conference of the Parties to the CBD Decision VIII/1' (15 June 2006) UN Doc UNEP/CBD/COP/DEC/VIII/1, Annex pt E goal 8.
[291]CBD, 'Conference of the Parties to the CBD Decision VII/5' (13 April 2004) UN Doc UNEP/CBD/COP/DEC/VII/5, Annex para 1.
[292]CBD, 'Conference of the Parties to the CBD Decision XIV/5' (30 November 2018) UN Doc CBD/COP/DEC/14/5, preamble.
[293]CBD, 'Conference of the Parties to the CBD Decision XII/7' (17 October 2014) UN Doc UNEP/CBD/COP/DEC/XII/7, para 42.

the livelihoods of reef-dependent communities, many of whom live in small island developing States and are often extremely poor.[294] It also noted the potential importance of deep seabed ecosystems for supporting sustainable development, and the essential role that marine biodiversity plays in mitigating and adapting to climate change which, in the absence of such support, would threaten the enjoyment of human rights for populations across the globe.[295] Furthermore, the COP recognised marine debris and plastic waste as a common driver of harm to both marine biodiversity and human health, with marine biodiversity often serving as the conduit for harm to human health.[296]

Collectively, this demonstrates a robust awareness, within the CBD framework, of the human rights and biodiversity interface. Although human rights are seldom referenced directly, the issues addressed within CBD COP decisions include the role played by biodiversity in protecting human life and health, women and children's rights, and indigenous cultural heritage, in addition to facilitating economic development — all of which correlate to established human rights. Crucially, the CBD COP also recognised the unique value of marine biodiversity to human health and livelihoods.

In theory, this complements the growing awareness of the biodiversity and human rights nexus under IHRL. Reading the two regimes together, in accordance with the principle of mutual supportiveness, they collectively help elucidate and bring form and normative content to the gradually emerging patchwork of State human rights obligations concerning biodiversity. As awareness of the importance of the nexus grows, there is scope for stronger alignment and cross-collaboration between international human rights treaty bodies and governing bodies of the primary biodiversity treaties, similar to recent collaboration between the CBD and the WHO under a joint work programme formed in 2012. Since its inception, the CBD-WHO Joint Work Programme has culminated in the production of the seminal 2016 State of the Knowledge Review, and numerous other outputs including CBD COP decisions[297] and WHO Assembly resolutions[298] that collectively advance understanding of the human health and biodiversity nexus from a scientific, economic and public policy standpoint.

[294]CBD, 'Report of the Fifth Meeting of the Conference of the Parties to the Convention on Biological Diversity' (n 3) Annex III Decision V/3, para 6 and Annex pt C.
[295]CBD, 'Conference of the Parties to the CBD Dec. VIII/21' (15 June 2006) UN Doc UNEP/CBD/COP/DEC/VIII/21, para 1; CBD, 'Conference of the Parties to the CBD Dec. X/29' (29 October 2010) UN Doc UNEP/CBD/COP/DEC/X/29, para 8.
[296]CBD, 'Conference of the Parties to the CBD Dec. XIII/10' (10 December 2016) UN Doc CBD/COP/DEC/XIII/10, Annex, para 2.
[297]See eg CBD, 'Conference of the Parties to the CBD Dec. XII/21' (17 October 2014) UN Doc CBD/COP/DEC/XII/21; CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2); CBD, 'Biodiversity and Human Health - Note by Executive Secretary' (7 November 2017) UN Doc CBD/SBSSTA/21/4.
[298]See eg WHO (n 80).

Nonetheless, despite the developments highlighted above, integration of biodiversity and human rights is still in its infancy, and we may currently be witnessing the same trend that occurred around the integration of human rights and environmental law in the late 1960s and early 1970s, with environmental law emerging as a distinct body of law well before its uptake as a human rights issue. Biodiversity conservation has been a distinct area of law since the adoption of the Convention on Biological Diversity in 1992, and in recent years there has been a growing understanding of and interest in the biodiversity and human health interface, as demonstrated by the above CBD-WHO Joint Work Programme. However, this has not yet been taken up as a human rights issue on a large scale. In 2018, through Article 20(1) of the UN Peasants Declaration, we witnessed the first express legal recognition of the biodiversity and human rights nexus in an international agreement, which arguably serves as the biodiversity counterpart of the role played by Principle 1 of the Stockholm Declaration in spearheading the integration of environmental concerns and human rights. If the trajectory continues to mirror the convergence of human rights and environmental issues in the latter half of the twentieth century, over the coming years we can expect to see increasing acknowledgement of the biodiversity and human rights nexus by a range of authoritative actors, including human rights treaty bodies, leading ultimately to the express expansion of State obligations under human rights treaties to incorporate biodiversity, and perhaps even the development and widespread recognition (including in national constitutions) of a human right to biodiversity.

The objective of the above section was to highlight the extent to which IHRL and international biodiversity law each recognise the fundamental importance of the human health and marine biodiversity nexus. In summary, international biodiversity law demonstrates a stronger awareness of this relationship than IHRL, including express acknowledgement within CBD decisions of the unique value of marine biodiversity specifically. Nonetheless, this acknowledgement via CBD COP decisions falls short of establishing legally binding obligations geared towards protection of this nexus. By contrast, IHRL lags behind with only a few sparse references to biodiversity in treaty body general comments, and one express reference to biodiversity in the 2018 UN Peasants Declaration. Former Special Rapporteur Knox has taken milestone steps to demonstrate how environmental obligations under IHRL may extend to biodiversity. Nonetheless, both IHRL and international biodiversity law demonstrate a rudimentary acknowledgement of the nexus, far below the level required to protect essential human health and marine biodiversity linkages.

3. Conclusions

In this chapter, I undertook original research to demonstrate that a human rights perspective provides a potent conceptual framework to duly recognise and protect the human health and marine biodiversity nexus

in international law. In doing so, I built on existing academic literature on the intersection of human rights, the environment and biodiversity. Crucially, while I contend that there are notable inherent strengths in adopting a human rights perspective, IHRL has also the potential to work synergistically with additional bodies of law to protect the human health and biodiversity nexus, such as environmental law, private law mechanisms (such as payments for ecosystem services) and rights of nature.

I contend that human rights possess three valuable characteristics that render them a valuable tool through which to protect the human health and marine biodiversity nexus. First, as stated by Tasioulas:

> Human rights discourse is distinctive in that it ultimately concerns not mere interests to be factored into a cost-benefit analysis, but rather universal rights that impose obligations on others and which are, therefore, not readily susceptible to trade-offs against countervailing considerations.[299]

Second, in addition to promoting substantive outcomes, human rights also promote equitable decision-making processes that support extensive stakeholder participation and access to justice. Amongst other things, this serves to protect and empower vulnerable and marginalised groups who have often historically been denied a seat at the decision-making table and yet, in many cases, also stand to bear the greatest burden from loss and degradation of marine biodiversity.[300] Third, linking environmental issues (including biodiversity loss) to human rights unlocks access to the series of recourse mechanisms established under IHRL, enabling individuals to challenge environmental issues that infringe on their entitlements as rights holders.[301]

Despite these strengths, a human rights perspective is not devoid of criticism. Human rights have been deemed by many as ill-suited to addressing environmental issues in light of their fundamentally anthropocentric nature.[302] While it is true that human rights retain an inherently anthropocentric perspective, their suitability for tackling environmental issues has increased significantly in recent years, as the traditional human perspective that views the natural environment as a pool of resources to be exploited for economic gain has started to give way to a more ecocentric formulation that acknowledges a healthy environment as a fundamental precondition to human wellbeing.[303] Furthermore, my research focuses on

[299]Tasioulas (n 179) 24.
[300]Pathak (n 175) 18; HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166) paras 22-25.
[301]Shelton, 'Human Rights and the Environment: Problems and Possibilities' (n 180) 44; Bodansky (n 180) 517.
[302]Grear (n 199) 152; Borràs (n 199) 115.
[303]Kotzé (n 178) 258.

the intersection of human and environmental wellbeing, and fundamentally employs, at least in part, a perspective focused on human interests. Therefore, the anthropocentric character of human rights is not a hinderance for current purposes.

Human rights are also criticised for being vague.[304] However, herein lies one of their core strengths that enables them to complement other legal frameworks in protecting the natural environment (including biodiversity). The broad nature of many human rights treaty provisions enables them to adapt to tackle new and emerging issues in an ever-changing world, without becoming entrenched in outdated language and detail. In this sense, human rights can operate synergistically with alternative legal frameworks to tackle environmental issues. Non-human rights frameworks, including environmental law and private law solutions (e.g., payments for ecosystem services), provide the tangible legal tools required to achieve the degree of environmental protection necessary to facilitate full enjoyment of human rights. Conversely, human rights elevate environmental issues as a priority within State policy making and budgeting, thus driving greater focus and resources towards environmental law and related policy mechanisms. Moreover, they promote inclusive and equitable decision-making processes on environmental issues. The degree of universal acceptance enjoyed by many human rights also enables them to offer immediate legal protections to biodiversity, while alternative, less established mechanisms, such as rights of nature, mature.

Having demonstrated the value of adopting a human rights perspective for protecting the human health and marine biodiversity nexus, I analysed the extent to which both the environment and biodiversity, respectively, are recognised as core components of human rights in international law. To facilitate such analysis, it is necessary to clearly distinguish between the terms ‘environment’ and ‘biodiversity’. In the context of environmental law, I posit that the ‘environment’ includes both natural and socially constructed environments (including built environments such as roads and buildings, and social environments such as the constructs of wealth, poverty and ethnicity).[305] Biodiversity is a core component of the natural environment, and therefore a more specific term than ‘environment’.

There is little acknowledgement of the environment and human rights interface in early human rights instruments, with no identifiable reference in the UDHR or the ICCPR. The only reference in the ICESCR can be found in Article 12(2)(b) which acknowledges the importance of ‘environmental and industrial hygiene’ for the enjoyment of the right to health. The recognition, in Principle 2 of the Stockholm Declaration, that humans have ‘the fundamental right to freedom, equality and adequate conditions of life,

[304]Boyd (n 182) 33.
[305]For more information on the socially constructed environment, see Archer (n 223) 499.

in an environment of a quality that permits a life of dignity and wellbeing,' represented a tipping point that catalysed stronger incorporation of environmental issues into the corpus of IHRL. Since then, three distinct approaches have emerged.[306] The first involves 'greening' existing substantive human rights to include State obligations towards protection of the environment, on the basis that full realisation of numerous rights (including the rights to life, health, food, and water) is dependent on a healthy environment. The second concerns the establishment of procedural environmental rights, on the basis that environmental harm and the way in which the environment is managed can impact the rights and freedoms of a wide range of individuals. The third promotes the recognition of a stand-alone substantive right to a healthy environment, to better respect the holistic value of the natural environment and its inseparability from human wellbeing.

In contrast, the integration of biodiversity considerations and human rights remains in its infancy, lagging several decades behind the confluence of environmental issues and human rights. The first express acknowledgement of this relationship within IHRL can be found within Article 20(1) of the Peasants Declaration. While this is a milestone acknowledgement, it stands as an island of progress towards establishing express State obligations to biodiversity under IHRL.[307] Notably however, former UN Special Rapporteur Knox also declared that State environmental obligations under IHRL can be extended to apply to biodiversity, in light of the foundational role that biodiversity plays in facilitating a healthy environment.[308] This allows a number of substantive and procedural environmental rights to be extended to biodiversity.

Collectively, this reveals a series of biodiversity-related obligations under IHRL, some deriving from pre-existing environmental obligations and others explicitly relating to biodiversity. To date, there is no express recognition of the unique value of marine biodiversity within IHRL. However, international biodiversity law reveals a stronger awareness of the biodiversity and human rights interface than can be found within the strict body of IHRL. In many instances, these connections are not framed in human rights language, but nonetheless clearly address human rights issues. Several CBD COP decisions acknowledge the fundamental role biodiversity plays in supporting 'basic human needs', including access to food and livelihood security.[309] Furthermore, unlike IHRL, the CBD COP goes one step further and acknowledges the role

[306]Boyle and Anderson (n 238) 4; Shelton, 'Human Rights, Health and Environmental Protection: Linkages in Law and Practice', (n 238) 10; Leib (n 238) 71.

[307]The first draft of the CRC General Comment No.26 ('Children's Rights and the Environment With a Special Focus on Climate Change') (n 241), which was opened for public consultation as this thesis was being finalised, contains numerous significant acknowledgements of the role played by biodiversity in supporting enjoyment of a range of human rights.

[308]HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166) para 26.

[309]CBD, 'Report of the Fifth Meeting of the Conference of the Parties to the Convention on Biological Diversity' (n 3) Annex III Decision V/5, appendix para 2(a). See also CBD, 'Conference of the Parties to the CBD Dec. VII/23' (n 287) Annex para 1.

played by marine biodiversity in supporting human wellbeing, including the threats that loss of coral reefs pose to reef-dependent communities,[310] and the importance of marine biodiversity in supporting economic development and climate change mitigation and adaptation — all of which bear clear human rights implications.[311] Collectively, this demonstrates a robust awareness, within the CBD framework, of the biodiversity and human rights interface. In this chapter I demonstrate that an integrated reading of IHRL and international biodiversity law reveals an emerging sensitivity to biodiversity and human rights linkages and a patchwork of possible State obligations concerning protection of biodiversity. While this falls short of establishing a clear set of State obligations geared towards protection of the human health and marine biodiversity nexus specifically, it nonetheless represents a valuable and much-needed step in the right direction.

In the next chapter, I narrow my focus further to assess the degree of interconnection between marine biodiversity and the human right to health specifically. Having identified this baseline, I undertake an original body of legal analysis to identify the specific State obligations under the right to health that derive from the human health and marine biodiversity nexus.

[310]CBD, 'Report of the Fifth Meeting of the Conference of the Parties to the Convention on Biological Diversity' (n 3) Annex III Decision V/3, para 6 and Annex pt C.
[311]CBD, 'Conference of the Parties to the CBD Dec. VIII/21' (n 295) para 1; CBD, 'Conference of the Parties to the CBD Dec. X/29' (n 295) para 8.

Chapter 3

MAPPING THE OVERLAP BETWEEN THE HUMAN RIGHT TO HEALTH AND MARINE BIODIVERSITY

I closed the previous chapter with an analysis of the extent to which the interconnections between marine biodiversity and human rights are currently reflected in international law, concluding that recognition of such connections is beginning to emerge, but nonetheless is in its infancy. In this chapter, I narrow my focus further to consider the linkages between marine biodiversity and the human right to health under international human rights law (IHRL). I begin by exploring the general connections between marine biodiversity and the right to health, and whether there are any conceivable legal grounds on which to consider the former a fundamental component of the latter. Having established that there are multiple grounds for concluding that marine biodiversity is integral to the right to health, I identify and discuss the specific State obligations that can arise from the human health and marine biodiversity nexus under the right to health. I posit that this nexus gives rise to a series of procedural and substantive State obligations designed to protect essential linkages between human health and marine biodiversity.

1. The duty to protect marine biodiversity and the right to health under IHRL

In this section, I demonstrate that States are obligated to take steps to protect marine biodiversity to achieve full realisation of the human right to health under IHRL. At the time of writing, there is no express reference to biodiversity — let alone marine biodiversity — within any treaty provisions pertaining to the right to health, or in any related commentary of the human rights treaty bodies.[312] Nor has this interface been the

[312]At the time of finalising this thesis, the Committee on the Rights of the Child has issued a draft of its General Comment No.26, entitled 'Children's Rights and the Environment With a Special Focus on Climate Change' (n 241). Paragraph 25 of the draft explicitly acknowledges that biodiversity loss and ecosystem degradation threaten children's enjoyment of the right to health. If this provision is approved in its current form, it will represent a milestone in recognising the human health and biodiversity nexus in IHRL.

focus of academic discourse. However, Special Rapporteur Knox considered the intersection of biodiversity and the human right to health in his 2017 report on biodiversity and human rights,[313] in which he asserted that 'States have obligations to protect against environmental harm that interferes with the enjoyment of human rights, and the obligations apply to biodiversity as an integral part of the environment'.[314] Furthermore, there are several tangible connections between the right to health and environmental health, including an associated body of academic literature.[315] My starting point is therefore to assess whether there are any existing State obligations towards the environment under the human right to health that can extend to marine biodiversity.

The right to health first emerged as a binding human right in 1966 in Article 12 of the International Covenant on Economic, Social and Cultural Rights (ICESCR) and is fully entitled 'the right of everyone to the enjoyment of the highest attainable standard of physical and mental health'.[316] Article 12(2) establishes parameters around what could otherwise be considered a broad and nebulous right by providing a non-exhaustive list of obligations to be fulfilled by States Parties in furtherance of this right. This includes '[t]he improvement of all aspects of environmental and industrial hygiene'.[317] Thus, from the outset, there is an explicit recognition of the intrinsic connection between human health and the environment. Nonetheless, while this acknowledgement constitutes a milestone in the convergence of human rights and the environment, the language of the provision is broad and, without insight into the underlying objectives of the text, it is challenging to derive its normative content.

Indeed, many IHRL treaty provisions could be accused of being vague when read in isolation.[318] However, in addition to further clarity afforded by academic discourse, some degree of clarification on the objective and normative content of such provisions is offered by general comments of the respective human rights treaty bodies. I therefore turn to the work of treaty bodies to highlight the extent to which a healthy environment is considered a core component of the right to health. While the interpretive weight to be

[313]HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166) 5-7.
[314]Ibid para 26.
[315]Shelton, 'Human Rights, Health and Environmental Protection: Linkages in Law and Practice' (n 238); Dinah Shelton, 'Resolving Conflicts Between Human Rights and Environmental Protection: Is There a Hierarchy?' in Erika De Wet and Jure Vidmar (eds), *Hierarchy in International Law: The Place of Human Rights* (Oxford University Press 2012); HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2012) (n 231).
[316]International Covenant on Economic, Social and Cultural Rights (adopted 16 December 1966, entered into force 3 January 1976) 993 UNTS 3 (ICESCR) art 12(1).
[317]Ibid art 12(2)(b).
[318]David McGrogan, 'On the Interpretation of Human Rights Treaties and Subsequent Practice' (2014) 32 Netherlands Quarterly of Human Rights 347, 347; John Tobin, *The Right to Health in International Law* (Oxford University Press 2012), 75.

attached to human rights treaty bodies has generated a vast body of academic debate,[319] there are two generally accepted crucial points that help differentiate interpretation of human rights treaties from other bodies of international law.

First, human rights treaty bodies play a unique role in the spectrum of international law.[320] Generally under international law, States themselves are the primary actors responsible for interpreting the treaties that bind them, and for generating 'subsequent practice' with which to inform treaty interpretation. Each State's discretion to interpret treaty provisions in the manner most favourable to them is counterbalanced by the voices of the other States Parties to the agreement, thus creating a peer-to-peer equilibrium. In the case of IHRL, however, treaties create obligations that States owe to third parties. It would generate a conflict of interest if States were fully empowered to interpret their own obligations devoid of checks and balances. For this reason, human rights treaty bodies were established to act in an independent supervisory capacity, guide State practice and monitor treaty compliance. Treaty bodies therefore assume the role of interpreting the respective human rights treaty for which they were established and contributing to the generation of 'subsequent practice' that usually would be the exclusive purview of States Parties.[321] This means that general comments of human rights treaty bodies can carry significant weight in informing the interpretation of IHRL treaty provisions.

Second, the objective of IHRL is to promote the realisation of human rights regardless of the source or nature of the harm that threatens their realisation. Because of this, human rights are considered teleological in nature and must be interpreted in an evolutionary manner that takes account of the circumstances that prevail at any given moment, rather than just at the time of their formulation.[322] This need to interpret human rights in an evolutionary manner enables us to interpret the right to health in a manner that affords due recognition to the key role played by marine biodiversity in supporting human health.

Turning to the interpretation of Article 12(2)(b) of ICESCR specifically, the Economic, Social and Cultural Rights Committee (the ESCR Committee) elaborated on this provision in its General Comment No.14 on the right to health. Amongst other things, the Committee clarified that Article 12(2)(b) obligates States to reduce the population's exposure to 'detrimental environmental conditions that directly or indirectly impact

[319]See eg Mechlem (n 244); Birgit Schlütter, 'Aspects of Human Rights Interpretation by the UN Treaty Bodies' in Helen Keller and Geir Ulfstein (eds), *UN Human Rights Treaty Bodies: Law and Legitimacy* (Cambridge University Press 2012); McGrogan (n 318).
[320]McGrogan (n 318) 347-348.
[321]Ibid 348; Mechlem (n 244) 919.
[322]McGrogan (n 318) 348.

upon human health' and to facilitate 'an adequate supply of food and proper nutrition'.[323] This provides two bases for recognising important human health and marine biodiversity linkages. The obligation to facilitate an adequate supply of food and proper nutrition is directly relevant to marine biodiversity, which provides an essential food source in many developing countries where vulnerable communities in particular may lack the resources to acquire alternative, less accessible or convenient food sources.[324] While marine biodiversity may not play such a pivotal role in supporting food security in high income countries, it nonetheless plays a universal role in supporting human nutrition through the provision of omega 3 fatty acids, selenium, iodine and other key nutrients.[325] Furthermore, as discussed in Chapter 1, human health and marine biodiversity linkages are not always positive, and mismanagement of the marine environment can result in human exposure to conditions that are detrimental to human health.[326] Thus, to comply with Article 12(2), States should take steps to minimise harm to marine biodiversity (including disruption of ecosystem services) caused by any actions that they undertake directly or that are undertaken by people, including businesses, within their jurisdiction.

Therefore Article 12(2)(b) of ICESCR, read in conjunction with General Comment No.14, imposes a duty on States to protect marine biodiversity. General Comment No.14 contains several other statements that support this conclusion. It clarifies that the right to health is not a right to be healthy, nor is it simply a right to healthcare. It bestows upon right holders the entitlement to enjoy the key 'facilities, goods, services and conditions necessary for the realisation of the highest attainable standard of health'.[327] The ESCR Committee entitled these components the 'underlying determinants of health', which include 'an adequate supply of safe food', 'healthy occupational and environmental conditions' and 'a healthy environment'.[328] This proclamation that the right to health extends to the protection of underlying determinants of health is corroborated by Article 24(2) of the Convention on the Rights of the Child (CRC), which States that in order to protect children's right to health, States must 'take appropriate measures (…) to combat disease and malnutrition (…) through the provision of adequate nutritious foods and clean drinking water, taking into consideration the dangers and risks of environmental pollution'.

In General Comment No.14, the ESCR Committee also reiterated the evolutionary nature of human rights obligations, noting that:

[323]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 15.
[324]Lloret (n 1) 31.
[325]Ibid.
[326]See ch 1 sec 2.3.
[327]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para.9.
[328]Ibid paras 11 and 4.

> Since the adoption of the two International Covenants in 1966, the world health situation has changed dramatically and the notion of health has undergone substantial change and also widened in scope. More determinants of health are being taken into consideration, such as resource distribution and gender differences. (…) Moreover, formerly unknown diseases (…) as well as the rapid growth of the world population, have created new obstacles for the realisation of the right to health which need to be considered when interpreting article 12.[329]

This demonstrates that not only must existing determinants be interpreted in an evolutionary manner, but also that the underlying determinants of health are dynamic. This presents two additional avenues for the recognition of the human health and marine biodiversity nexus. The first derives from the argument that marine biodiversity is essential to the achievement of healthy environmental conditions or a healthy environment, which are already recognised as determinants of health. The second is to recognise marine biodiversity itself as a stand-alone determinant.[330]

The first avenue for recognising the human health and marine biodiversity nexus hinges upon how one interprets 'healthy environmental conditions' or 'a healthy environment'. They could be interpreted in an inclusive manner that recognises the role that marine biodiversity plays in supporting healthy ecosystems and the ecosystem services necessary to preserve human health. This perspective is validated by a body of scientific academic literature and associated policy decisions.[331] For example, biodiversity is listed as the first metric for good environmental status under the European Union Marine Strategy Framework Directive.[332] It is also recognised as 'a cornerstone of healthy ecosystems' and is becoming a primary focus in environmental management.[333] While the precise definition of 'healthy environment' remains subject to debate in IHRL, constitutional provisions establishing environmental rights in various jurisdictions acknowledge the fundamental ties between biodiversity and environmental health.[334] For example, the Quebec provincial Charter states that 'Every person has a right to live in a healthful environment in which biodiversity is preserved'.[335] Thus, there is abundant evidence to support an interpretation of 'good

[329]Ibid para 10.
[330]It is plausible that arguments raised in this section in favour of including marine biodiversity as a determinant could be applied to biodiversity more broadly. While this would itself be a valuable point for future consideration, this is not considered further here.
[331]See ch 1 sec 2.
[332]'Our Oceans, Seas and Coasts' (*European Commission*, ND) <https://ec.europa.eu/environment/marine/good-environmental-status/descriptor-1/index_en.htm> accessed 19 December 2022.
[333]Mirka Laurila-Pant and others, 'How to Value Biodiversity in Environmental Management?' (2015) 55 Ecological Indicators 1, 2.
[334]Shelton, 'Resolving Conflicts Between Human Rights and Environmental Protection: Is There a Hierarchy?' (n 315) 230.
[335]*Canadian Charter of Rights and Freedoms*, s 46.1, Part I of the *Constitution Act*, 1982, being Schedule B to the Canada Act 1982 (UK), 1982 c 12 (CAN)

environmental conditions' and 'healthy environment' that recognises the intrinsic role of biodiversity. However, one could also interpret these terms in a more restrictive manner. Westra suggested that a healthy environment 'might include a plantation forest or a well-cultivated agricultural region. Both of which might be sustainable but still lack the completeness of organisms, processes and the ability to provide ecosystem or natural "services" that are provided by wild areas'.[336]

Nonetheless, as scientific understanding concerning the importance of biodiversity for facilitating essential ecosystem services advances, it would be extremely difficult to defend such a narrow interpretation as being in good faith and consistent with the object and purpose of Article 12 of ICESCR.

At this point, it is worth noting the relevance of the precautionary principle when discussing the intersection of marine biodiversity and the right to health, and any associated State responsibility to protect marine biodiversity as discussed in Chapter 4.[337] While the scientific literature reviewed in Chapter 1 highlighted a range of known interactions between human health and marine biodiversity, it also revealed that much remains unknown.[338] In the face of scientific uncertainty, it is essential that States exercise the precautionary principle (also referred to as the precautionary approach) in gauging the degree of connectivity between human health and marine biodiversity, and that this principle is adequately reflected in a State's ocean governance practices. The precautionary principle demands that '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' or harm to human health.[339] In 2011, the International Tribunal for the Law of the Sea (ITLOS) declared the 'precautionary approach' to be trending towards becoming part of customary international law.[340] While there is no universal consensus on the precise threshold for triggering the precautionary principle, in general terms it requires the potential harm to be of sufficient gravity (i.e., significant, serious or irreversible) and to have a sufficient probability of materialising (Trouwborst proposed there must be 'reasonable grounds for concern' that harm may occur).[341] Similarly, the International Law Commission (ILC) contends that the degree of risk required to

[336]Westra (n 207) 10.
[337]See ch 4 sec 3.4.
[338]See ch 1 sec 1.2.
[339]Rio Declaration (n 246) principle 15; Marco Martuzzi, 'The Precautionary Principle: In Action for Public Health' (2007) 64 Occupational and environmental medicine 569, 569. Many authors contend that the 'precautionary approach' and 'precautionary principle' are functionally synonymous (eg Aline Jaeckel, *The International Seabed Authority and the Pre-cautionary Principle: Balancing Deep Seabed Mineral Mining and Marine Environmental Protection* (Brill Nijhoff 2017), 27).
[340]ITLOS, 'Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area (Request for Advisory Opinion Submitted to the Seabed Disputes Chamber) — List of Cases: No. 17 — Advisory Opinion of 1 February 2011' (2011) ITLOS Rep 10, para 135.
[341]Jaeckel (n 339) 38–39.

trigger application of the precautionary principle may constitute 'a low probability of causing disastrous harm' or 'a high probability of causing significant harm'.[342]

The second avenue for the recognition of the human health and marine biodiversity nexus within the right to health springs from the evolutionary nature of IHRL and its capacity to recognise new determinants of health based on changes over time and developing understanding of the contributors to health. The recognition of marine biodiversity as a stand-alone underlying determinant bypasses the intensely debated issue of defining a 'healthy environment', and the requirement to demonstrate an incontrovertible causal link between marine biodiversity and environmental health. Moreover, it acknowledges the inherent value of biodiversity, rather than valuing it through the conduit of the environment. This is timely as the direct role that both biodiversity generally, and marine biodiversity specifically, play in underpinning human health is now incontrovertible.[343] This connection has been recognised expressly by several prominent actors. Since 2014, each Convention on Biological Diversity (CBD) Conference of the Parties (COP) has produced a Decision focused exclusively on biodiversity and health.[344] In 2018, the World Health Organization (WHO) stated that:

> Human health ultimately depends on ecosystems for elements essential to human health and wellbeing (for instance, food and freshwater). Biodiversity underpins the ecological functions and processes that give rise to the benefits provided by ecosystems ('ecosystem services'), including purification of water and air, pest and disease control, pollination, soil fertility, and resilience to climate change.[345]

The WHO further added that 'at the same time, biodiversity can sometimes be a source of pathogens and, when unsustainably managed, can exacerbate negative health outcomes'.[346] These statements succinctly capture two of the three primary reasons why the conservation and sustainable use of marine biodiversity should be considered a stand-alone determinant of the human right to health. First, marine biodiversity contributes to positive health outcomes.[347] Second, if improperly managed and used unsustainably, there is potential for negative health outcomes.[348] Third, in addition to the health benefits already realised from

[342]UNGA Official Records, 'Report of the International Law Commission, 53rd Session (23 April-1 June and 2 July-10 August 2001)' (2001) UN Doc A/56/10, 387 art 2(a), as cited in Birnie, Boyle and Redgwell (n 222) 153.
[343]See eg Romanelli and others (n 2); IPBES (n 54); Moore and others (n 1).
[344]CBD COP Decisions XII/21 (n 297); CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2); and CBD, 'Conference of the Parties to the CBD Dec. XIV/4' (30 November 2018) UN Doc CBD/COP/DEC/14/4.
[345]WHO (n 80) para 4.
[346]Ibid.
[347]See ch 1 sec 2.1.
[348]See ch 1 sec 2.2.

marine biodiversity, it holds immeasurable potential health benefits that have yet to be discovered. As stated by Special Rapporteur Knox, 'biodiversity is an irreplaceable resource for new medicines, but we are rapidly destroying the resource before we have discovered all that it has to offer'.[349] Therefore, ideally, marine biodiversity should be protected not only for its present contributions to human health, but also its prospective future contributions.

However, the notion of being obligated to protect marine biodiversity for its potential health benefits raises a challenging legal question. Can — and indeed should — a State be obligated to protect something based on a value or contribution that does not, and may never, exist, to the detriment of competing economic interests and possibly even human rights? One concern with answering in the affirmative is the kind of legal precedent this would set. Numerous commentators have already expressed concern over adopting broad interpretations of the right to health that frame it as 'a repository for everything that impacts upon the health of an individual'.[350] Additionally, one may consider measures to protect marine biodiversity on the basis of unknown potential future benefits to be an inefficient use of resources. Therefore, it seems that IHRL cannot reasonably be deployed to protect marine biodiversity on the basis of its biomedical potential. This is a regrettable conclusion considering the potential importance of marine biodiversity for delivering life-changing biomedical advancements. However, this is potentially more of a theoretical concern than a practical one since I have demonstrated above that there are already several other grounds on which to preserve marine biodiversity under the right to health. Nonetheless, I contend that the potential for human rights to protect biodiversity based on its biomedical potential is a valuable topic for future research.

In summary, I demonstrated that there are several bases on which to contend that the conservation and sustainable use of marine biodiversity underpins full enjoyment of the right to health. Having established this connection, in the remainder of this chapter I explore the State obligations that this gives rise to concerning management of marine biodiversity.

2. State obligations concerning governance of marine biodiversity under the right to health

In the previous section, I asserted that States are subject to a general responsibility to protect marine biodiversity to the extent necessary to protect human health. While this is a valuable starting point, it leaves many questions unanswered regarding the specific nature and content of such an obligation. In this section

[349]HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166) para 14. See also ch 1 sec 2.2.3.
[350]Tobin (n 318) 132. See also John Tobin and Barrett Damon, 'The Right to Health and Health-Related Human Rights' in Lawrence Gostin and Benjamin Meier (eds), *Foundations of Global Health & Human Rights* (Oxford University Press 2020), 69.

I answer these questions by dissecting existing State obligations under the human right to health, to highlight how they apply to marine biodiversity. In the interests of clarity, I focus my analysis on obligations that apply to States. I do not engage with the debate around whether the right to health is also capable of imposing obligations on non-State actors, as this falls outside the scope of this research which explicitly aims to clarify State obligations under the human right to health regarding the human health and marine biodiversity nexus.[351] However, I acknowledge this as a valuable area for further research. I also do not devote attention to obligations concerning the provision of healthcare since this aspect of the right to health bears relatively little direct connection to marine biodiversity.

While the right to health is recognised within multiple IHRL instruments,[352] Article 12 of ICESCR constitutes the oldest and most established encapsulation of the right. For this reason, I focus primarily on the ICESCR (namely Articles 2(1) and 12)) and the general comments of the ESCR Committee. Where relevant, I also refer to other IHRL instruments, such as the CRC and the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW). These instruments all offer mutually supportive derivatives of the right to health that collectively help define the parameters of the right.

Article 2(1) of ICESCR sets out the foundational obligations that apply equally to all economic, social and cultural (ESC) rights. The Article reads:

> Each State Party to the present Covenant undertakes to *take steps, individually and through international assistance and co-operation,* especially economic and technical, *to the maximum of its available resources*, with a view to *achieving progressively the full realisation of the rights* recognised in the present Covenant *by all appropriate means, including particularly the adoption of legislative measures*.[353]

Article 12(1) in turn provides that '[t]he States Parties to the present Covenant recognise the right of everyone to the enjoyment of the highest attainable standard of physical and mental health', while Article 12(2) provides a non-exhaustive list of actions that States should take to achieve full realisation of the right

[351]For commentary on this issue, see Yael Ronen, 'Human Rights Obligations of Territorial Non-state Actors' (2013) 46 Cornell international law journal 21; Bill Wringe, 'Global Obligations and the Human Right to Health' in Kendy Hess (ed), *Collectivity: Ontology, Ethics, and Social Justice* (1st edn, Rowman & Littlefield International 2018).

[352]UNGA, Universal Declaration on Human Rights (10 December 1948) UN Doc A./RES/3/217(III) (UDHR) art 25(1); International Convention on the Elimination of all Forms of Racial Discrimination (adopted 21 December 1965, entered into force 4 January 1969) 660 UNTS 195 (ICERD) art 5(e)(iv); ICESCR (n 316) art 12; Convention on the Elimination of All Forms of Discrimination against Women (adopted 18 December 1979, entered into force 3 September 1981) 1249 UNTS 13 (CEDAW) arts 11(1)(f) and 12; CRC (n 241) art 24.

[353]Emphasis added.

to health. Read together, these provisions demonstrate that States enjoy a margin of discretion in how to realise the right to health, but that the breadth of this discretion is subject to temporal, procedural and substantive constraints.

To elaborate, these provisions obligate States to progressively realise the right to health by all appropriate means — an obligation which affords States broad discretion in terms of both how and when they fulfil it. However, this discretion is constrained temporally by an obligation to take steps[354] and a series of obligations that must be given immediate effect, including minimum core obligations,[355] the obligation to ensure non-discrimination[356] and the obligation of non-retrogression.[357] State discretion is further constrained procedurally by the obligations to use maximum available resources and to collaborate internationally, in addition to undertaking unilateral action.[358] Finally, the exercise of State discretion is simultaneously constrained substantively and guided by the tripartite obligation that States take actions to respect, protect and fulfil the right to health, and the duty to ensure that all measures taken satisfy four criteria: availability, accessibility, acceptability, and quality (the AAAQ standards).[359] It is within this remaining window of discretion that States are obligated to take 'all appropriate means'. In the remainder of this section, I undertake original research to systematically analyse each of the obligations listed above to identify any logical relationship to marine biodiversity in light of the human health and marine biodiversity nexus. Through this exercise, I conclude that these obligations incur a package of State responsibilities concerning the conservation and sustainable use of marine biodiversity. These findings, in turn, serve as the basis for the analysis in Chapter 4, in which I explore whether there are any precedents or parallels for such obligations within the body of IHRL and international environmental law, and offer suggestions on how States may satisfy these obligations under the right to health concerning marine biodiversity.

Finally, I acknowledge that any claims made in the following sections concerning actions that States should take in pursuit of full realisation of the right to health could, depending on the circumstances, interfere with the enjoyment of other human rights. For this reason, any assertion concerning action that States should

[354]ICESCR (n 316) art 2(1).
[355]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 43.
[356]ICESCR (n 316) art 2(2).
[357]ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (14 December 1990) UN Doc E/1991/23, para 9; ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 32.
[358]ICESCR (n 316) art 2(1).
[359]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) paras 34-37 and 12, respectively. I acknowledge that these categorisations are not absolute, and, for example, the obligation of non-discrimination also imposes a degree of procedural and substantive constraints on State discretion.

take is not absolute, and any clash of rights would need to be addressed in accordance with human rights balancing processes under IHRL and, if necessary, dispute resolution — topics which are outside the scope of this thesis.[360]

2.1. The obligation to achieve progressively the full realisation of the right to health

In this section I examine the meaning of 'progressive realisation' in the context of marine biodiversity and the right to health. I demonstrate that, while this concept allows States time to fully realise the right to health, it does not grant them a free pass to address their obligations at their leisure. The doctrine of progressive realisation is embedded in Article 2(1) of ICESCR, obligating States Parties to '[achieve] progressively the full realisation of the rights recognised in the present Covenant'. This language clearly conveys that it was not the intention of the drafters to hold States accountable for full implementation of the rights therein immediately upon its entry into force.[361] Rather, the doctrine of progressive realisation derives from a pragmatic recognition that it takes time and resources for States to achieve full realisation of ESC rights.[362] Despite its logical and pragmatic underpinning, this doctrine has stimulated extensive academic debate.[363] It has prompted claims that ESC rights are subsidiary to civil and political rights (which are not subject to progressive realisation) and has even led some commentators to question whether ESC rights can be considered rights at all, or whether they are mere programmatic goals or aspirations.[364] Others have questioned the justiciability of ESC rights.[365] I do not reopen these debates here.[366] Today, such claims have largely been surpassed and ESC rights are increasingly understood to hold equal legal force to civil and political rights,[367] in accordance with the principle of indivisibility of rights.[368]

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[360]For more information, see Helen Keller and Reto Walther, 'Max Planck Encyclopedias of International Law' in Hélène Ruiz Fabri (ed), *Max Planck Encyclopedia of International Procedural Law* (Oxford University Press 2018)Stijn Smet, *Resolving Conflicts between Human Rights: The Judge's Dilemma* (London: Routledge 2017).

[361]See, for comparison, the language used in Article 2(1) of the International Covenant on Civil and Political Rights (adopted 16 December 1966 entered into force 23 March 1976) 999 UNTS 171 (ICCPR) which does not allow for progressive realisation of the rights protected therein.

[362]ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para 1; Tobin (n 318) 177-178.

[363]For more information, see Allison Corkery and Ignacio Saiz, 'Chapter 14: Progressive Realization Using Maximum Available Resources: the Accountability Challenge' in Jackie Dugard and others (eds), *Research Handbook on Economic, Social and Cultural Rights as Human Rights* (Edward Elgar Publishing Limited 2020); and Katherine Young, 'Chapter 21: Waiting for Rights: Progressive Realization and Lost Time' in Katherine Young (ed), *The Future of Economic and Social Rights* (Cambridge University Press 2019).

[364]Eibe Riedel, 'The Human Right to Health: Conceptual Foundations' in Andrew Clapham, Mary Robinson and Scott Jerbi (eds), *Realizing the Right to Health* (Ruffer & Rub 2012), 30.

[365]Leib (n 238) 59-62.

[366]For more information on ESC rights versus civil and political rights, see Javaid Rehman, *International Human Rights Law* (2nd edn, Pearson Education UK 2015), ch 6.

[367]Leib (n 238) 59-62; Young (n 363) 3-4.

[368]The Limburg Principles on the Implementation of the International Covenant on Economic, Social and Cultural Rights (8 January 1987) UN Doc E/CN.4/1987/17 ('Limburg Principles') para 3.

Nonetheless, this does not render ESC rights and civil and political rights indistinguishable in practical terms, and State obligations concerning ESC rights must still be interpreted within the framework of progressive realisation. However, while progressive realisation grants States the necessary time to facilitate absolute realisation of ESC rights, it does not allow them to defer action indefinitely. The ESCR Committee has clarified that progressive realisation 'should not be misinterpreted as depriving the obligation of all meaningful content', but rather it 'imposes an obligation to move as expeditiously and effectively as possible' towards full realisation of ESC rights.[369] To constrain the potential for States to delay taking action, drafters of ICESCR and subsequently the ESCR Committee have established three obligations of an immediate nature within the doctrine of progressive realisation: an obligation to take steps, the obligations of non-retrogression and non-discrimination, and minimum core obligations. Additionally, the obligation to take steps must be fulfilled within 'a reasonably short time after the Covenant's entry into force'.[370] These collectively serve as a temporal constraint on the discretion afforded to States in achieving full realisation of the right to health. Each of these is addressed in detail below.

The time afforded to States by the doctrine of progressive realisation will be essential to enable them to satisfy an obligation to protect human health and marine biodiversity linkages. By way of explanation, States must undertake a series of interlinked actions before they may implement effective measures to protect such linkages. A logical first step for any State will be to advance research to better understand linkages between marine biodiversity and human health within their jurisdiction and corresponding stressors on those linkages.[371] Only with such information can an appropriate response strategy be developed. Moreover, the ability to undertake such research, analyse resulting data and make informed policy decisions would require programs to educate a variety of actors on the human health and marine biodiversity nexus.[372] Only once capacity has been developed and baseline information gathered can States begin to formulate a strategic response (e.g., designation of marine protected areas or implementation of ecosystem restoration projects). Finally, appropriate indicators and monitoring systems must be implemented to monitor progress, identify unintended impacts and recalibrate response measures accordingly. I contend that the totality of these tasks would require a significant investment of time and resources, which the doctrine of progressive realisation accommodates. That is not to say, however, that States should not start taking action to fulfil their obligations in the immediate to short term. I address this

[369]ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para 9.
[370]Ibid para 2.
[371]For example, gathering of baseline information and identification of key stressors on marine biodiversity serve as a core component of Japan's 2011 Marine Biodiversity Conservation Strategy (Japan Ministry of the Environment, 'Marine Biodiversity Conservation Strategy' (*FAO*, March 2011) <http://extwprlegs1.fao.org/docs/pdf/JAP181975.pdf> accessed 19 December 2022).
[372]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para 4(g).

issue further in Section 2.3, where I unpack the obligation to 'take steps' in the context of the human health and marine biodiversity nexus.

2.2. The obligation of non-retrogression

In this section, I demonstrate that the obligation of non-retrogression under the right to health prevents States from unjustifiably rolling back measures that promote conservation of marine biodiversity. An early version of the doctrine of non-retrogression (sometimes referred to as 'non-regression') is found in the 1986 Limburg Principles, which state that a State Party to the ICESCR will be in violation of the Covenant if 'it deliberately retards or halts the progressive realisation of a right, unless it is acting within a limitation permitted by the Covenant or it does so due to a lack of available resources or *force majeure'*.[373] This was expanded upon by the ESCR Committee in General Comment No.3, which further provided that '[a]ny deliberately retrogressive measures in that regard would require the most careful consideration and would need to be fully justified by reference to the totality of the rights provided for in the Covenant and in the context of the full use of the maximum available resources'.[374]

Specifically in the context of the right to health, the ESCR Committee observed that:

> There is a strong presumption that retrogressive measures taken in relation to the right to health are not permissible. If any deliberately retrogressive measures are taken, the State Party has the burden of proving that they have been introduced after the most careful consideration of all alternatives and that they are duly justified by reference to the totality of the rights provided for in the Covenant in the context of the full use of the State Party's maximum available resources.[375]

In essence therefore, the doctrine of non-retrogression serves as a tool that seeks to, at least, preserve the status quo and to raise flags if States take any steps that would cause them to deviate further from full realisation of the right to health.[376] Such steps may be normative, through the revocation of legal norms that promote the right to health, or may be empirical, if they restrict real-world enjoyment of guarantees protected by legal norms.[377] Given the intrinsic role that marine biodiversity plays in supporting human health through the provision of ecosystem services, it is logical to conclude that steps to reduce the level of protection afforded to marine biodiversity could be retrogressive, in the first instance.

[373]Limburg Principles (n 368) para 72.
[374]ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para 9.
[375]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 32.
[376]Young (n 363) 17.
[377]Corkery and Saiz (n 363) 280.

While the doctrine of non-retrogression is well established as a core guiding principle and obligation in the field of human rights, it is also increasingly recognised as an important principle in the context of environmental protection.[378] Prieur highlighted that evidence for the importance of non-retrogression in environmental law can be found in various legal fields, including human rights law, international environmental law, European Union law, constitutional law and national environmental law.[379] The International Union for Conservation of Nature (IUCN) incorporated an express provision on 'non-regression' in their 2015 Draft International Covenant on Environment and Development. The provision states that 'substantive and procedural rules for environmental conservation shall be maintained without regression, and interpreted and applied in favour of ecological integrity, unless compelling reasons of public interest require otherwise'.[380] Although the draft Covenant holds no legal force, it nonetheless demonstrates growing international awareness of the importance of non-retrogression concerning environmental protection.

There are also numerous provisions in international environmental law that, while they may not mention the term 'non-retrogression' or 'non-regression' explicitly, nonetheless prevent States from rolling back environmental protection measures.[381] For example, Article 8(k) of the CBD requires States Parties to '[d]evelop *or maintain* necessary legislation and/or other regulatory provisions for the protection of threatened species and populations'.[382] The Paris Agreement states, in Article 3, that '[t]he efforts of all parties will represent *a progression over time*'.[383] In the context of protection of the marine environment, Article 194(1) of the United Nations Convention on the Law of the Sea (UNCLOS) obligates States, inter alia, to 'take, individually or jointly as appropriate, all measures (…) *to prevent, reduce and control* pollution of the marine environment from any source'.[384] Harrison noted that, in practice, this provision creates a due diligence obligation on States that, not only extends to controlling marine pollution, but has also been interpreted to include measures targeted towards protection of marine biodiversity.[385] Therefore,

[378]See Lynda M. Collins and David R. Boyd, 'Non-regression and the Charter Right to a Healthy Environment' (2016) 29 Journal of environmental law and practice 285.
[379]Michel Prieur, 'Non-regression in Environmental Law' (2012) 5 Surveys and perspectives integrating environment and society 52, 54-55
[380]IUCN, *Draft International Covenant on Environment and Development — Implementing Sustainability (Fifth Edition: Updated Text)* (IUCN Environmental Policy and Law Paper No 31 Rev 4 2015), art 10.
[381]See Michael Faure (ed), *Elgar Encyclopedia of Environmental Law* (Edward Elgar Publishing 2016), 251-259.
[382]Emphasis added.
[383]Emphasis added.
[384]Emphasis added.
[385]Harrison (n 74) 28-30. See also *Chagos Marine Protected Area Arbitration (Mauritius v. United Kingdom)* (2015) Permanent Court of Arbitration case No.2011-3, Award of 18 March 2015, para 538.

Article 194(1) of UNCLOS can be interpreted in a way that corroborates the existence of a State obligation against unjustifiably rolling back protection measures for marine biodiversity.

In summary therefore, the doctrine of non-retrogression is well established as a key legal tool for both the advancement of human rights and protection of the environment. It therefore follows that it is equally important for protection of the environment as required for fulfilment of human rights. Therefore, I posit that the obligation of non-retrogression under the right to health requires States to refrain from taking actions that reduce existing levels of protection to marine biodiversity, either de jure or de facto, without adequate justification. Any such actions would place an onus on the State to justify its actions. The forms that such retrogressive action may take and the potential grounds for justification are explored in Chapter 4.[386]

2.3. The obligation to take steps

The obligation to 'take steps' builds on the obligation of non-retrogression by requiring States to make tangible progress within a short timeframe, rather than simply preserving the status quo. In doing so, it serves as another key temporal constraint on discretion afforded under the doctrine of progressive realisation. In this section, I contend that the obligation to take steps requires States, in the short term, to plan for the protection of marine biodiversity and ecosystem services.

As noted by the ESCR Committee in its General Comment No.3:

> While the full realisation of the relevant rights may be achieved progressively, steps towards that goal must be taken within a reasonably short time after the Covenant's entry into force for the States concerned. Such steps should be deliberate, concrete and targeted as clearly as possible towards meeting the obligations recognised in the Covenant.[387]

It further added that the obligation to take steps 'cannot be qualified or limited by other considerations' such as resource constraints.[388] Commentators have observed that the obligation to take steps should be considered an obligation of conduct rather than result, and in the context of the right to health, it at least obligates States to make a plan or strategy for how they will achieve full realisation of the right to health.[389]

[386]See ch 4 sec 2.3.
[387]ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para 2.
[388]Ibid.
[389]Tobin (n 318) 177.

A similar obligation to develop appropriate plans can be found in General Comment No.15 of the Committee on the Rights of the Child (CRC Committee), which prescribes that core State obligations regarding children's right to health include 'developing, implementing, monitoring and evaluating policies and budgeting plans of action that constitute a human rights-based approach to fulfilling children's right to health'.[390] The scale of the steps that must be taken are further informed by the concurrent obligations to use maximum available resources, to seek international assistance, and to give priority to realising the minimum core obligations under the right to health, as discussed further in the following sections.[391]

In the context of the human health and marine biodiversity nexus, the obligation to take steps at least translates into a duty on States to develop a plan for protecting marine biodiversity and the ecosystem services that it provides, and thereafter to take steps towards implementing the plan. This plan should set out a pathway towards the incorporation of the nexus into decision-making processes, with a view to achieving full protection of marine biodiversity to the extent necessary to support human health. While the content of any national plan or strategy will depend upon each State's unique circumstances, valuable insights on how to integrate biodiversity and health can be found within both international biodiversity and health law.

Both the CBD and WHO have highlighted a range of measures that States should take to enhance human health and biodiversity linkages, including: developing interdisciplinary research programs to fill existing knowledge gaps, driving capacity-building initiatives to increase knowledge of the human health and biodiversity nexus, and facilitating integrated decision-making processes by incorporating biodiversity considerations into public health policies and planning processes and vice versa.[392] The specific actions that States should take to fully realise the right to health in light of the human health and marine biodiversity nexus are covered in greater detail in the next chapter. For the purposes of this section, my primary contention is that the obligation to take steps requires States, in the short term, to start developing plans on how human health and marine biodiversity linkages will be strengthened within national policymaking, including through the mechanisms mentioned above.

[390]CRC Committee, 'General Comment No.15 on the Right of the Child to the Enjoyment of the Highest Attainable Standard of Health (art 24)' (17 April 2013) UN Doc CRC/C/GC/15, para 73(d).
[391]ESCR Committee, 'An Evaluation of the Obligation to Take Steps to the "Maximum Of Available Resources" Under an Optional Protocol to the Covenant' (21 September 2007) UN Doc E/C.12/2007/1, paras 4-6.
[392]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para.4(b); WHO (n 80) para 17.

2.4. The obligation of non-discrimination

In this section, I demonstrate that the obligation of non-discrimination under the right to health extends to ensuring non-discrimination in enjoyment of access to ecosystem services provided by marine biodiversity. The right to freedom from discrimination is well recognised within IHRL, including the Universal Declaration on Human Rights, the International Covenant on Civil and Political Rights (ICCPR), the ICESCR, the CRC, the Convention on Migrant Workers , and the Convention on the Rights of Persons with Disabilities (CRPD).[393] Furthermore, it is the exclusive focus of two treaties: CEDAW, and the International Convention on the Elimination of Racial Discrimination (ICERD)[394] While the right to freedom from discrimination duly enjoys the status of a stand-alone human right,[395] it is also a fundamental component of the right to health. This has been recognised by the ESCR Committee,[396] and is also acknowledged within ICERD[397] and CEDAW.[398] The ESCR Committee also acknowledges that the obligation of non-discrimination falls outside the purview of the doctrine of progressive realisation, proclaiming that 'State Parties have immediate obligations in relation to the right to health, such as the guarantee that the right will be exercised without discrimination of any kind'.[399] Failure to take appropriate measures to combat discrimination also cannot be attributed to lack of resources, as the ESCR Committee further notes that many measures to combat discrimination in access to healthcare and the underlying determinants of health can be 'pursued with minimum resource implications through the adoption, modification or abrogation of legislation and the dissemination of information'.[400] From this text it is clear that there are no apparent defensible grounds for States' failure to combat discrimination regarding full enjoyment of the right to health. This also clearly demonstrates the ESCR Committee's intention that the duty of non-discrimination extends not only to access to healthcare but also to the underlying determinants of health,[401] which I argue above includes marine biodiversity.[402]

[393]UDHR (n 352) art 7; ICCPR (n 361) art 26; ICESCR (n 316) arts 2(2) and 3; CRC (n 241) art 2; International Convention on the Protection of the Rights of All Migrant Workers and Members of their Families (adopted 18 December 1990, entered into force 1 July 2003) 2220 UNTS 3 (CMW) art 7; Convention on the Rights of Persons with Disabilities (adopted 13 December 2006, entered into force 3 May 2008) 2515 UNTS 3 (CRPD) art 4(1).
[394]CEDAW (n 352); ICERD (n 352).
[395]ICESCR (n 316) arts 2(2) and 3.
[396]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) paras 3, 12(b), 18, 19, 21, 22, 26, 27, 30, and 34.
[397]ICERD (n 352) art 5(e)(iv).
[398]CEDAW (n 352) arts 11(1)(f) and 12.
[399]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 30. See also ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para. 1
[400]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233).
[401]Ibid para 18.
[402]See ch 3 sec 1.

To understand whether, and if so how, marine biodiversity relates to the principle of non-discrimination in the context of health, it is first necessary to narrow down what the term 'discrimination' means. In its General Comment No.18, the Human Rights Committee (HRC) observed that, while the term is not defined in either the ICCPR or the ICESCR, its meaning can be discerned from a joint reading of ICERD and CEDAW. On this basis, it defined 'discrimination' — albeit in the context of the ICCPR — as:

> any distinction, exclusion, restriction or preference which is based on any ground such as race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status, and which has the purpose or effect of nullifying or impairing the recognition, enjoyment or exercise by all persons, on an equal footing, of all rights and freedoms.[403]

It is important to acknowledge that the term 'non-discrimination' is not synonymous with 'equality'. As noted by MacNaughton, 'equality' may be viewed as individual (or one-to-one) equality, whereby one person must be treated identically to another — such as the principle that, in a democracy, every person has one vote, and each vote is weighted equally.[404] 'Non-discrimination', on the other hand, may be considered as bloc equality, which requires equality between blocs (or distinct groups) of people, but does not necessarily require identical treatment of individuals within each bloc.[405] In other words, discrimination refers to groups of people being treated differently based on a shared characteristic.

The ESCR Committee has provided further clarity on the meaning of discrimination in the context of ESC rights by prescribing that discrimination may be formal (i.e., a product of written laws or policies), or substantive (i.e., resulting from acts or omissions in practice).[406] It may also be direct (i.e., when a group of people suffer less favourable conditions as a direct result of their race, colour, sex, religion, etc, such as being refused access to necessary health care) or indirect (i.e., a disproportionate impact experienced by a person or persons that is not due to express discrimination based on specific grounds, but in practice harms a subset of people based on a shared characteristic).[407] In a similar vein, McKean observed that 'it is not necessary for a discriminatory motive to exist if discrimination exists in fact'.[408] Therefore, actions taken

[403]HRC, 'CCPR General Comment No.18: Non-discrimination' (10 November 1989) <www.refworld.org/docid/453883fa8.html> accessed 19 December 2022, para 6.
[404]Gillian MacNaughton, 'Untangling Equality and Non-discrimination to Promote the Right to Health Care for All' (2009) 11 Health Hum Rights 47, 49.
[405]Ibid.
[406]ESCR Committee, 'General Comment No.20: Non-discrimination in Economic, Social and Cultural Rights (art 2, para 2, of the International Covenant on Economic, Social and Cultural Rights)' (2 July 2009) UN Doc E/C.12/GC/20, paras 8 and 10.
[407]Ibid.
[408]Warwick McKean, 'The Meaning of Discrimination in International and Municipal Law' (1970) 44 British yearbook of international law 177, 181.

at a State level that unwittingly yield a discriminatory outcome may still constitute discrimination. Moreover, grounds for discrimination are not constrained to an exhaustive predetermined list of characteristics, and the concept of discrimination remains flexible and capable of adapting to meet new challenges.[409]

Based on this understanding, there is clear potential for unequal enjoyment of the right to health when considered in the context of the marine environment. Indigenous peoples and many of the world's poorest communities are highly dependent on the natural environment and ecosystem services for their subsistence, livelihoods and health.[410] Therefore, they suffer a disproportionate burden from loss or deterioration of biodiversity.[411] In the context of the right to health specifically, the ESCR Committee has also acknowledged that 'the vital medicinal plants, animals and minerals necessary to the full enjoyment of health of indigenous peoples should also be protected'.[412] There is an expansive body of research that acknowledges the intrinsic role that marine biodiversity plays in many traditional medicines.[413] Research also suggests that women and children suffer disproportionately from environmental pollution.[414] Furthermore, susceptibility to such risks does not depend upon vulnerable groups living in close physical proximity to the area where environmental harm occurs. Due to the dynamic nature of the marine environment, marine pollution, for example, can trigger negative health outcomes in communities living thousands of miles from the pollution source.[415]

As noted above, the grounds for discrimination are not limited to predetermined categories such as sex, race, religion, age, etc. The impacts of marine biodiversity loss and degradation will require acknowledgement of new categories of discrimination. At a national level, coastal communities will suffer a greater burden from loss of marine biodiversity than inland populations, just as at an international level, small island States will suffer a greater burden than landlocked States. Similarly, economic status will play a strong distinguishing factor and States' delays in taking action to combat biodiversity loss could exacerbate the relative burden borne by poorer communities who have fewer resources with which to

[409]ESCR Committee, 'General Comment No.20: Non-discrimination in Economic, Social and Cultural Rights (art 2, para 2, of the International Covenant on Economic, Social and Cultural Rights)' (n 406) para 15.
[410]IPBES (n 54) 15.
[411]Ibid.
[412]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 27.
[413]See eg Héctor Barrios-Garrido and others, 'Marine Turtle Presence in the Traditional Pharmacopoeia, Cosmovision, and Beliefs of Wayuú Indigenous People' (2018) 17 Chelonian conservation and biology 177; Rômulo Romeu Nóbrega Alves and others, *Marine Invertebrates in Traditional Medicines* (Springer Berlin Heidelberg 2012).
[414]HRC, 'Report of the Independent Expert on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment, John H. Knox' (2013) UN Doc A/HRC/25/53, paras 71 and 74.
[415]Jennifer Martin and others, 'What is Marine Justice?' (2019) 9 J Environ Stud Sci 234, 238.

procure alternative sources of food or medicine, or less formal education with which to acquire alternative sources of employment.[416]

Furthermore, vulnerable groups do not just face disproportionate risks from the loss or degradation of biodiversity, but also from response measures taken to combat biodiversity loss. In his capacity as Special Rapporteur, Knox reported that he has observed many examples of indigenous communities being displaced during the designation of protected areas, resulting in 'marginalisation, loss of livelihoods, food insecurity, extrajudicial killings, and disrupted links with spiritual sites and denial of access to justice and remedy'.[417] Whilst physical displacement is less likely to occur in the protection of marine environments, it is foreseeable that, unless care is exercised, such measures could deny such groups access to sources of food, livelihood and ingredients for traditional medicines.

Thus, specific groups are clearly subject to elevated health risks through a variety of interactions with marine biodiversity: through the loss of essential food sources, livelihoods and medicinal inputs resulting from biodiversity loss; enhanced exposure and vulnerability to risks from marine pollution through consumption of contaminated food or bathing; and potential consequences of conservation or other response measures. The harms suffered by these groups may not immediately resonate as discrimination in the general sense of the word, which often conjures up images of formal and/or direct discrimination, such as denial of voting rights for women or oppression of indigenous groups. Nonetheless, there is a clear logical argument that the harm experienced by distinct groups outlined above constitutes discrimination. We must recall that loss of marine biodiversity at the rate currently observed is not a natural process — it is a product of State actions, both directly through undertaking activities that cause harm to the marine environment, and indirectly through authorising third parties to undertake such activities. It is also a product of State inaction, through failure either to regulate harmful activities or implement sufficiently stringent controls and protection measures. I reiterate that a discriminatory outcome does not require a discriminatory motive. Due to State action and inaction leading to loss and degradation of marine biodiversity, distinct groups of individuals are experiencing a disproportionate impairment of their ability to enjoy their right to health. This is a clear case of discrimination in violation of Article 2(2) of ICESCR. To apply the terminology used by the ESCR committee, the above examples of the disproportionate impacts that vulnerable groups are likely to experience because of loss or degradation of marine biodiversity will, in most cases, be substantive and indirect resulting from their stronger reliance upon marine biodiversity, or their increased vulnerability

[416]Young (n 363) 22-23.
[417]HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166) para 58.

to loss of ecosystem services or increased marine pollution. Thus, protection of the nexus between marine biodiversity and human health is essential to avoid States breaching their obligation of non-discrimination under the right to health. Failure by States to take action to prevent the loss and deterioration of marine biodiversity will impair the enjoyment of the right to health by specific identifiable groups of people. As observed by the ESCR Committee, 'in order to eliminate substantive discrimination, States parties may be, and in some cases are, under an obligation to adopt special measures to attenuate or supress conditions that perpetuate discrimination'.[418]

Building on the above, I posit that there are several logical actions for States to consider, to avoid such discrimination and adhere to their international obligations under the ICESCR. First, it will be essential to advance research into the various human health and marine biodiversity linkages, with a particular focus on vulnerable groups. With an advanced level of understanding, States can identify and counteract potential instances of discrimination. Second, States must establish a national plan to combat all forms of discrimination, including those that relate to the human health and marine biodiversity nexus, as noted above in the context of the obligation to take steps and mandated by the ESCR Committee regarding the obligation of non-discrimination.[419] Third, States must ensure the participation of marginalised and vulnerable groups in decision-making processes regarding ocean governance.[420] Fourth, States must take affirmative action to counteract the disproportionate burdens faced by these groups.

2.5. Minimum core obligations

In an additional effort to derive immediate impact from ESC rights and further restrict the temporal discretion afforded to States by the doctrine of progressive realisation, the ESCR Committee postulated that States Parties are also obligated to give immediate effect to a series of minimum core obligations (MCOs) for each right protected by the covenant.[421]

The specific character of MCOs has been debated extensively since their emergence, with some scholars asserting that they must be considered non-derogable, or justiciable by courts, whilst others argue that their realisation may not be subject to any delay thus removing them from the scope of the doctrine of progressive

[418]ESCR Committee, 'General Comment No.20: Non-discrimination in economic, social and cultural rights (art 2, para 2, of the International Covenant on Economic, Social and Cultural Rights)' (n 406) para 9.
[419]Ibid para 38.
[420]Ibid para 36; ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 54; Martin and others (n 415) 239-240.
[421]ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para 10.

realisation.[422] Some have questioned their legitimacy on a number of grounds, including their indeterminacy and feasibility.[423] Tasioulas observed that 'The items on [General Comment No.14's] list of [MCOs], and those of comparable priority, are highly indeterminate, both as to the kind of benefits involved and the cost or level at which these benefits must be provided in order to comply with the relevant obligation'.[424] On the issue of feasibility, Tobin asserted that, 'for many States the capacity to ensure the realisation of these [MCOs] will remain as distant as the prospect of the full realisation of the right to health itself'.[425] Forman et al. further highlighted that this places a 'financially unrealistic obligation upon poorer countries'.[426]

These uncertainties are reflected in the level of State acceptance, with States generally demonstrating sporadic and inconsistent acknowledgement of MCOs in their reports to the ESCR Committee and within judicial systems.[427] Despite such contention, there is growing consensus around the validity of MCOs and the interpretation that they are characterised by the immediacy of the obligations they impose.[428] As Tasioulas noted, 'the rationale of the [MCO] is that it addresses a persistent problem regarding the temporal sequencing of human rights obligations in situations in which they cannot be immediately complied with due to resource constraints'.[429] Thus, it is reasonable to conclude that MCOs are to be fulfilled immediately and in full by States.[430]

In the context of the right to health, the ESCR Committee indicated that the objective of the MCOs is to facilitate the minimum essential level of enjoyment of the right '*including* essential primary health care'.[431] Thus, the Committee did not limit the scope of the MCOs exclusively to essential primary health care, leaving scope for inclusion of additional factors such as, potentially, underlying determinants of health.[432] However, there are several reasons not to be too optimistic for the inclusion of underlying determinants in the MCOs. The MCOs serve to identify the first steps that States should take towards progressively realising the right to health, taking account of the most pressing health needs.[433] In this sense, Tobin noted that there

[422]Young (n 363) 12-13; Tasioulas (n 179) 1.
[423]See eg Lisa Forman and others, 'What Do Core Obligations Under the Right to Health Bring to Universal Health Coverage?' (2016) 18 Health and Human Rights 23.
[424]Tasioulas (n 179) 7.
[425]Tobin (n 318) 240.
[426]Forman and others (n 423) 29.
[427]Tobin (n 318) 243.
[428]Young (n 363) 12-13.
[429]Tasioulas (n 179) 4.
[430]Ibid.
[431]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) paras 43-45. Emphasis added.
[432]Tasioulas (n 179) 5.
[433]Tobin (n 318) 245.

is a logical synergy between this objective and primary health care.[434] While marine biodiversity — along with many other underlying determinants — indisputably plays an essential role in supporting enjoyment of the highest attainable standard of physical and mental health, it would almost invariably play a less immediate role in tackling a State's most pressing health issues. Furthermore, some commentators argue that expansive or maximalist interpretations of the MCOs deprive them of their value and fundamental purpose — namely to facilitate prioritisation of health interventions, taking account of the reality of resource constraints.[435] As the scope of MCOs expands, so too does the resource cost of their realisation. Thus, it seems potentially counterproductive to include protection of underlying determinants of health as a standalone objective of the MCOs.

Nonetheless, while protection of underlying determinants may not be defensible as a priority of the MCOs, there is potential scope for consideration of marine biodiversity within the non-exhaustive list of MCOs provided in General Comment No.14. Two MCOs in particular have a logical connection to marine biodiversity: '(b) To ensure access to the minimum essential food which is nutritionally adequate and safe, to ensure freedom from hunger to everyone'; and '(f) To adopt and implement a national public health strategy and plan of action (…) on the basis of a participatory and transparent process (…) [which] shall include methods, such as right to health indicators and benchmarks, by which progress can be closely monitored'.[436]

Whether protection of marine biodiversity can be linked to the MCO, to ensure access to 'the minimum essential food, which is nutritionally adequate and safe, to ensure freedom from hunger to everyone' depends on several factors. First, it remains unclear what constitutes 'minimum essential food' or the parameters within which food may be considered 'nutritionally adequate and safe'.[437] Thus, where one chooses to draw these lines will influence the relevance of marine biodiversity. Second, the relevance of marine biodiversity will vary according to the country, locality, community and culture in question, as some diets and traditional culinary practices will depend more heavily on the marine environment than others. This then constitutes another area for States to exercise sensitivity to the needs of vulnerable or marginalised members of their population, who may rely heavily upon marine biodiversity as a source of food and nutrition. Ultimately, the determination of whether protection of marine biodiversity is the most efficient

[434]Ibid 250.
[435]Tobin and Damon (n 35) 77.
[436]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 43. Para 44 also introduces 'obligations of comparable priority', the legal status of which remain subject to dispute. See eg Tasioulas (n 179) 8.
[437]Tasioulas (n 179) 6.

and cost-effective way to ensure access to minimum essential food (compared to provision of alternative food sources, for example) will remain the prerogative of each State.

There is a more logical entry point for marine biodiversity in the MCO to adopt a national public health strategy and plan of action. This obligation corroborates the planning obligations highlighted above in the context of the duties to take steps and to ensure non-discrimination.[438] The intrinsic connection that marine biodiversity bears to public health means that any such plan or national strategy must consider human health and marine biodiversity linkages. This MCO extends beyond the planning obligations already considered above by explicitly requiring the incorporation of health indicators and benchmarks to facilitate monitoring. As discussed below in the context of, 'all appropriate means',[439] it is imperative that States advance research into the human health and marine biodiversity nexus, including the identification of indicators and other methods with which to measure progress.

2.6. The obligation to use maximum available resources

In addition to the temporal constraints imposed on the doctrine of progressive realisation by the State obligations to take steps to ensure non-discrimination and non-retrogression, and by the MCOs, procedural constraints are also imposed by the duty to use maximum available resources. This helps to ensure that full realisation of the right to health remains a priority within State budgeting and planning processes. On the face of it, the determination of whether a State is deploying its maximum available resources to pursue full realisation of the right to health seems to be a subjective and challenging one, based on questions around what constitutes 'resources' and what is meant by 'maximum available'. However, the ESCR Committee and the academic community have offered clarification on these points.

In line with the obligation to seek international assistance and to cooperate, the ESCR Committee has confirmed that the pool of available resources is not limited to resources within the State, but also those available through the international community.[440] This therefore requires States to make use of support available to them through relevant international platforms, such as regional fisheries management organisations, the secretariat of the CBD and the Food and Agriculture Organization of the United Nations (FAO), to name a few. This is discussed further in the context of the obligation to cooperate internationally in Section 2.7, below. Similarly, Tobin noted that:

[438]See ch 3 secs 2.3 and 2.5.
[439]See ch 3 sec 2.8.
[440]ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para 13.

> As commentators have recognised, 'available resources refers to resources available within the society as a whole, from the private sector as well as the public'. Thus, the obligation of the States is to 'mobilise these resources', to the extent that it is reasonably practicable to do so, for the purpose of securing the realisation of the right to health.[441]

The most effective policy mechanisms to satisfy this obligation in the context of the human health and marine biodiversity nexus will depend on the circumstances at hand. However, this could include developing policy frameworks to encourage private sector investment in more environmentally friendly sectors such as ecotourism, rather than extractive industries.

The CRC Committee has also asserted that 'resources' must be understood to encompass, 'not only financial resources but also other types of resources relevant for the realisation of ESC rights such as human, technological, organisational, natural and information resources'.[442] This view is widely supported by the academic community.[443] I therefore contend that this holistic interpretation of 'resources' must logically include biological and genetic resources derived from marine biodiversity and the ecosystem services that it provides. Considered in conjunction with the concept of sustainable development, the obligation to use marine biodiversity to help realise the right to health cannot logically be interpreted in a manner that supports short-term depletion of such resources. Rather, it necessitates sustainable use and protection of biological resources, such that they remain available to continue to support health needs over time, including those of future generations. Moreover, use of marine biological resources, or indeed any efforts taken to protect such resources, must be undertaken in a manner that prevents foreseeable violation of the rights and interests of vulnerable communities — particularly indigenous communities — in line with the immediate obligation to ensure non-discrimination.

Therefore, regarding the question of what constitutes 'resources' for the purposes of Article 2(1), the ESCR Committee has clarified that they include resources available internationally as well as domestically, and they are not constrained only to financial resources. There are therefore two ways to look at marine biodiversity as it relates to the obligation to use maximum available resources. First, protection of marine biodiversity is important for preserving human health, therefore States should consider allocating their resources (financial and otherwise) towards stronger protection of marine biodiversity in pursuit of full

[441]Tobin (n 318) 230.
[442]CRC, 'Report of the Forty-Sixth Session' (2 April 2008) UN Doc CRC/C/46/3, ch VII para 65.
[443]See Veronika Bílková, 'The Nature of Social Rights as Obligations of International Law: Resource Availability, Progressive Realization and the Obligations to Respect, Protect, Fulfil' in Christina Binder and others (eds), *Research Handbook on International Law and Social Rights* (Edward Elgar Publishing 2020), 24-25; Corkery and Saiz (n 363) 286.

realisation of the right to health. Second, marine biodiversity can, itself, be considered part of the pool of natural resources available to States with which to pursue full realisation of the right to health. Therefore, marine biodiversity must be used sustainably to ensure its availability over time and to support the needs of future generations.

The remaining question to be addressed is: at what point can a State be considered to have deployed the 'maximum available' resources? The question of resource allocation is a challenging one that necessitates solemn reflection on the role that human health and marine biodiversity linkages play within the bigger picture of realising the right to health. There are two intrinsically linked subcomponents for consideration here: how much resources States allocate, and what they allocate them to. As a minimum, the ESCR Committee has confirmed that States cannot simply attribute an unwillingness to act to a lack of resources, stating that 'if resource constraints render it impossible for a State to comply fully with its Covenant obligations, it has the burden of justifying that every effort has been made to use all available resources at its disposal'.[444] The Limburg Principles add that 'in the use of the available resources, due priority shall be given to the realisation of rights recognised in the Covenant'.[445] Thus, lack of resources cannot be used as an incontestable excuse for inaction, and realisation of ESC rights must take a high priority in State resource allocation. The ESCR Committee has acknowledged that a State has the discretion to 'adopt what it considers to be its most appropriate policies and to allocate resources accordingly'.[446] In addition, various bodies have stressed that resources must be used as effectively and efficiently as possible.[447] Beyond this broad discretion, it is clear that priority in allocation must be afforded to realising the MCOs[448] and ensuring the protection of the most vulnerable members or groups of society.[449]

Within this remaining discretionary window lies the challenge in pushing for protection of marine biodiversity in pursuit of the right to health. It is clear from the above that a State cannot be obligated to allocate resources to protection of marine biodiversity, as the State may not deem this to be the most efficient or effective use of the limited pool of resources at its disposal with which to fulfil the right to health. Indeed, in the case of some developing States that do not yet have the necessary infrastructure to

[444]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 47.
[445]Limburg Principles (n 368) para 28.
[446]ESCR Committee, 'An Evaluation of the Obligation to Take Steps to the "Maximum Of Available Resources" Under an Optional Protocol to the Covenant' (n 391) para 2.
[447]Corkery and Saiz (n 363) 284.
[448]ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para 10; ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 43.
[449]ESCR Committee, 'An Evaluation of the Obligation to Take Steps to the "Maximum Of Available Resources" Under an Optional Protocol to the Covenant' (n 391) para 4; Corkery and Saiz (n 363) 282.

provide widespread primary care services, it would be absurd to suggest that resources should be reallocated to the designation and management of marine conservation areas at the expense of building hospitals or training medical staff. Nonetheless, an increased awareness of the human health and marine biodiversity nexus should at least necessitate consideration of marine biodiversity protection within States' budget allocation processes.

2.7. The obligation to facilitate realisation of rights both individually and through international assistance and cooperation

The obligation to facilitate realisation of rights, both individually and through international assistance and cooperation, imposes additional procedural constraints on the discretion afforded to States concerning how they realise the right to health.[450] The obligation to cooperate in the fulfilment of all ESC rights — including the right to health — is well established in IHRL, and is enshrined in ICESCR, CRC, and CRPD.[451] In Article 2(1) of ICESCR, it is framed as an obligation on States to 'take steps, *individually and through international assistance and co-operation*, especially economic and technical (…) with a view to achieving progressively the full realisation of the rights recognised in the present Covenant'.[452] This obligation contains multiple components, each of which are relevant for how States manage human health and marine biodiversity linkages. First, any obligation of international collaboration is counterbalanced with a corresponding obligation to take unilateral action as far as possible towards protecting marine biodiversity, to the extent necessary to realise the right to health. Thus, States cannot concede all responsibility to international fora, and any steps to do so would be difficult to justify as anything other than a breach of Article 2(1).

Second, States are also obligated to realise the right to health through 'international assistance and cooperation', which is particularly relevant in the context of marine biodiversity for several reasons. As noted by Harrison, 'the interconnected nature of the seas means that individual action by States is not sufficient to address the protection of the marine environment'.[453] I propose there are three reasons why international cooperation is necessary. First, many marine species are migratory, requiring an international response to achieve their sustainable use and protection. Dunn et al. concluded that 'without such collaboration focused on migratory connectivity, efforts to effectively conserve these critical species across jurisdictions will have limited effect'.[454] Second, in addition to the migratory nature of much marine

[450]ICESCR (n 316) art 2(1)
[451]ICESCR (n 316) art 2(1); CRC (n 241) arts 23(4) and 28(3); CRPD (n 393) art 32.
[452]Emphasis added.
[453]Harrison (n 74) 2.
[454]Daniel Dunn and others, 'The Importance of Migratory Connectivity for Global Ocean Policy' (2019) 286 Proc R Soc B 20191472, 2 [page numbers cited for this article correspond to the PDF version of the article downloaded from the journal website].

biodiversity, the interconnectedness of the ocean means that human activities — both marine and terrestrial — undertaken within the territory of one State, are capable of harming marine biodiversity within the territory of another. Agricultural run-off and industrial effluent continue to cause significant harm to the marine environment globally, and continually advancing research is helping us to understand the global and catastrophic impact of plastic pollution on the marine environment and biodiversity.[455] Third, a large proportion of marine biodiversity, and sources of harm to marine biodiversity, occur in areas beyond national jurisdiction (ABNJ),[456] and therefore a collaborative international response is necessary.

While the duty to cooperate under ICESCR is drafted in such a way that it applies equally to all rights protected therein, drafters of the CRC instead opted to include a paragraph on international cooperation within the provision on the right to health itself, obligating States to, 'promote and encourage international cooperation'.[457] Unlike the ICESCR language to 'facilitate realisation of rights' through 'international cooperation and assistance', the language of the CRC to 'promote and encourage' suggests that this is more an obligation of conduct than of result.[458] However, Tobin observed that this does not render the obligation 'meaningless' or 'redundant'.[459] Rather, it obligates States to 'take every reasonable measure subject to their available resources and capacities to facilitate effective international cooperation with respect to the right to health'.[460]

The 'assistance' component warrants further consideration. In addition to collaborating on a level playing field to overcome transboundary challenges, it is crucial to acknowledge the inequities in global wealth and resource distribution. Obligations of international assistance exist to help resource-constrained States acquire the resources necessary to achieve full realisation of ESC rights. For this reason, it must give rise to different obligations for different States based on their economic status. Both academic literature and the general comments of the ESCR Committee point to the existence of an obligation on developed States — or those 'in a position to assist others' — to provide assistance to other States to achieve full realisation of ESC rights.[461] While the academic literature remains divided on the existence of a general obligation to

[455]See Beth Polidoro and others, 'Land-based Sources of Marine Pollution: Pesticides, PAHs and Phthalates in Coastal Stream Water, and Heavy Metals in Coastal Stream Sediments in American Samoa' (2017) 116 Marine Pollution Bulletin 501; Kağan Cebe and Lale Balas, 'Monitoring and Modeling Land-based Marine Pollution' (2018) 24 Regional Studies in Marine Science 23.
[456]Glen Wright and others, *The Long and Winding Road: Negotiating a Treaty for the Conservation and Sustainable Use of Marine Biodiversity in Areas Beyond National Jurisdiction* (IDDRI, Studies No08/18 2018), 9-22.
[457]CRC (n 241) art 24(4).
[458]Tobin (n 318) 330.
[459]Ibid 330-331.
[460]Ibid.
[461]ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para 14. See also ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 40; Magdalena Sepúlveda Carmona, 'The Obligations of "International Assistance and Cooperation" Under the

provide extraterritorial assistance, there is stronger consensus that such an obligation exists under the ICESCR specifically.[462] For instance, Vandenhole asserted that such an obligation does not exist under the CRC due to an express jurisdiction clause limiting the scope of State obligations to apply only within their territory.[463] By contrast, the absence of a jurisdiction clause in the ICESCR led him to conclude that the Covenant gives rise to extraterritorial obligations to provide assistance.[464] This is corroborated by Article 23 of ICESCR itself, which reads: 'the States Parties (…) agree that international action for the achievement of the rights recognised in the present Covenant includes (….) the furnishing of technical assistance'.

Developing States on the other hand, as those most likely in need of assistance to fulfil their human rights obligations, are subject to a different set of obligations. This includes an obligation to seek assistance, as necessary, to enable them to realise the right to health. This obligation has been recognised in both academic literature and general comments of the ECSR Committee, and also represents an essential component of the obligation to use maximum available resources, discussed in Section 2.6 above.[465] This bears strong ties to, and is mutually supportive with, the obligation to deploy maximum available resources, since the pool of resources available for a State to draw from include those available through the international community. The obligation to seek assistance is also well developed in the context of disaster relief. In 2003, the Institut de Droit International published a resolution on humanitarian assistance, which proclaimed that 'Whenever the affected State is unable to provide humanitarian assistance to the victims placed under its jurisdiction or de facto control, it shall seek assistance from competent international organisations and/or from third States'.[466] Benton Heath further observed that 'In the debates surrounding the development of this provision, some members of the Institut argued that this obligation reflected customary international law, regardless of whether the relevant catastrophe is an armed conflict, or a natural or man-made disaster'.[467]

Later in 2016, the International Law Commission (ILC) adopted a series of draft articles on 'Protection of Persons in the Event of Disasters', Article 11 of which reads 'To the extent that a disaster manifestly

International Covenant on Economic, Social and Cultural Rights. A Possible Entry Point to a Human Rights Based Approach to Millennium Development Goal 8' (2009) 13 The international journal of human rights 86, 93; Wouter Vandenhole, 'Economic, Social and Cultural Rights in the CRC: Is There a Legal Obligation to Cooperate Internationally for Development?' (2009) 17 The International journal of children's rights 23, 51.

[462]See Vandenhole (n 461) 51-52.

[463]Ibid 26.

[464]Ibid 51.

[465]Carmona (n 461) 94; ESCR Committee, 'Concluding Observations: Moldova' (12 December 2003) UN Doc E/C.12/1/Add.91, para 41.

[466]IIL, 'Bruges Resolution on Humanitarian Assistance' (Institut de Droit International, 2 September 2003) <www.idi-iil.org/app/uploads/2017/06/2003_bru_03_en.pdf> accessed 19 December 2022.

[467]Joseph Benton Heath, 'Disaster, relief, and neglect: the duty to accept humanitarian assistance and the work of the International Law Commisision' (2011) 43 New York University journal of international law & politics 419.

exceeds its national response capacity, the affected State has a duty to seek assistance from, as appropriate, other States, the United Nations and other potential assisting actors'.[468]

Clearly, the obligation to seek assistance is well established. In addition to the obligation to seek assistance, there is ongoing academic debate concerning whether developing States are obligated to accept international assistance in the event that it is offered.[469] Again, this has been debated heavily in the context of humanitarian assistance and disaster relief.[470] In addition to reiterating the State obligation to seek external assistance, both the 2003 Bruges Resolution and the 2016 ILC Draft Articles both proclaim that States may not arbitrarily refuse external assistance.[471] There appears to be less support for the argument that a general duty not to refuse assistance represents customary international law. Benton Heath suggests that such an obligation perhaps only represents customary international law in the context of armed conflict.[472] Thomsen, on the other hand, argued for the 'convening of a multilateral treaty that would oblige States not to arbitrarily refuse international humanitarian assistance when a disaster overwhelms its domestic capacity'.[473]

I acknowledge that much of the above discussion concerning the obligations on States in need of assistance is framed in the context of disaster relief. However, I contend it is by no means a stretch to define the ongoing loss and degradation of marine biodiversity as a 'disaster'. The 2016 ILC draft articles define 'disaster' as 'a calamitous event or series of events resulting in widespread loss of life, great human suffering and distress, mass displacement, or large-scale material or environmental damage, thereby seriously disrupting the functioning of society'.[474] The Bruges Resolution similarly defines it as 'calamitous events which endanger life, health, physical integrity, or the right not to be subject to cruel, inhuman or degrading treatment, or other fundamental human rights, or the essential needs of the population'.[475] The connections I outline in Chapter 1 clearly demonstrate that the loss of core human health and marine biodiversity linkages do indeed result in 'great human suffering and distress' and endanger life, health and physical integrity, not to mention the resulting 'large-scale environmental damage'.[476] A sceptic may retort

[468]ILC, *Draft Articles on the Protection of Persons in the Event of Disasters* (Yearbook of the International Law Commission, 2016, vol II, Part Two, 2016).
[469]See eg K. Luopajarvi, 'Is there an Obligation on States to Accept International Humanitarian Assistance to Internally Displaced Persons under International Law?' (2003) 15 International journal of refugee law 678.
[470]See eg Matias Thomsen, 'The Obligation Not to Arbitrarily Refuse International Disaster Relief : a Question of Sovereignty' (2015) 16 Melbourne journal of international law 484.
[471]ILC (n 468) art 13; IIL (n 466) art viii.
[472]Heath (n 467) 456. See also Luopajarvi (n 469) 683.
[473]Thomsen (n 470) 486.
[474]ILC (n 468) art 3(a).
[475]IIL (n 466) art I(2).
[476]ILC (n 468) art 3(a). See ch 1 sec 2.

that the loss of marine biodiversity hardly constitutes a 'calamitous event' that is 'seriously disrupting the functioning of society'. However, the validity of such a response is questionable at best as scientists around the world acknowledge that we have now entered the sixth mass extinction era which they posit 'may be the most serious environmental threat to the persistence of civilisation', heralding catastrophic loss of biodiversity and associated ecosystem services.[477] If the sceptic were to persist that the immediacy of the threat is not comparable to an earthquake or other natural disaster, I posit that failure to act today will rapidly accelerate the immediacy of the threat until loss of biodiversity, and the ecosystem services that support human health, could no longer be described as anything short of a disaster by even the most weathered cynic.

To summarise, in this section I demonstrated that, in the context of marine biodiversity, the duty to take individual and cooperative action gives rise to several specific State obligations. First, all States are obligated to take unilateral action, to the extent possible, to protect essential marine biodiversity and ecosystem services that underpin human health. Second, to the extent that unilateral action is insufficient to achieve the required level of protection, either due to financial, technical or practical constraints, States are obligated to cooperate internationally and to seek assistance to achieve this end. In addition to collaborating on an equal footing, this imposes an obligation on developed States to provide assistance to more resource-constrained States to help them meet their obligations under the right to health. Conversely, developing States that suffer resource constraints must seek assistance as necessary, and should not arbitrarily refuse bona fide support.

2.8. The obligation to use all appropriate means

Having addressed the various temporal and procedural constraints on State discretion in the preceding sections, the meaning of the State obligation to employ 'all appropriate means' nonetheless seems to leave a broad margin of State discretion and remains rather vague in a theoretical vacuum.[478] However, there are many resources that help us to interpret the meaning of this term in the context of the right to health, and to begin to formulate an understanding of how the human health and marine biodiversity nexus may shape this obligation. These include the text of Articles 2(1) and 12 of ICESCR, Article 24 of CRC, and general comments of the ESCR Committee; in particular General Comment No.14 which sets out the tripartite typology of obligations (to respect, protect and fulfil) in the context of the right to health,[479] in addition to

[477]Gerardo Ceballos, Paul Ehrlich and Peter Raven, 'Vertebrates on the Brink as Indicators of Biological Annihilation and the Sixth Mass Extinction' (2020) 117 Proc Natl Acad Sci U S A 13596 117.
[478]Tobin (n 318) 178.
[479]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 33. Although the tripartite typology of obligations is universal to all human rights, the individual characteristics it takes on in the context of the right to health are considered in ch 3 sec 2.9.

the AAAQ standards.[480] I consider each of these resources below, with dedicated sections allocated to the tripartite typology of obligations and the AAAQ standards.

The first key source to help narrow down 'all appropriate means' is the text of Article 2(1) itself, which indicates that the term includes, 'the adoption of legislative measures'. Therefore, implementation of necessary legislative interventions takes a high priority in the package of measures to fulfil the right to health. The specific legislative measures relevant for current purposes are explored further in the context of the tripartite typology below. However, it is noteworthy that the wording of this obligation bears similarity to several provisions under UNCLOS pertaining to pollution of the marine environment. Amongst other things, UNCLOS obligates States to 'take individually or jointly as appropriate, all measures (…) necessary to prevent, reduce and control pollution of the marine environment from any source', which include, 'those [measures] necessary to protect and preserve rare or fragile ecosystems as well as habitat of depleted, threatened or endangered species and other forms of marine life';[481] 'adopt laws and regulations to prevent, reduce and control pollution of the marine environment from land-based sources';[482] and, 'adopt laws and regulations to prevent, reduce and control pollution of the marine environment arising from or in connection with seabed activities'.[483] Read in accordance with the principle of mutual supportiveness, these UNCLOS provisions help define the content of the State obligation to take 'all appropriate means'. Actions taken by States in pursuit of these UNCLOS provisions may, to the extent that they contribute to positive health outcomes or the avoidance of negative health outcomes, also contribute to the collective body of 'appropriate means' for States to take to satisfy their obligations under Article 2(1) of ICESCR.

The importance of adopting an integrated reading of human rights obligations in conjunction with other relevant international environmental obligations is reiterated by the HRC in General Comment No.36 on the right to life.[484] The HRC acknowledges that, 'environmental degradation, climate change and unsustainable development constitute some of the most pressing and serious threats to (…) the right to life', and prescribes that 'Obligations of States Parties under international environmental law should thus inform the content of [the right to life] and ensure the right to life should also inform their relevant obligations under international environmental law'.[485]

[480]Ibid para 12.
[481]UNCLOS (n 16) arts 194(1) and 194(5).
[482]UNCLOS (n 16) art 207(1).
[483]UNCLOS (n 16) art 208(1).
[484]HRC, 'General Comment No.36 on Article 6 of the International Covenant on Civil and Political Rights, on the Right to Life' (n 243).
[485]Ibid para 62.

Although stated in the context of the right to life, it would be difficult to deny that such logic equally extends to the right to health since, as acknowledged by the ESCR Committee, the right to health is 'closely related to and dependent upon' the right to life.[486]

The second source of clarification concerning the interpretation of 'all appropriate means' is the text of Articles 12(2) of ICESCR and Article 24(2) of CRC, which collectively provide a non-exhaustive list of actions that States must take in pursuit of the right to health. Amongst other things, these obligate States to '[improve] all aspects of environmental and industrial hygiene' and 'combat disease (…) taking into consideration the dangers and risks of environmental pollution', respectively. Thus 'all appropriate means', in the context of the right to health, must include actions to protect the environment, including the marine environment. Both the CRC Committee and the ESCR Committee offer clarification on the meaning of these provisions in respective general comments. The CRC Committee confirms, regarding 'environmental pollution', that 'States should regulate and monitor the environmental impacts of business activities that may compromise children's right to health'.[487]

This obligation to 'regulate and monitor' can logically be expanded into three subcomponents. First, it necessarily entails an obligation on States to undertake further research on the linkages between marine biodiversity and children's health, since an understanding of such linkages is a prerequisite to understanding what impacts to regulate or monitor. Second, it obligates States to implement integrated decision-making and management frameworks including, for example, undertaking integrated impact and strategic assessments of proposed activities that consider both biodiversity and health impacts holistically. Third, it incurs a duty to develop capacity for undertaking integrated monitoring and data collection to assess the impacts of approved activities over time. Each of these subcomponents has been expressly encouraged by both the CBD COP and the WHO Assembly to understand and protect invaluable health and biodiversity linkages.[488] This approach is also intrinsically embedded in the One Health concept.[489]

The ESCR Committee has also expanded on the environmental obligations in Article 12(2) of ICESCR, noting that this includes 'the prevention and reduction of the population's exposure to harmful substances

[486]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (art. 12)' (n 233) para 3.
[487]CRC Committee, 'General Comment No.15 on the Right of the Child to the Enjoyment of the Highest Attainable Standard of Health (art 24)' (n 390) para. 49. See also the draft CRC General Comment No.26, entitled 'Children's Rights and the Environment With a Special Focus on Climate Change' (n 241).
[488]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) paras 4 & 5; WHO (n 80) para 19.
[489]For more information on the One Health Concept, see Delphine Destoumieux-Garzón and others, 'The One Health Concept: 10 Years Old and a Long Road Ahead' (2018) 5 Front Vet Sci 14.

(…) or other detrimental environmental conditions that directly or indirectly impact upon human health'.[490] Thus, I contend that actions taken under Article 12(2) must include steps to protect positive human health and marine biodiversity linkages, such as production of atmospheric oxygen or provision of food and nutrition, and to minimise negative linkages, such as by controlling activities that could harm marine biodiversity's capacity to support human nutrition, or that could increase the likelihood of waterborne pathogens.

The third key resource to help interpret 'all appropriate means' is the portfolio of general comments of the various human rights treaty bodies, as already expanded upon in the preceding paragraphs. The ESCR Committee has acknowledged that means to be taken must include, in addition to legislative measures, 'the provision of judicial or other remedies, where appropriate, as well as administrative, financial, educational and social measures'.[491] Thus, in addition to adopting appropriate legislative frameworks, States should ensure that appropriate institutional frameworks are in place to ensure access to justice concerning environmental matters and effective remedies (e.g., marine ecosystem restoration or designation of marine protected areas), and to undertake programs to educate rights holders on human health and marine biodiversity linkages and how to enforce their rights. However, two of the most significant contributions by the ESCR Committee on interpreting 'all appropriate means' under the right to health are its introduction of the tripartite typology of obligations to respect, protect and fulfil,[492] and the AAAQ standards. I explore these in detail in the following sections.

2.9. The tripartite typology of obligations to respect, protect and fulfil the right to health

The tripartite typology of obligations to respect, protect and fulfil is not unique to the right to health, having first emerged in the ESCR Committee's General Comment No.12 on the Right to Food.[493] It is now considered a universal component of all human rights.[494] Nonetheless, despite its universal nature, the tripartite typology takes on a unique character depending on which human right it is being applied to, and the ESCR Committee has expanded on its application in the context of the right to health in General Comment No.14.[495] In this section, I demonstrate that the tripartite typology of obligations gives rise to a series of obligations concerning how States manage the marine environment.

[490]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 15.
[491]ESCR Committee, 'An Evaluation of the Obligation to Take Steps to the "Maximum Of Available Resources" Under an Optional Protocol to the Covenant' (n 391) para 3.
[492]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) paras 33-37.
[493]ESCR Committee, 'General Comment No.12: The right to adequate food (Art.11)' (12 May 1999) UN Doc E/C.12/1999/5, para 15.
[494]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 33.
[495]Ibid paras 34-37.

Before I delve into the details of each component, there are a few important general points to note. First, the tripartite typology plays a critical role in providing structure and definition to the general State obligation to progressively achieve full realisation of the right by 'all appropriate means'.[496] However, it is not enough in itself to formulate a clear assessment of the suitability of actions States should take in pursuit of the right to health.[497] For this reason, the tripartite typology of obligations must be used in conjunction with the AAAQ standards discussed in the following section.

Second, the nature of the obligations to respect, protect and fulfil each reinforce the importance of the doctrine of progressive realisation for the right to health. As noted by Young, the obligation to respect the right to health will often require minimal time and resources to implement, since it largely incurs a negative obligation to refrain from taking actions that would limit enjoyment of the highest attainable standard of health.[498] Actions to 'protect' would likely incur a greater investment of time and resources to develop appropriate regulatory regimes to govern the actions of third parties, and actions to fulfil will often incur the highest cost through capacity-building initiatives and the development of appropriate infrastructure and regulatory frameworks.[499]

Third, as emphasised above, research and knowledge building on human health and marine biodiversity linkages must underpin actions under all pillars of the tripartite typology. Without a detailed understanding of the various interactions between humans and the marine environment and their consequences, it will be difficult for States to take targeted and effective action to protect marine biodiversity.

Finally, and linked to the need to prioritise research, the precautionary principle must play a central role in State decision making, since the absence of scientific certainty on health and marine biodiversity linkages cannot be used to preclude action to protect these essential relationships. As observed by Tobin in his reinterpretation of Principle 15 of the Rio Declaration on Environment and Development, '"where there are threats of serious or irreversible damage [to the health of an individual], lack of full scientific uncertainty shall not be used as a reason for postponing cost-effective measures to prevent" harm to health'.[500]

[496]Tobin (n 318) 184.
[497]Ibid 197.
[498]Young (n 363) 16.
[499]Ibid 16.
[500]Tobin (n 318) 183.

The obligation to 'respect' 'requires States to refrain from interfering directly or indirectly with the enjoyment of the right to health'.[501] There are several clear entry points for consideration of the human health and marine biodiversity nexus under this obligation. A core component of the obligation to respect, is the duty on States to prevent discrimination, on any grounds, regarding people's enjoyment of the highest attainable standard of health.[502] This includes a duty to prevent or remove any barriers to the practice of traditional medicine.[503] The ESCR Committee has also expressed that the obligation to respect requires States to refrain from 'preventing people's participation in health-related matters'.[504] In the context of human health and marine biodiversity linkages, this obligation aligns closely with the obligation to facilitate public participation in environmental decision making, under both Article 6 of the Aarhus Convention and Article 7 of the Escazú Agreement, with the duty to prevent exclusion from decision-making processes serving as the negative counterpart to the positive duty to facilitate public participation under these treaties.[505] State obligations to facilitate public participation under the right to health do not cease at a negative obligation to refrain from preventing it. Indeed, the ESCR Committee reiterates the importance of 'participation of the population in all health-related decision making at the community, national, regional and international levels'.[506] Thus, the duty to facilitate public participation extends across all of the tripartite obligations.

In addition to obligations rooted in the principle of non-discrimination, the ESCR Committee also prescribes that State actions to respect should include refraining from 'unlawfully polluting air, water and soil, e.g., through industrial waste from State-owned facilities (…)'.[507] Logically this language can be extrapolated to include pollution of the marine environment, to the extent that it poses a threat to human health. However, the use of the term 'unlawful' is important to note. This suggests that States must conform with pre-existing environmental standards and adhere to the obligation of non-retrogression, but that — under the obligation to respect — they could not be held accountable to standards higher than those they are already legally bound to satisfy. Thus, the effectiveness of this measure depends on the pre-existence of stringent, scientifically sound and legally binding environmental standards that set out maximum permissible levels of pollution. However, the actual revision and expansion of existing environmental

[501]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 33.
[502]Ibid para 34; Tobin (n 318) 186. For more information on this, see ch 3 sec 2.4.
[503]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 34.
[504]Ibid.
[505]Aarhus Convention (n 188) art 6; Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean (adopted 4 March 2018, entered into force 22 April 2021) C.N.195.2018.TREATIES-XXVII.18 of 9 April 2018 (Escazú Agreement) art 7.
[506]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 10.
[507]Ibid para 34.

standards to reflect the level required to protect human health and marine biodiversity linkages would fall under the obligations to protect and fulfil.

While the above represent essential steps to take under the obligation to respect the right to health, the wording of General Comment No.14 suggests that the range of steps provided is not intended to be exhaustive. It is therefore logical to conclude that States should refrain from actions that unjustifiably limit the full enjoyment of the right to health. In the context of the human health and marine biodiversity nexus, this could preclude States from undertaking, approving or investing in actions that would cause harm to the marine environment, to the extent that they infringe on the enjoyment of the highest attainable standard of health. Moreover, this obligation would not just apply to potential future activities, but should also include critical review of activities already ongoing across a range of sectors, through the lens of the human health and marine biodiversity nexus, to assess whether they present risks or actual harm to human health.[508]

Unlike the duty to respect, the duty to protect imposes a positive obligation on States to act, and therefore will often require greater input of time and resources.[509] Specifically, it requires States to prevent infringement of the right to health by non-State actors; thus confirming that the right to health does not just concern interactions between the State as duty bearer and citizens as rights holders, but also provides an avenue for regulating the actions of third parties.[510] The ESCR Committee has highlighted that adoption of legislation will play a core role in the fulfilment of this obligation.[511] In the context of the human health and marine biodiversity nexus, there are several obvious groups of non-State actors that are causing harm to the marine environment with potential knock-on health implications. These include the agriculture sector contributing to nutrient runoff,[512] the global fisheries industry that imposes continuous and often unsustainable pressure on fish stocks and associated marine ecosystems[513] and the shipping and aquaculture industries which both pollute the marine environment and contribute to the introduction and spread of invasive alien species,[514] not to mention the looming threat of deep seabed mining which is explored in greater detail in Chapter 5.[515]

[508]Michael Krennerich, 'The Human Right to Health. Fundamendals of a Compex Right' in Sabine Klotz (ed), *Healthcare as a Human Rights Issue: Normative Profile, Conflicts and Implementation* (Transcript 2017).
[509]Ibid 37.
[510]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para. 35; Tobin and Damon (n 350) 72.
[511]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 35.
[512]Craig (n 43) 227.
[513]Hilborn (n 29); Thrush, Ellingsen and Davis (n 58).
[514]Craig (n 43) 227; Lloret and others (n 25) 32.
[515]Amy Maxmen, 'Discovery of Vibrant Deep-sea Life Prompts New Worries Over Seabed Mining' (2018) 561 Nature 443; Luc Cuyvers and others, *Deep Seabed Mining: A Rising Environmental Challenge* (IUCN 2018).

Of course, these activities often also provide essential contributions to society, as sources of food, employment, economic growth and core inputs to other industrial processes. Therefore, the solution is not to prohibit these activities outright. Rather, Tobin suggested a two-part process: First, 'an examination as to whether the acts or omissions of a non-State actor have an impact, whether directly or indirectly, on the health of an individual';[516] second, where an impact is identified:

> an examination, in light of any other relevant international legal standards, to determine whether the interference is reasonably justified. If not justifiable, there must be an assessment of those measures which can reasonably [be] taken by a State, in light of available resources, to ameliorate the interference.[517]

Regarding the first step of examining the impact of third-party actions on the health of individuals, each of the sectors listed above are already subject to their own regulatory regimes, often at national, regional and international levels. Nonetheless, the impacts of these activities must be re-assessed with due consideration to the human health and marine biodiversity nexus. The CBD and WHO have set out several steps on how to factor the nexus into impact analyses and decision making.[518] These include: adopting holistic management approaches such as One Health that integrate biodiversity, health and ecosystem management; considering human health and biodiversity linkages within national policies and plans; and factoring such linkages into both environmental impact assessment (EIA) and health impact assessment (HIA) frameworks.[519] Furthermore, such assessments must also take account of the impacts of proposed activities upon marginalised and vulnerable groups, taking account of their 'specific exposure pathways and response characteristics'.[520] Indeed, steps to protect vulnerable groups from the actions of third parties are a core part of the obligation to protect, building on the negative duty to refrain from discriminating on any grounds under the obligation to respect.[521]

The second component of Tobin's test (i.e., assessing whether such actions are justifiable and formulating appropriate responsive action) again highlights the unique characteristics of marine biodiversity and its need for focused consideration. For many of the sectors listed above, including fishing, shipping and deep seabed mining, actions that they carry out in ABNJ or within the jurisdiction of a specific State are capable

[516]Tobin (n 318) 192.
[517]Ibid 192.
[518]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2); WHO (n 80).
[519]Ibid.
[520]Tobin (n 318) 284.
[521]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 35.

of impacting upon marine biodiversity in other States.[522] Therefore, proper regulation of these activities to minimise health impacts requires collaboration at an international level through appropriate fora.[523] This will be explored further in the following chapter.[524]

The obligation to fulfil requires States to take all appropriate 'legislative, administrative, budgetary, judicial, promotional and other measures' necessary to achieve, progressively, the full realisation of the right to health.[525] Krennerich aptly observed that, in general terms, the obligation to fulfil 'is about creating the prerequisites for the realisation of the right to health through respective statutes, institutions and procedures as well as by way of State provisions in the form of money, goods or services'.[526] Thus, in contrast to the obligations to respect and protect, the obligation to fulfil will often incur the greatest contribution of time and cost by States.[527] In the context of the right to health, the ESCR Committee has further expanded the obligation to fulfil into three sub-obligations: to facilitate, provide and promote.[528] The obligation to facilitate requires States to take measures to 'enable and assist individuals and communities to enjoy the right to health'.[529] The obligation to provide requires States to provide additional support to vulnerable groups to realise their right to health when they are otherwise unable to do so, through no fault of their own.[530] The obligation to promote requires States to take active measures that 'create, maintain and restore the health of the population'.[531]

The ESCR Committee takes steps to clarify the nature of the obligation to fulfil in General Comment No.14.[532] Four specific points are worthy of note here. First, the Committee highlights that States are required to 'give sufficient recognition to the right to health in the national and political legal systems'.[533] Second, States must 'adopt a national health policy with a detailed plan for realising the right to health'.[534] Third, States must 'ensure equal access for all to the underlying determinants of health'.[535] Fourth, States are required to 'adopt measures against environmental and occupational health hazards', which includes formulating and implementing 'national policies aimed at reducing and eliminating pollution of air, water

[522]Harrison (n 74) 2.
[523]Ibid; Tobin (n 318) 194.
[524]See ch 4 sec 1.3.
[525]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 33.
[526]Krennerich (n 508) 40.
[527]Young (n 363) 16.
[528]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 33.
[529]Ibid para 35.
[530]Ibid.
[531]Ibid.
[532]Ibid para 36.
[533]Ibid.
[534]Ibid.
[535]Ibid.

and soil'.[536] Cumulatively, these pronouncements convey several key pieces of information. First, in addition to undertaking often time-consuming and cost-intensive practical steps to fulfil the right to health, such as developing necessary infrastructure and legal frameworks, States are obligated to first develop a plan and policy to guide these actions. As indicated by the fact that a parallel obligation to develop a national public health strategy and plan of action is included amongst the MCOs for the right to health, it is highly unlikely that States would be able to defer such planning on the grounds of inadequate funds.[537] Second, and linked to the above, it is also clear that the ESCR Committee continues to hold protection of the underlying determinants of health and environmental health as key priorities alongside the provision of healthcare. Read together, these observations reinforce the case for consideration of marine environmental health — including the protection of marine biodiversity — amongst measures required to fulfil the right to health. Furthermore, it suggests that environmental considerations — including protection of marine biodiversity — should be given serious consideration in the short term by its inclusion within national health plans and policies.

While these observations begin to offer some clarity on the steps that States should take to protect the human health and marine biodiversity nexus, it nonetheless remains unclear what kinds of tangible actions States should consider beyond developing plans and policies. On this point, decisions of the CBD COP and the World Health Assembly (WHA) offer valuable guidance. In line with the pronouncements of the ESCR Committee, both the CBD COP and WHA reiterate the importance of establishing plans and policies that reflect the human health and marine biodiversity nexus,[538] in addition to undertaking integrated impact assessments, risk analyses and decision-making processes.[539] More broadly speaking, the CBD COP and WHA promote the adoption of a holistic approach to management of health and the environment through the lens of the One Health approach.[540] Although traditionally focussed upon the human and animal health interface with a view to controlling risks from zoonotic diseases, the One Health approach is shifting towards the promotion of integrated solutions to protect the health of humans, animals and the environment.[541] In line with the One Health approach, it is also important that channels of communication are established between government entities responsible for the health of humans, animals and the environment as a prerequisite to collaboration and holistic decision making.[542]

[536]Ibid.
[537]Ibid para 43(f).
[538]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) paras 4(b) & (i); WHO (n 80) para 17.
[539]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para 4(d); WHO (n 80) para 14.
[540]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) preamble and para 10; WHO (n 80) paras 16 and 19(b).
[541]C LeAnn White and others, 'An Ecological and Conservation Perspective' in Jakob Zinsstag and others (eds), *One Health: The Theory and Practice of Integrated Health Approaches* (2nd edn, CAB International 2020), 25.
[542]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para. 4(a); WHO (n 80)paras 18(d) & 19(a).

In addition to adopting more integrated and holistic planning, management, risk analysis and decision-making frameworks, both the CBD COP and WHA highlight the importance and urgency of both funding and conducting research to better understand human health and biodiversity linkages,[543] including 'the significance for health of marine biodiversity'.[544]

On an ongoing basis, as the state of knowledge develops, it is also essential that States strengthen their monitoring capacities to measure the health impacts of changes to marine biodiversity.[545] Additionally, States should undertake capacity development, training and education programmes both to increase the knowledge and competence of public and private sector actors operating in the spheres of public health and ocean governance, and also to make the public aware of human health and marine biodiversity linkages, and also of their rights as rights holders.[546]

2.10. The standards of availability, accessibility, acceptability, and quality

The AAAQ standards provide an additional layer of protection to ensure that the way a State realises the right to health is adequate, appropriate, and equitable. 'Availability' requires the State to make available sufficient 'functioning public health and health-care facilities, goods and services'.[547] 'Accessibility' requires that 'health facilities, goods and services' are accessible to everyone, with particular focus on the assurance of non-discrimination; their 'physical accessibility (…) for all sections of the population'; their 'economic accessibility' ensuring that they are affordable for all; and the availability of information, including 'the right to seek, receive and impart information and ideas concerning health issues'.[548] 'Acceptability' requires that all health facilities, goods and services are 'respectful of medical ethics and culturally appropriate', while 'quality' requires that they are 'scientifically and medically appropriate and of good quality'.[549]

Upon first reading, the connection between the AAAQ standards and marine biodiversity may seem tenuous. However, such an assumption is incorrect on several grounds. Crucially, while the ESCR Committee only makes express reference to the importance of the underlying determinants of health under

[543]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para. 6; WHO (n 80) para 15.
[544]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para 6(d).
[545]Ibid, para 4(c); WHO (n 80) para. 19(h).
[546]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para 4(g); WHO (n 80) para 19(f).
[547]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 12(a).
[548]Ibid para 12(b).
[549]Ibid paras 12(c) and (d), respectively.

'availability', it also confirms that, unless stated otherwise, any reference to 'health facilities, goods and services' includes the underlying determinants of health, therefore extending all four components of the AAAQ standard to take consideration of the underlying determinants.[550]

As already established, marine biodiversity plays a pivotal role in supporting human health through provision of ecosystem services. The requirement of 'availability' therefore requires that these services are available in appropriate quantities for the benefit of all. This requirement is most easily applied to ecosystem services that are readily quantifiable, such as the number or volume of marine species that serve as a source of food. However, where appropriate metrics are available, the requirement of availability could logically also extend to volume and distribution of marine biodiversity required to support more complex ecosystem services such as the production of atmospheric oxygen and carbon sequestration.[551] Furthermore, in the context of the ecosystem services provided by marine biodiversity, availability does not necessarily go hand-in-hand with geographic proximity, since the benefits of oxygen production or carbon storage can be enjoyed by individuals across the world regardless of where the ecosystem service occurs.

The requirement of 'accessibility' is multifaceted. The subcomponent of non-discrimination has been covered in detail above and will not be reiterated here.[552] The subcomponents of physical and financial accessibility set out by the ESCR Committee bear a stronger connection to the provision of healthcare and other underlying determinants such as potable drinking water. However, it is also applicable to certain marine ecosystem services, such as the physical availability and cost of food derived from the marine environment, or the physical accessibility of ingredients used in traditional medicines. The subcomponent of information accessibility relates closely to the obligation to facilitate access to environmental information under Article 4 of the Aarhus Convention and Article 5 of the Escazú Agreement. 'Information' in this context should include information on the human health and marine biodiversity linkages themselves (including both delivery of ecosystem services on the positive side, and health risks from environmental mismanagement on the negative side), but also on the actual and potential impacts of activities by public or private actors upon marine biodiversity.

[550]Ibid para 12(b), footnote 6.
[551]See eg Kenneth Bagstad and others, 'A Comparative Assessment of Decision-Support Tools for Ecosystem Services Quantification and Valuation' (2013) 5 Ecosystem services 27; Alice Newton and others, 'Assessing, Quantifying and Valuing the Ecosystem Services of Coastal Lagoons' (2018) 44 Journal for nature conservation 50; Tiziana Luisetti and others, 'Quantifying and Valuing Carbon Flows and Stores in Coastal and Shelf Ecosystems in the UK' (2019) 35 Ecosystem services 67.
[552]See ch 3 sec 2.4.

The requirement of 'acceptability', much like the obligation of non-discrimination, requires States to exercise a high degree of sensitivity to the various roles that marine biodiversity plays in supporting health, including particularly its use in traditional medicine and any considerations unique to traditionally vulnerable groups such as women and children. Moreover, the obvious way to ensure the acceptability of any proposed measures would be to facilitate public participation in decision-making processes, with particular attention to ensuring participation of vulnerable groups.

Finally, the requirement of 'quality' reiterates the need to consider marine biodiversity specifically as a determinant of health, rather than focussing simply on the marine environment generally. It also highlights the need to consider, not only positive human health and marine biodiversity linkages, but also the negative ones. As demonstrated by Romanelli et al. on the relationship between biodiversity and infectious disease:

> Changes in the abundance and composition of biodiversity may affect human exposure to and the transmission of infectious diseases. Numerous studies discuss the multifaceted role of biodiversity in pathogen transmission; it can increase or decrease disease transmission by affecting the abundance, behaviour or condition of hosts or vectors.[553]

Consideration of the marine environment without particular attention to biodiversity could overlook the need to preserve ecosystem composition, rather than simply maintaining a standard level of biomass. Thus, the 'quality' of marine biodiversity is a key consideration to preserve essential ecosystem services. Of course, this raises the question of how to define 'quality', and what degree of 'quality' must be preserved. The answers to these question would likely vary according to geography, the types of human health and marine biodiversity linkages at play and potentially also the quantity of resources a specific State has at its disposal. It is beyond the scope of this thesis to render an informed judgement on this point. For current purposes, I have demonstrated that the AAAQ standards obligate States to ensure equal access to marine ecosystem services, with particular consideration for the needs of vulnerable groups. This includes consideration of the role that marine biodiversity plays in cultural practices of indigenous communities. They also require States to facilitate access to information concerning governance of the marine environment, and to maintain the 'quality' of marine biodiversity as necessary to ensure equal enjoyment of marine ecosystem services. The precise level of 'quality' to be preserved, and how to quantify this, will need to be addressed in a contextual manner when these obligations are implemented.

[553]Cristina Romanelli, H David Cooper and Braulio Ferreira de Souza Dias, 'The Integration of Biodiversity into One Health' (2014) 33 Rev sci tech Off int Epiz 487, 491.

3. Conclusions

In this chapter, I demonstrated that the conservation and sustainable use of marine biodiversity is essential for full enjoyment of the human right to health, and thus States are obligated to take immediate action to this end. To further clarify the types of State obligations that this relationship gives rise to, I mapped out the connections between marine biodiversity and existing obligations under the right to health. In so doing, I demonstrated that such obligations must be interpreted in a manner that duly recognises the role that marine biodiversity plays in supporting human health. Through this process I have revealed a package of State obligations concerning management of the marine environment, which I summarise below.

I posit there are at least two grounds on which States are already obligated to protect marine biodiversity as part of their pre-existing responsibilities under the right to health in IHRL. Both hinge upon the understanding that the right to health encompasses not only a right to healthcare, but also a right of access to the underlying determinants of health, which include food, nutrition and a healthy environment.[554] The first basis for a State duty to protect marine biodiversity under the right to health stems from the pre-existing acknowledgement that a healthy environment is an underlying determinant of health.[555] Biodiversity in turn plays a core role in enabling a healthy environment, leading the former UN Special Rapporteur on human rights and the environment to conclude that States' 'obligations to protect against environmental harm that interferes with the enjoyment of human rights (…) apply to biodiversity as an integral part of the environment'.[556] On this basis, State obligations to facilitate a healthy environment under the right to health may extend to the protection and sustainable use of marine biodiversity.

The second basis for a State duty to protect marine biodiversity under the right to health rests on the growing body of evidence concerning human health and marine biodiversity linkages, twinned with the fact that the portfolio of recognised underlying determinants of health continues to grow as understanding of human health develops.[557] Thus, marine biodiversity should be considered an underlying determinant of the right to health in its own right for three reasons. First, it contributes to positive health outcomes through the provision of ecosystem services, such as food and nutrition and production of atmospheric oxygen.[558] Second, if improperly managed, it is capable of causing negative health outcomes, including through increased incidence of waterborne pathogens and food safety risks from pollution.[559] Third, in addition to

[554]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 11.
[555]Ibid para 4.
[556]HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166) para 26.
[557]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 10.
[558]See ch 1 sec 2.1.
[559]See ch 1 sec 2.2.

the benefits already realised from marine biodiversity, it holds immeasurable biomedical potential.[560] Unfortunately, while the yet-undiscovered biomedical potential of marine biodiversity could ultimately yield the greatest benefits to human health, it is also the most difficult component to protect under IHRL due to the inherent uncertainty involved.

Regardless of which of the two arguments outlined above is used to incorporate the human health and marine biodiversity nexus into the right to health, this necessitates a critical analysis of the State obligations recognised under the right to health, which I undertook in Section 2 above. My analysis yielded a series of interlinked and mutually supportive State obligations concerning marine biodiversity, which can be broadly categorised into three groups. First, there are several foundational obligations that underpin fulfilment of all other State obligations that stem from the human health and marine biodiversity nexus. Foremost amongst these, I contend there is an obligation on States to develop research to better understand the multitude of linkages between human health and marine biodiversity. This must be twinned with an obligation to ensure research findings are made available to the public. In the absence of scientific certainty, States must use the precautionary principle to guide their actions. In addition to developing research (either directly or through supporting third-party researchers), I argue that States must develop the capacity of public and private sector actors to better understand human health and marine biodiversity linkages, to facilitate informed decision making. In addition to driving research and developing capacity, States must use the maximum available resources at their disposal — both nationally and internationally, including private sector resources — to realise the right to health, including through protecting marine biodiversity. Finally, given the transboundary nature of the marine environment, States must collaborate through appropriate international fora, such as regional fisheries management organisations and other transnational governance and treaty bodies, to take collective action to protect marine biodiversity.

The second group of obligations may be described as those requiring immediate fulfilment. This comprises obligations that fall outside the doctrine of progressive realisation. This includes an obligation to take steps towards full realisation of the right to health. In the context of the human health and marine biodiversity nexus, I contend that this should be interpreted as an obligation to develop a national plan for the protection of human health and marine biodiversity linkages, in addition to indicators to measure progress over time. In addition to an obligation to take steps, States are under an immediate obligation to ensure non-discrimination in enjoyment of the right to health. In the context of human health and marine biodiversity linkages, there is scope for discrimination on multiple grounds, including sex, age, culture, economic status,

[560]See ch 1 sec 2.2.3.

and geography. Furthermore, while discrimination may result from failure to protect marine biodiversity in the form of unequal access to food, nutrition, livelihood and inputs to traditional medicine, there is also potential for discriminatory outcomes from efforts to protect biodiversity.[561] States are also subject to an obligation of non-retrogression, requiring them to refrain from reducing current levels of protection to marine biodiversity — either de jure or de facto — or scaling-up harm, without adequate justification. For any retrogressive action to be considered justifiable, it must, amongst other things, be non-discriminatory in its outcome and be based on a participatory decision-making process that was informed by appropriate impact assessments, with particular consideration for vulnerable groups.

The third group of State obligations includes those that fall within the doctrine of progressive realisation and may thus be entitled obligations that require non-immediate fulfilment. First, States are obligated to ensure procedural environmental rights including access to environmental information, participation in decision making and access to justice, as reflected in the Aarhus Convention and the Escazú Agreement. In the context of the human health and marine biodiversity nexus, this translates into obligations to facilitate public access to information concerning the impacts of ongoing and proposed activities on the marine environment, participation in decisions pertaining to ocean governance, and access to appropriate recourse mechanisms and remedies. In addition to facilitating procedural environmental rights, full protection of these linkages in the long term will require significant systemic changes, and decisions and reports of the CBD COP and WHA offer guidance to States in this regard.[562] Among this guidance lies an obligation on States to implement systems to monitor the marine environment, including marine biodiversity and human health interactions. This will serve as an essential basis to better understand how human activities impact these linkages, in addition to monitoring the effectiveness of any restoration or conservation measures. In addition to undertaking monitoring, I contend that States must mainstream the human health and marine biodiversity nexus into planning, impact assessment and decision-making processes. This will enable States to ensure due consideration is given to the nexus and associated human rights impacts in policymaking processes. Finally, States must take tangible steps to restore and conserve marine biodiversity, to protect the essential human health and marine biodiversity linkages that underpin enjoyment of the right to health.

In summary, in this chapter I systematically interpreted existing obligations under the right to health in light of current scientific literature on the human health and marine biodiversity nexus. In so doing, I demonstrated that the right to health yields a package of State obligations concerning the governance of

[561]HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166) para 58.
[562]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2); WHO (n 80).

marine biodiversity, which I synthesised in the preceding paragraphs. In the next chapter, I build on these findings by fleshing out each obligation outlined in the preceding paragraphs. Specifically, through referencing primary and secondary resources, I explore whether any precedent can be found for similar obligations under different facets of the right to health, expand on the normative content of these obligations, and analyse the specific means of implementation that States may be required to take to fulfil these obligations. Thus, in Chapter 4 I expand on my findings in Chapter 3 to develop a comprehensive breakdown of State obligations that arise from the right to health concerning the governance of marine biodiversity.

Chapter 4

EVALUATING MARINE BIODIVERSITY OBLIGATIONS UNDER THE RIGHT TO HEALTH

In the previous chapter I demonstrated that conservation and sustainable use of marine biodiversity is a prerequisite (or underlying determinant) to the full realisation of the right to health. Consequently, the right to health must be interpreted in a manner that incurs a series of State obligations concerning how marine biodiversity is managed. Specifically, I contend that there are three distinct groups of obligations towards marine biodiversity under the right to health. First, there are foundational obligations of a general and overarching nature. This comprises obligations to develop and ensure access to research on the human health and marine biodiversity nexus; to ensure individual capacity development to advance awareness and understanding of the nexus; to cooperate internationally through appropriate fora to protect human health and marine biodiversity linkages; and to mobilise maximum available resources to protect these linkages. Second, obligations that require immediate fulfilment, comprising obligations to develop a national plan to protect the human health and marine biodiversity nexus; to ensure non-discrimination in the enjoyment of these linkages; and to maintain existing levels of marine protection. Third, there are obligations that require non-immediate fulfilment. This comprises obligations to ensure procedural rights in marine biodiversity management; monitor marine biodiversity and linkages to human health; to mainstream the human health and marine biodiversity nexus; and to take all measures necessary to ensure protection and restoration of marine biodiversity and ecosystem services.

In this chapter, I build upon my findings in the previous chapter, to bring greater definition and normative content to each of the obligations outlined above. Through re-engagement with additional legal materials, I further develop the content and interpretation of each obligation and determine its practical implications. I achieve this by defining the foundations for each obligation and investigating whether related obligations exist in other areas of the right to health, the wider body of international human rights law (IHRL), or in

international law generally, and the types of State actions that may be required to achieve their fulfilment. By the end of this chapter, I define the rationale and normative content for each of these obligations and offer suggestions on how States could fulfil them. In Chapter 5 I apply each of these obligations to the issue of deep seabed mining (DSM) in areas beyond national jurisdiction (ABNJ) to ascertain its human rights implications in light of its anticipated impacts to marine biodiversity.

Finally, it is worth noting that each of the obligations that I elaborate on in this chapter falls into one of two categories. The first comprises obligations that are already expressly enshrined in IHRL — such as the obligations to cooperate internationally and to use maximum available resources. Consequently, these obligations are already widely accepted. The second category comprises obligations that are not already expressly stated in IHRL, such as the obligation to ensure capacity development on human health and marine biodiversity linkages. Instead, obligations in this category arise from interpreting the right to health in an evolutionary manner that is mutually supportive with other State obligations under international environmental law. I do not base the structure of this chapter on this distinction, instead opting to split it into foundational, immediate and non-immediate obligations. I do so because this offers the reader greater clarity in terms of the timescale with which States must implement these obligations, and how the obligations relate to each other. However, I focus particularly on the rationale to support the existence of those obligations that follow from an evolutionary interpretation of the right to health. For all obligations, regardless of whether they are already expressly stated under IHRL, I explore the types of actions that States may take to achieve their fulfilment. For those obligations that are not currently expressly enshrined in IHRL, I also validate their legitimacy through empirical research.

1. Foundational obligations

I posit that the right to health generates four foundational obligations concerning marine biodiversity. These are the obligations to develop and ensure access to research on human health and marine biodiversity linkages, ensure individual capacity development and education to enhance peoples' understanding of human health and marine biodiversity linkages, cooperate through relevant international fora to protect human health and marine biodiversity linkages, and mobilise maximum available resources towards the protection of human health and marine biodiversity linkages. I elaborate on each of these obligations in turn below.

I have collectively labelled these obligations as foundational because they serve as essential building blocks to enable States to fulfil the remaining immediate and non-immediate obligations discussed in Sections 2

and 3 of this chapter. For instance, it is not possible for States to develop a national health plan that factors in the role of biodiversity without sufficient understanding of human health and marine biodiversity linkages. Thus, the obligation to develop and ensure access to research on these linkages should be considered a foundational obligation. Furthermore, the obligations listed in this section require sustained effort and demonstrable progress by States over time. For example, the obligation to mainstream the human health and marine biodiversity nexus, which I have listed as a non-immediate obligation below, will require knowledge, collaboration and a sustained input of resources for its fulfilment. As with any regulatory framework, governance of human health and marine biodiversity linkages must be revised on an ongoing basis in response to ongoing research and changing circumstances. This is affirmed by the explicit recognition, by the Convention on Biological Diversity (CBD) Conference of the Parties (COP), that adaptive management is an essential component of the ecosystem approach.[563] Throughout the remainder of this section, I explore each foundational obligation in turn to further solidify their legal basis and to propose actions that States may take to fulfil them.

1.1. Develop and ensure access to scientific research on the human health and marine biodiversity nexus

The State obligation to develop and ensure access to research is not explicit under the right to health. Rather, considering the importance of human health and marine biodiversity linkages for enjoyment of the right to health, I contend it is implicit in the obligations to respect, protect and fulfil the right to health. Without adequate understanding and awareness of these linkages, it is not possible for States to protect them. In this section I demonstrate that this obligation requires States to develop national and international research agendas, which include disaggregated analysis into the significance of the human health and marine biodiversity nexus for different segments of society; ensure research is undertaken in an inclusive and non-discriminatory manner; develop policy and legal frameworks that incentivise research; and ensure that research findings are accessible to all, in an affordable manner.

There are numerous examples of State obligations to conduct research in international law, particularly when the term ‘research’ is interpreted broadly to include obligations to collect data or to investigate. These include obligations to conduct environmental impact assessment (EIA) and to investigate breaches of international humanitarian law and human rights.[564] Of particular relevance for current purposes is the

[563]CBD, 'Report of the Fifth Meeting of the Conference of the Parties to the Convention on Biological Diversity' (n 3) Annex III Decision V/6, para 4 and Principles 6 and 9.

[564]Ian Park, 'Joint Series on International Law and Armed Conflict: The Obligation to Investigate Violations of IHL' (*Blog of the European Journal of International Law (EJIL:Talk!)*, 2016) <www.ejiltalk.org/joint-series-on-international-law-and-armed-

human right to science, which plays an important role in advancing and ensuring access to research necessary for realising the right to health.[565] I posit that the obligation placed on States concerning the advancement of research on human health and marine biodiversity linkages comprises two interlinked components: the development of research, and actions to ensure public access to such research. Research findings alone do little to advance the protection of human and ocean health if they are not made available to rights holders to facilitate informed and participatory decision making.[566]

Before exploring the specific actions that States may undertake to fulfil this obligation, there are three general points that must be noted concerning the development of scientific research. First, the human health and marine biodiversity nexus comprises relationships not only based in the physical sciences, but also the social sciences. Physical sciences are essential to understand the chemical and ecological interactions in the marine environment that support human health. However, social sciences are essential to understand how different groups of society relate to, and interact with, marine biodiversity. Understanding of the latter is also an essential requirement to ensure non-discrimination in enjoyment of the right to health, discussed further in Section 2.2. Therefore, for the purposes of the obligation to develop and ensure access to scientific research, my interpretation of 'science' mirrors that of the ESC Committee, which defines it as '[encompassing] the natural and social sciences'.[567] Therefore scientific research must encompass both qualitative and quantitative research methods.

Second, research is conducted by a wide range of actors, spanning the public and private sector. Therefore, the obligation to develop research does not require States to undertake all research directly, but may also be fulfilled through provision of support to non-government entities to enable them to conduct research (e.g., through provision of funds, materials, infrastructure, etc.).[568]

conflict-the-obligation-to-investigate-violations-of-ihl/#:~:text=In%20conclusion%2C%20IHL%20does%20place,in%20practice%2C%20investigated%20and%20prosecuted> accessed 19 December 2022; Jacopo Roberti di Sarsina, 'The Content of the Obligations to Investigate and Prosecute International Human Rights Law Violations' in Jacopo Roberti di Sarsina *Transitional Justice and a State's Responsibility to Mass Atrocity* (TMC Asser Press 2019).

[565]ESCR Committee, 'General Comment No.25 (2020) on Science and Economic, Social and Cultural Rights (art 15 (1) (b), (2), (3) and (4) of the International Covenant on Economic, Social and Cultural Rights)' (n 269) paras 52 and 70.

[566]Existence of an obligation to ensure access to research outputs and other environmental information is supported by Principle 7 of the Framework Principles on Human Rights and the Environment (HRC, 'Framework Principles on Human Rights and the Environment' (2018) UN Doc A/HRC/37/59, Annex paras 17-19).

[567]ESCR Committee, 'General Comment No.25 (2020) on Science and Economic, Social and Cultural Rights (art 15 (1) (b), (2), (3) and (4) of the International Covenant on Economic, Social and Cultural Rights)' (n 269) para 5.

[568]Ibid para 46.

Third, some States have more resources to allocate to research than others. In line with the general principle of common but differentiated responsibility under international environmental law,[569] this must be considered when determining whether a State has satisfied its research obligation. While developed States may be required to advance research through unilateral research initiatives and/or by facilitating third party research, developing States may simply be expected (and supported by developed States as necessary) to participate in research initiatives through relevant platforms, such as intergovernmental entities like the World Health Organization (WHO) or the Convention on Biological Diversity (CBD). Moreover, the Committee on Economic, Social and Cultural Rights (ESCR Committee) confirms a direct responsibility for developed States to 'contribute to the development of science and technology in developing countries'.[570] I discuss obligations to give and receive assistance in greater detail in Section 1.3 below.

To identify actions that States must take to fulfil the obligation to develop and ensure access to research, lessons can be drawn from various sources including, once again, the right to science. Notably, the ESCR Committee specifies, amongst the foundational obligations for the right to science, that research related to health must be prioritised.[571] This reinforces the mutually supportive relationship between the rights to health and to science.

The first step for States is to develop a plan to prioritise and harmonise research efforts.[572] By defining national research priorities (in which procedural rights must play a paramount role), States can target efforts towards the highest priority issues, and avoid research gaps or duplication of effort. Planning should be coupled with the development of national infrastructure to remove any pre-existing barriers to undertaking or participating in scientific research, which could include barriers to international cooperation between scientists.[573] When it comes to defining priorities and coordinating research at an international level, it is essential that the research agenda is defined through an inclusive process that affords significant weight to the inputs of developing States, rather than being driven exclusively or predominantly by developed States.

Second, States must ensure non-discrimination and promote diversity in their research into human health and marine biodiversity linkages (the obligation of non-discrimination is considered more broadly in Section 2.2 below). In this context, it comprises four key elements. States must both remove any barriers

[569]See Philippe Cullet, 'Differential Treatment in Environmental Law: Addressing Critiques and Conceptualizing the Next Steps' (2016) 5 TEL 305.
[570]ESCR Committee, 'General Comment No.25 (2020) on Science and Economic, Social and Cultural Rights (art 15 (1) (b), (2), (3) and (4) of the International Covenant on Economic, Social and Cultural Rights)' (n 269) para 79.
[571]Ibid para 52.
[572]Ibid para 87.
[573]Ibid paras 52 and 42, respectively.

to participation by specific groups,[574] and actively encourage participation of vulnerable and marginalised groups.[575] In addition to removing barriers to participation and actively promoting diversity in research, States must ensure that research priorities include investigating the impacts of marine biodiversity loss and degradation on different segments of the population. The ESCR Committee notes, in the context of a gender-sensitive approach to research, that this is 'not a luxury for scientific research, but a crucial tool in order to ensure that scientific progress and new technologies adequately take into account the characteristics and needs of women and girls'.[576] I contend that this logic applies to all groups that may be at a heightened risk from loss or degradation of marine biodiversity. Disaggregated data will play a key role in identifying the most vulnerable groups and ensuring that they are afforded special consideration. In this regard, due diligence should be exercised in the identification of particularly vulnerable groups.[577] States should facilitate de facto equality, meaning that all members of society have equal access to, amongst other things, the underlying determinants of health.[578] Finally, in addition to ensuring non-discrimination throughout the research process, States should also ensure that research findings are accessible to all groups of society.[579]

Third, as mentioned in the preceding paragraph in the context of vulnerable groups, it is important that States develop frameworks that actively incentivise and advance research through appropriate policies, legislation, infrastructure and financial measures.[580] This will involve setting aside resources in national budgets to fund research initiatives on human health and marine biodiversity linkages. In the longer term, this could also require States to ensure that national education curricula are designed to empower people to participate in scientific research.[581]

Finally, States must ensure that research findings are accessible to all. The ESCR Committee stated that 'States Parties have a duty to make available and accessible to all persons (…) all the best available applications of scientific progress necessary to enjoy the highest attainable standard of health'.[582] It adds

[574]Ibid, para 52.
[575]Ibid paras 10, 26 and 35.
[576]Ibid para 32.
[577]I discuss the concept of 'vulnerability' and delineation of vulnerable groups in greater detail in ch 4 sec 2.2.
[578]Martha Albertson Fineman, 'The Vulnerable Subject and the Responsive State' (2010) 60 Emory law journal 251, 256-262.
[579]ESCR Committee, 'General Comment No.25 (2020) on Science and Economic, Social and Cultural Rights (art 15 (1) (b), (2), (3) and (4) of the International Covenant on Economic, Social and Cultural Rights)' (n 269), para. 52; Martin and others (n 415) para 31.
[580]Y. Donders, 'The Right to Enjoy the Benefits of Scientific Progress: in Search of State Obligations in Relation to Health' (2011) 14 Med Health Care and Philos 371, 377; ESCR Committee, 'General Comment No.25 (2020) on Science and Economic, Social and Cultural Rights (art 15 (1) (b), (2), (3) and (4) of the International Covenant on Economic, Social and Cultural Rights)' (n 269) para 46.
[581]ESCR Committee, 'General Comment No.25 (2020) on Science and Economic, Social and Cultural Rights (art 15 (1) (b), (2), (3) and (4) of the International Covenant on Economic, Social and Cultural Rights)' (n 269) para 46.
[582]Ibid paras 52 and 70.

that research results must be made available to the international community, in a manner that allows developing countries to access these results 'in an affordable manner'.[583] Thus, the State obligation to conduct research also incurs an obligation to cooperate (discussed further in Section 1.3 below) both in undertaking and disseminating research. Obligations to disseminate research findings can also be found in the United Nations Convention on the Law of the Sea (UNCLOS) in the context of marine scientific research.[584] Thus, States are obligated to disseminate the outcomes of scientific research conducted in the marine environment under both IHRL and UNCLOS.

It would be naïve to suggest such an obligation may be implemented without any obstacles, and there are several foreseeable challenges in driving forward a globally cohesive research agenda on human health and marine biodiversity linkages. Paramount amongst these is the fact that all States face budget constraints. At any given time, there are innumerable drivers of harm to health that demand allocation of resources. The health risks presented by loss of biodiversity will not, and indeed likely should not, take priority for budget allocation in every instance. Second, while I propose that global research initiatives should be harmonised to promote efficient and targeted progress, research priorities related to the human health and marine biodiversity nexus will likely vary across geographies. Therefore, achieving international cooperation on research may be challenging, resulting in piecemeal pockets of collaborative research by smaller groups that share common concerns.[585] Nonetheless, the obligation to promote and disseminate research should be duly considered by States as they prioritise actions towards progressive realisation of the right to health.

1.2. Ensure individual capacity development concerning the human health and marine biodiversity nexus

In this section, I posit that States are obligated to develop the capacity of individuals to better understand the human health and marine biodiversity nexus, as a prerequisite to ocean governance practices that align with the right to health. The United Nations Development Programme (UNDP) defines 'capacity' as 'the ability of individuals, institutions and societies to perform functions, solve problems, and set and achieve objectives in a sustainable manner'.[586] One of the most widely accepted definitions of 'capacity

[583]Ibid paras 79 and 80.
[584]UNCLOS (n 16) arts 143(2) and 244(1).
[585]For more information on obstacles to marine scientific research, see Kerry Sink and others, 'Challenges and Solutions to Develop Capacity for Deep-sea Research and Management in South Africa' (South African National Biodiversity Institute 2021) <https://oneoceanhub.org/wp-content/uploads/2022/03/Challenges-and-Solutions-to-develop-capacity-for-deep-sea-reseach-and-management-in-south-africa.pdf> accessed 22 December 2022.
[586]Ionel Zamfir, 'Understanding Capacity-building/Capacity Development: a Core Concept of Development Policy' (European Parliamentary Research Service 2017) <www.europarl.europa.eu/RegData/etudes/BRIE/2017/599411/EPRS_BRI(2017)599411_EN.pdf> accessed 22 December 2022, 3.

development' was originated by the Organisation for Economic Co-operation and Development (OECD) in 2008, which defined it as 'the process whereby people, organisations and society as a whole unleash, strengthen, create, adapt and maintain capacity over time'.[587]

In the context of ocean governance, Butler, Coffen-Smout and Werle asserted that:

> If scientific knowledge and technical know-how are two essential elements for ocean management and conservation in this century, then developing capacity for responsible governance by way of ocean education and training of human resources is bound to be a third prerequisite.[588]

It is based on this logic that I posit that governments are subject to an obligation under the right to health to ensure capacity development concerning the human health and marine biodiversity nexus. Without adequate and widespread awareness and understanding of these linkages, States cannot hope to take the steps necessary to protect them. Thus, the obligation to ensure individual capacity development is implicit in the State obligations to respect, protect and fulfil the right to health. This obligation also builds upon the former obligation to develop and ensure access to scientific research, since the ability to develop capacity is dependent on the existence of a robust base of knowledge.

Support for capacity development obligations can be found within both primary and secondary resources. In the context of IHRL, the Framework Principles on Human Rights and the Environment, prepared in 2018 by the United Nations Special Rapporteur on the issue of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment, state that:

> States should make the public aware of the specific environmental risks that affect them and how they may protect themselves from those risks. (…) States should build the capacity of the public to understand environmental challenges and policies, so that they may fully exercise their rights to express their views on environmental issues.[589]

This is a call to States to strengthen capacity concerning environment and human rights linkages. The importance of capacity development in the context of ocean governance has been reiterated by multiple

[587]OECD, 'The Challenge of Capacity Development: Working Towards Good Practice' (2008) 8(3) OECD Journal on Development 223, 244; Zamfir (n 586) 3.
[588]Michael Butler, Scott Coffen-Smout and Dirk Werle, 'Introduction' in Dirk Werle and others (eds), *The Future of Ocean Governance and Capacity Development: Essays in Honor of Elisabeth Mann Borgese*, vol 2018 (Brill Nijhoff 2018), 69.
[589]HRC, 'Framework Principles on Human Rights and the Environment' (n 566) Annex para 16.

academic commentators,[590] and is a key element of ongoing negotiations under UNCLOS to develop a new international agreement on the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction (BBNJ Treaty).[591]

In 1998, UNDP proposed that capacity development should be undertaken at three levels: the system (or enabling environment), the entity or organisation, and the individual.[592] The enabling environment refers to the framework within which individuals, organisations and other entities function, and includes laws, policies, resources and processes.[593] The organisational level focusses on the structure, objectives, policies, procedures, and resources with which organisations operate, in addition to how organisations interact with other organisations and the wider enabling environment.[594] The individual level addresses the knowledge and skills of individual persons in various capacities, ranging from those involved in the functioning of public and private entities, to the general public.[595]

Building capacity in all three tiers will be essential to achieve adequate consideration and protection of human health and marine biodiversity linkages. Nonetheless, only the third of these (i.e., the individual level) is considered in this section. The enabling environment and organisational level are considered in Section 3.3 below in the context of mainstreaming the human health and marine biodiversity nexus. This is because the current section — foundational obligations — considers obligations that underpin the ability of States to fulfil all other obligations considered in Sections 2 and 3 below. Developing the capacity of individuals to understand the connections between human health and marine biodiversity is a logical prerequisite to enable them to progress towards fulfilling any of the immediate or non-immediate obligations discussed later in this chapter.

Li et al. further categorised individuals into three subcategories: consumers of evidence, producers of evidence and knowledge brokers.[596] Knowledge (or 'evidence') consumers comprise individuals that will

[590]Nicholas Bax and others, 'Linking Capacity Development to GOOS Monitoring Networks to Achieve Sustained Ocean Observation' (2018) 5 Frontiers in Marine Science article 346 <https://doi.org/10.3389/fmars.2018.00346> accessed 23 December 2022.
[591]UNGA, 'Further Revised Draft Text of an Agreement Under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction' (1 June 2022) UN Doc A/CONF.232/2022/5, para 2 and Annex, arts 7(b), 11(3)(d) and pt IV.
[592]UNDP, 'Capacity Assessment and Development: In a Systems and Strategic Management Context' (Technical Advisory Paper No3, 1998) <www.cbd.int/doc/pa/tools/Capacity%20assessment%20and%20development.pdf> accessed 22 December 2022.
[593]Ibid 11-12.
[594]Ibid 12-13.
[595]Ibid 13-14.
[596]Ryan Li and others, 'Evidence-Informed Capacity Building for Setting Health Priorities in Low- and Middle-Income Countries: A Framework and Recommendations for Further Research' (2017) 6 F1000Res 231 <https://doi.org/10.12688/f1000research.10966.1> accessed 23 December 2022, 7.

use the outputs of scientific research. In the current context, this would include policy- and decision-makers, courts and members of the judiciary, individuals within industries that either protect or undermine human health and marine biodiversity linkages, and the general public. Capacity needs will vary between these groups. Policy makers, and decision makers will need a detailed understanding of the connections between human health and marine biodiversity to enable them to develop appropriate policies and legislative frameworks on ocean governance, public health and other relevant sectors. Courts and the judiciary will require sufficient knowledge to allow them to adequately respond to alleged grievances in this regard. Industry players will need to understand how their actions can harm ecosystem services or exacerbate negative human health and marine biodiversity linkages.

The general public (which in itself comprises various distinct groups of individuals) would need to understand the various human health and marine biodiversity linkages that play a role in supporting their health and wellbeing, and also the various risks they may be exposed to and how to minimise their exposure.[597] In addition to developing scientific understanding, they must also be informed how to access and understand policies and laws, and how to participate in their development.[598] States must pay particular attention to developing the capacity of the most vulnerable groups of society, as explored further in Section 2.2 below in the context of the obligation of non-discrimination.[599]

Knowledge (or 'evidence') producers include the research community generating knowledge on human health and marine biodiversity linkages. They will require technical research skills, funds or equipment to enable them to monitor changes in the marine environment, or to measure impacts of changes in marine ecosystems upon human health.[600] Furthermore, knowledge production and use is not a linear process with a one-way flow of information from knowledge producers to knowledge consumers. Rather, it must be a circular and iterative process whereby knowledge consumers, such as policy makers, are able to clearly articulate their research needs to knowledge producers, ensuring that research efforts are targeted and valuable.[601] Therefore knowledge producers may require support to develop their capacity to engage with consumers and facilitate effective knowledge transfer.[602]

[597]HRC, 'Framework Principles on Human Rights and the Environment' (n 566) Annex para 16.
[598]Ibid.
[599]Ibid Annex para. 43.
[600]Li and others (n 596) 10.
[601]Ibid.
[602]Ibid.

Finally, knowledge brokers comprise the actors that serve as a bridge between knowledge producers and consumers and catalyse knowledge transfer and exchange.[603] This may include media organisations, think tanks and NGOs that translate scientific outputs into formats more understandable by knowledge consumers. Their capacity needs may include financial resources to support their work, or access to government platforms with which to disseminate information.

The actors that fall into each of these three categories of knowledge producers, consumers and brokers will vary between States, as will their capacity needs and the most appropriate ways to develop required capacity. Thus, the above simply comprises a hypothetical exploration of what these actors and their needs may look like. It is crucial that, in developing the capacity of individuals to understand and protect human health and marine biodiversity linkages, States pay careful attention not to neglect the needs of any single group, as this can ultimately undermine the effectiveness of all other capacity development interventions.[604] Furthermore, States must demonstrate sensitivity to differences in culture, communication styles and situations of various groups, and tailor their capacity development initiatives accordingly.[605]

There will inevitably be challenges in implementing the obligation to develop individual capacity. Resource availability and budgeting will always present an obstacle and could incentivise States to bypass costly capacity development initiatives and continue to manage the marine environment and activities therein with existing levels of capacity. However, I contend that this would be a mistake that could perpetuate existing unsustainable practices and yield significant long-term harm to human and ocean health alike. Resource limitations will likely be felt most strongly be developing States. Therefore, international cooperation will play a strong role in facilitating capacity development on a global scale, to avoid a capacity disparity between the global north and south.

1.3. Cooperate through relevant international fora to protect human health and marine biodiversity linkages

States are subject to an express obligation under IHRL to cooperate as necessary to achieve full realisation of the right to health.[606] In this section I demonstrate that this extends to provision of international assistance, including technology transfer. The importance of international cooperation for the protection of marine biodiversity cannot be understated. As discussed in Chapter 3, there are three primary reasons why collaboration is key in the marine context: marine species are often highly migratory, the physical nature

[603]Ibid 11.
[604]Ibid 6.
[605]HRC, 'Framework Principles on Human Rights and the Environment' (n 566) Annex para 16.
[606]ICESCR (n 316) Art. 2(1).

of the marine environment allows matter to travel further thus increasing scope for transboundary harm, and much of marine biodiversity is located in ABNJ.[607] Indeed, the need for cooperation in the protection of marine biodiversity is a primary driver behind the ongoing development of the BBNJ Treaty.[608] The importance of cooperation has already been acknowledged above in the context of the obligations to develop and ensure access to scientific research and to ensure capacity development. It will also play a central role in facilitating fulfilment of many of the obligations considered later in this chapter.

State obligations concerning international assistance and cooperation under the right to health are well established in IHRL,[609] and any obligations of international assistance or cooperation sit parallel with an obligation on States to take unilateral action towards fulfilment of the right to health.[610] Where unilateral action is inadequate to achieve full realisation of the right to health, States must work together as necessary towards this end.[611] In addition to cooperation on a level playing field where relevant, the inequitable realities of global wealth distribution must yield different responsibilities for different States. Developed States must provide assistance to less resource-wealthy developing States to help them progress towards full realisation of the right to health.[612] Conversely, developing States are under an obligation to seek assistance as necessary.[613] In conjunction with the obligation to seek assistance, I posit that there is also an argument in favour of an obligation not to refuse arbitrarily bona fide assistance from other States or international organisations.[614]

The notion of States cooperating to protect human rights and environment linkages is not novel. The Framework Principles on Human Rights and the Environment urge States to:

> cooperate with each other to establish, maintain and enforce effective international legal frameworks in order to prevent, reduce and remedy transboundary and global environmental harm that interferes with the full enjoyment of human rights.[615]

[607]See ch 3 sec 2.7.
[608]Vito De Lucia, 'The BBNJ Negotiations and Ecosystem Governance in the Arctic' (2019) Marine Policy 103756 <https://doi.org/10.1016/j.marpol.2019.103756> accessed 23 December 2022, 1.
[609]See ch 3 sec 2.7.
[610]ICESCR (n 316) art 2(1).
[611]Ibid.
[612]ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para. 14. See also ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para.40; Carmona (n 461) 93; Vandenhole (n 461) 51.
[613]Carmona (n 461) 94; ESCR Committee (n 465) para 41; ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para 13.
[614]See ch 3 sec 2.6.
[615]HRC, 'Framework Principles on Human Rights and the Environment' (n 566) Framework Principle 13.

The Framework Principles highlight that States are already party to a range of international environmental agreements that operate as platforms for cooperation, such as the United Nations Framework Convention on Climate Change (UNFCCC) and the CBD.[616] It further acknowledges that the nature of cooperation will vary on a case-by-case basis, taking account of the 'respective capabilities and challenges' of the States concerned, but that the precautionary principle should always be exercised.[617] Moreover, collaboration is not restricted solely to actions concerning international environmental or human rights law.[618] It also requires the international community to be sensitive to the potential unintended or indirect impacts of disparate areas of international law upon the environment, and to take necessary proactive steps to prevent or mitigate harm. This may include, for example, agreements implemented under international trade and investment law.[619]

It is both challenging and arguably counterproductive to attempt to define an exhaustive list of forms that cooperation may take because it will vary depending on the circumstances in question. That said, an awareness of the types of actions that cooperation may entail can help add definition to the obligation to cooperate. In the context of IHRL, this may include: 'transfer of resources and technical assistance and cooperation'; 'policy advice'; 'international sharing and exchange of experience, expertise and good practice to assist in effective implementation'; 'networking and workshops'; 'training'; 'awareness'; 'cooperation among (…) organisations'; and 'development of technologies'.[620] This list comprises forms of mutually beneficial cooperation (such as 'international sharing and exchange of experience' and 'networking and workshops') in addition to mechanisms that yield more unidirectional flow of benefits that therefore fall under the title of assistance (like 'transfer of resources and technical assistance').[621]

The exact scope of the term 'assistance' remains subject to debate.[622] Cleary this includes the provision of financial support. As stated by UN Special Rapporteur on Human Rights and the Environment, David Boyd, 'Wealthy States must contribute their fair share towards the costs of conserving, protecting and restoring healthy ecosystems and biodiversity in low-income countries, in accordance with the principles of common

[616]Ibid Annex para 36.
[617]Ibid Annex paras 37 and 38.
[618]Ibid Annex para 39.
[619]Ibid Annex para 37.
[620]Vandenhole (n 461) 56.
[621]Ibid.
[622]See Takhmina Karimova, *The Nature and Meaning of 'International Assistance and Cooperation' under the International Covenant on Economic, Social and Cultural Rights* (Oxford: Oxford University Press 2014).

but differentiated responsibility'.[623] Another essential aspect of assistance for current purposes is technology transfer. As mentioned in Section 1.1, research into human health and marine biodiversity linkages is essential to inform all subsequent actions to protect such linkages. However, low-income States often lack the necessary equipment to undertake marine research.[624] For this reason, technology transfer remains a key issue in the ongoing BBNJ negotiations.[625]

Obligations concerning technology transfer can be found across various spheres of international law, including IHRL, environmental law and the law of the sea. In the context of IHRL, Article 32(1)(d) of the Convention on the Rights of Persons with Disabilities requires States Parties, in the context of international cooperation, to '[Provide], as appropriate, technical and economic assistance, including by facilitating access to and sharing of accessible and assistive technologies, and through the transfer of technologies'.[626] In the sphere of international environmental law, technology transfer is expressly recognised as an essential tool to facilitate achievement of the CBD's objectives.[627] It therefore includes an obligation upon each Contracting Party to 'Provide and/or facilitate access for and transfer to other Contracting Parties of technologies that are relevant to the conservation and sustainable use of biological diversity (…)'.[628] A similar obligation can be found in the UNFCCC, which obligates Parties to 'Promote and cooperate in the development, application and diffusion, including transfer, of technologies (…)'.[629] Under the law of the sea, a similar obligation can be found in UNCLOS, which requires that:

> States, directly or through competent international organisations, shall cooperate in accordance with their capabilities to actively promote actively the development and transfer of marine science and marine technology on fair and reasonable terms and conditions.[630]

Thus, under the principle of mutual supportiveness and in line with the declaration by the Human Rights Committee (HRC) that State's obligations under international environmental law should 'inform the

[623]UNGA, 'Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2020) UN Doc A/75/161, para 74.
[624]Bax and others (n 590) 5.
[625]UNGA, 'Further Revised Draft Text of an Agreement Under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction' (n 591) para 2 and Annex, art 6(3).
[626]See also ICESCR (n 316) Art.23.
[627]CBD (n 22) art 1.
[628]CBD (n 22) art 16(1).
[629]United Nations Framework Convention on Climate Change (adopted 9 May 1992, entered into force 21 March 1994) 1771 UNTS 107 (UNFCCC) art 4(1)(c).
[630]UNCLOS (n 16) art 266(1).

contents' of States' human rights obligations,[631] it is clear that technology transfer must form a central pillar of international assistance in the context of the right to health and its nexus with marine biodiversity.

Despite the existence of multiple technology transfer obligations in international law, these have not been implemented widely.[632] Amongst other things, this is because, while technology transfer obligations exist between States, the technology itself is often owned by private actors.[633] It is beyond the scope of this thesis to explore the challenges and potential solutions to technology transfer in detail. Suffice to note that the obligation of technology transfer discussed here strongly aligns with ongoing development of a technology transfer mechanism under the BBNJ negotiations, as both seek to facilitate protection of marine biodiversity and, by extension, the ecosystem services that they provide. Thus, any technology transfer mechanisms that emerge under the BBNJ Treaty should support States to fulfil their corresponding technology transfer obligation under the right to health.

1.4. Mobilise maximum available resources

As with the obligation to cooperate, the obligation to use maximum available resources in achieving full realisation of the right to health is an express obligation under Article 2(1) of ICESCR. In Chapter 3,[634] I demonstrated that the term 'resources' is not limited to the monetary wealth of the State government. Rather, it must be interpreted expansively to include resources available through international assistance and cooperation,[635] in addition to those that may be mobilised from within the private sector.[636] Furthermore, 'resources' are not limited to finances, but also include human, technological, organisational, natural and information resources.[637] On this basis, I concluded that the term 'resources' relates to marine biodiversity in two ways. First, States should consider allocating resources to strengthen protection of marine biodiversity based on the importance of marine ecosystem services for realisation of the right to health. Second, marine biodiversity should itself be considered an essential resource required for realisation of the right to health, and therefore should be protected and used sustainably. In this section, I take a deeper

[631]HRC, 'General Comment No.36 on Article 6 of the International Covenant on Civil and Political Rights, on the Right to Life' (n 243) para 62.
[632]Stephen Minas, 'Marine Technology Transfer under a BBNJ Treaty: A Case for Transnational Network Cooperation' (2018) 112 AJIL unbound 144, 144.
[633]Christian Prip, G Kristin Rosendal and Morten Walløe Tvedt, *The State of Technology Transfer Obligations in Global Environmental Governance and Law: Biodiversity Conservation and Sustainable Use* (Fridtjof Nansen Institute December 2015), 1; Stephen Humphreys, 'Perspective: Technology Transfer and Human Rights, Joining up the Dots' (2009) 9 Sustainable development law & policy 2, 2.
[634] See ch 3 sec 2.6.
[635]ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para 13.
[636]Tobin (n 318) 230.
[637]CRC (n 442) ch VII para 65.

look at the relationship between marine biodiversity and the 'maximum available resources' obligation to address some of the practical considerations around its fulfilment.

The obligation to use maximum available resources can be broken down into several subcomponents: identification, allocation, expenditure, and mobilisation of resources.[638] Resource identification captures much of what has already been considered in Chapter 3 and summarised in the above paragraph. Resource allocation refers to the allocation of resources in public budgeting processes. Numerous commentators observe a tendency on the part of human rights monitoring bodies to focus almost exclusively on financial resources.[639] Viewed through this narrow lens, the question of resource allocation primarily focuses on whether States are allocating adequate funds to support realisation of ESC rights in their public budgeting and whether they those resources are being allocated appropriately.[640] The question of what constitutes 'adequate' allocation of resources — or 'maximum available' resources — remains elusive, with no consensus apparent in the literature reviewed. Similarly, there is little clarity on how to determine whether resources are being allocated appropriately. This is made more challenging by the broad discretion afforded to States by the doctrine of progressive realisation, allowing them to tailor their responses to their unique circumstances.[641]

Nonetheless, there are several considerations that can guide the appropriateness of resource allocation. First, States must avoid budget cuts that may be considered retrogressive.[642] Any reduction in funding to support realisation of ESC rights places a burden upon States to justify such cuts in accordance with the obligation of non-retrogression.[643] This should include reduction in resources allocated to protection of the marine environment. Second, States should prioritise achievement of the minimum core obligations (MCOs) for the right to health.[644] This includes prioritising development of a plan for protection of marine biodiversity, or considering human health and marine biodiversity linkages in any national public health strategy, as discussed in Section 2.1 below.[645] Third, States must ensure that priority is given to eradicating inequalities

[638]Corkery and Saiz (n 363) 282-287; Radhika Balakrishnan and others, *Maximum Available Resources & Human Rights* (Center for Women's Global Leadership, Rutgers 2011).
[639]Corkery and Saiz (n 363) 286; Balakrishnan and others (n 638) 2.
[640]Balakrishnan and others (n 638) 2.
[641]Corkery and Saiz, (n 363) 283. For more information on how to bridge financing gaps in realising environmental human rights, see UNGA, 'Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2022) UN Doc A/77/284, paras 56-76.
[642]Corkery and Saiz (n 363) 283; CRC Committee, 'General Comment No.19 on Public Budgeting for the Realization of Children's Rights (art. 4)' (2016) UN Doc CRC/C/GC/19, para 31.
[643]Balakrishnan and others (n 638) 4; Corkery and Saiz (n 363) 283.
[644]Corkery and Saiz (n 363) 282; ESCR Committee, 'An Evaluation of the Obligation to Take Steps to the "Maximum Of Available Resources" Under an Optional Protocol to the Covenant' (n 391) para. 6.
[645]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 43(f).

in enjoyment of the right to health. Primarily, this includes allocating resources to the protection of vulnerable groups,[646] and measures to combat discrimination in enjoyment of the right to health.[647] Finally, a key tool to ensure the acceptability of State budgeting is to facilitate widespread public participation in the budget formulation process, and to ensure transparency in decision-making processes.[648] These points help to clarify how States should allocate their resources, but not how much resources they should allocate. On this point, Balakrishnan et al. observed that the ESCR Committee has used several indicators for determining adequacy of resources allocated, including: a comparison of resources allocated for realising ESC rights compared to non-ESC rights; and assessment of resources that a State allocates to realising ESC rights compared to other States at a similar level of development.[649]

While resource allocation focuses on budgeting processes, resource expenditure refers to the implementation of this budget and use of allocated funds in practice. On this point, the Committee on the Rights of the Child (CRC Committee) declared that 'Public resources dedicated to child-related policies and programmes should be managed in such a way as to ensure value for money', 'Approved expenditures should be executed in line with the enacted budget', and 'Funds allocated to the rights of the child should not be wasted'.[650] These seem logical principles to guide the use of any human rights budget and need not be constrained to the realisation of children's rights. To measure impact and 'value for money', the CRC Committee further adds that monitoring, auditing and evaluation must be conducted to ensure that resources are being allocated and expended in a logical and efficient manner.[651] However, caution must be exercised in determining appropriate metrics of efficiency. Balakrishnan et al. observed that 'In the health sector, efficiency is typically judged in terms of the financial cost per treatment'.[652] This is problematic since, unless issues such as clinical outcome and clinical effectiveness are also considered, it may promote selection of the least expensive option, irrespective of the quality of patient care provided. Furthermore, it fails to consider the economic benefits of proactive prevention, rather than reactive treatment. For example, a recent publication concluded that the economic benefits of protecting at least 30 percent of the planets

[646]ESCR Committee, 'An Evaluation of the Obligation to Take Steps to the "Maximum Of Available Resources" Under an Optional Protocol to the Covenant' (n 391) paras 4, 8(f) and 13(d).
[647]Ibid paras 7, 8(f) and 13(d).
[648]Ibid para 11; CRC Committee, 'General Comment No.19 on Public Budgeting for the Realization of Children's Rights (art. 4)' (n 642) para 62.
[649]Balakrishnan and others (n 638) 2.
[650]CRC Committee, 'General Comment No.19 on Public Budgeting for the Realization of Children's Rights (art. 4)' (n 642) para 60.
[651]Ibid.
[652]Balakrishnan and others (n 638) 8.

land and ocean far outweigh the costs.[653] Another concluded that the economic value of protected areas in terms of impact on mental health is approximately $6 trillion USD per annum, which is two to three times greater than the aggregate of budgets for all protected area management bodies worldwide.[654] Thus there is an emerging body of research that suggests that the allocation of human rights budgetary resources for protection of biodiversity (including marine biodiversity) could be a highly efficient use of resources.

Finally, resource mobilisation concerns State actions designed to maximise resources available through the international community and the private sector. The international component was considered in the previous section. Regarding mobilising private sector resources, States have a variety of tools at their disposal, and it is beyond the scope of my research to explore these exhaustively. However, there are several options that are worth highlighting. Corkery and Siaz concluded that 'There is emerging consensus about the critical importance of taxation as a sustainable source of public revenue'.[655] As noted by the former Special Rapporteur on the Realisation of Economic, Social and Cultural Rights:

> Progressive (as opposed to regressive) measures of taxation can, if supported by adequate administrative machinery and enforcement mechanisms, lead to gentle and gradual forms of income redistribution within States without threatening economic stability or patterns of growth, thereby creating conditions that enable a larger proportion of society to enjoy economic, social and cultural rights.[656]

In the context of marine biodiversity, strategic taxation and other revenue-raising activities can be used to advance marine conservation while simultaneously protecting the ability of vulnerable groups to enjoy their right to health. This may comprise levying taxes on the industries that cause significant harm to the marine environment, such as commercial fisheries or deep seabed mining, and feeding the resulting income back into conservation initiatives and mechanisms to provide support to vulnerable groups to help protect their essential connections to the marine environment. Conversely, it is equally important that any

[653]Anthony Waldron and others, 'Protecting 30% of the Planet for Nature: Costs, Benefits and Economic Implications' (Campaign for Nature, 2020) <www.campaignfornature.org/protecting-30-of-the-planet-for-nature-economic-analysis> accessed 22 December 2022.
[654]Ralf Buckley and others, 'Economic Value of Protected Areas via Visitor Mental Health' (2019) 10 Nat Commun 5005 <https://doi.org/10.1038/s41467-019-12631-6> accessed 23 December 2022, 1.
[655]Corkery and Saiz (n 363).
[656]United Nations Economic and Social Council, 'The Realization of Economic, Social and Cultural Rights' (1992) UN Doc E/CN.4/Sub.2/1992/16, para 83.

environmentally harmful subsidies are eradicated, thus removing incentives for actions that harm both marine biodiversity and rights holders.[657]

Payments for ecosystem services (PES) are another promising market-based instrument to generate revenue that may be channelled to environmental and social purposes.[658] Under such arrangements, an entity may be mandated to protect and manage ecosystem services in return for payments from the beneficiaries of the ecosystem services, or the actors harming the ecosystem services (or both).[659] This approach has been adopted on a large scale, including in the Galapagos[660] and the Great Barrier Reef,[661] whereby entrance fees are channelled back into protecting the marine environment. Each of these incentive mechanisms considered in brief above are examples of tools that States have at their disposal to mobilise private sector resources towards both the protection of marine biodiversity and fulfilment of the right to health. In practice, States would have to deploy a package of complementary measures to optimise the mobilisation of private sector resources to this end.

2. Obligations requiring immediate fulfilment

I have collectively labelled the obligations in this section as requiring immediate fulfilment because each of them is either expressly recognised as transcending the doctrine of progressive realisation (i.e., the obligations of non-discrimination and non-retrogression)[662] or derives from obligations that transcend the doctrine of progressive realisation (i.e., the obligation to make plans emerges from both the obligations to take steps and to ensure non-discrimination, and the MCOs, all of which require immediate action).[663] Thus, by their inherent nature, these obligations require immediate fulfilment. States must immediately begin to take steps (which, I posit, in the current context means an obligation to start planning for protection of human health and marine biodiversity linkages), ensure the removal and avoidance of discriminatory

[657]Stephanie Switzer, Elisa Morgera and Elaine Webster, 'Casting the Net Wider? the Transformative Potential of Integrating Human Rights into the Implementation of the WTO Agreement on Fisheries Subsidies' (2022) 31 REV EUR COMP INT ENV 360; Melissa Bos, Robert Pressey and Natalie Stoeckl, 'Marine Conservation Finance: The Need for and Scope of an Emerging Field' (2015) 114 Ocean & coastal management 116.
[658]Bos, Pressey and Stoeckl (n 657) 118.
[659]Ibid 118-119.
[660]'Galapagos Entry Fees & Documents' (*Galapagos Travel Center*, ND) <www.galapagosislands.com/travel/transportation/entry-fees.html#:~:text=Galapagos%20National%20Park%20Entrance%20Fee&text=Most%20foreign%20tourists%20over%20the,%246%2C%20and%20children%20pay%20%243> accessed 19 December 2022.
[661]'What are the charges' (*Australian Government Great Barrier Reef Marine Park Authority*, ND) <www.gbrmpa.gov.au/access-and-use/environmental-management-charge/what-are-the-charges> accessed 19 December 2022. Environmental management charges are temporarily waived to facilitate recovery of the tourism industry following the COVID-19 pandemic.
[662]See ch 3 secs 2.4 and 2.2, respectively.
[663]See ch 3 secs 2.3-2.5, respectively.

practices, and refrain from unjustifiable retrogression concerning the protection of marine biodiversity. That said, I acknowledge that each of these obligations may include components that require more time to implement fully. For instance, obligations to respect and protect the principle of non-discrimination under the right to health may be actionable immediately, whereas systemic changes required to achieve its fulfilment may take more time and resources. In this sense, I characterise each of these obligations as 'immediate' based on a holistic consideration of their nature and the various outputs and assertions of the ESCR Committee and the academic community. Moreover, I use the term 'immediate' (rather than, 'short-term', for example) to adhere to the language used by the ESCR Committee to refer to obligations transcending the doctrine of progressive realisation.[664] However, as noted by Young, 'immediate' cannot be interpreted as 'instant', as any response measures to ensure fulfilment of an obligation will necessarily take a degree of time.[665] In practice, I contend that 'immediate' indicates the urgency with which such obligations must be fulfilled, and the very narrow window of temporal discretion that will be afforded to States to do so.[666]

2.1. Develop a plan for protection of the human health and marine biodiversity nexus

In Chapter 3, I concluded that a State obligation to develop a plan for the protection of the human health and marine biodiversity nexus emerges from several pre-existing State obligations under the right to health. These include the obligations to take steps and to ensure non-discrimination, the MCOs, and the obligations to protect and fulfil.[667] Furthermore, given that all of these (barring the obligations to protect and fulfil) transcend the doctrine of progressive realisation,[668] I conclude that the planning obligation must also require immediate fulfilment. In this section, I further define the content and form of this obligation through reference to general comments by human rights treaty bodies and decisions of the CBD COP.

The existence of a general planning obligation is corroborated by general comments both of the ESCR Committee[669] and the CRC Committee.[670] Both Committees list the obligation to make plans amongst the

[664]See eg ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para 1.
[665]Young (n 363) 20-21.
[666]For more detailed discussion on 'immediate' obligations under IHRL see ibid 20-21.
[667]See ch 3 secs 2.3, 2.4, 2.5 and 2.9, respectively.
[668]See ch 3 secs 2.3-2.5.
[669]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 43(f).
[670]CRC Committee, 'General Comment No.15 on the Right of the Child to the Enjoyment of the Highest Attainable Standard of Health (art 24)' (n 390) para 73(d).

select group of MCOs.[671] The ESCR Committee obligates States to 'adopt and implement a national public health strategy and plan of action',[672] while the CRC Committee requires that States '[develop], [implement], [monitor] and [evaluate] policies and budgeted plans of action that constitute a human rights-based approach to fulfilling children's right to health'.[673] This reinforces both the importance of planning for realising the right to health, and the immediate nature of the obligation.[674]

Both Committees provide additional information that helps to define the content of the planning obligation. First, plans must be based on 'epidemiological evidence'.[675] This indicates that they must be informed by sound science, reinforcing the importance of the obligation to develop scientific research, considered in Section 1.1 above. Second, plans must '[address] the health concerns of the whole population',[676] suggesting they should include actions to combat discrimination and ensure equal enjoyment of the right to health. This is mutually supportive with State obligations under the obligation of non-discrimination, under which the ESCR Committee requires States to, 'Ensure strategies, policies, and plans of action are in place in order to address both formal and substantive discrimination by public and private actors'.[677] Moreover, plans must afford 'particular attention to all vulnerable or marginalised groups'.[678] Third, plans must be devised using a transparent and participatory process that upholds procedural environmental rights, and must embody a human rights-based approach that affords due consideration to the totality of human rights.[679] Finally, in addition to the content of such plans, the plans should not be fixed in time, but should include methods to facilitate continuous monitoring of impact (including benchmarks and indicators) and should provide for periodic review and evaluation.[680] Moreover, the language of the CRC Committee suggests that the planning obligation is not constrained to the development and implementation of plans in the strict sense, but also includes policies.[681]

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[671]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 43(f); CRC Committee, 'General Comment No.15 on the Right of the Child to the Enjoyment of the Highest Attainable Standard of Health (art 24)' (n 390) para 73(d).
[672]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 43(f).
[673]CRC Committee, 'General Comment No.15 on the Right of the Child to the Enjoyment of the Highest Attainable Standard of Health (art 24)' (n 390) para 73(d).
[674]Tasioulas (n 179) 4.
[675]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 43(f).
[676]Ibid para 43(f).
[677]ESCR Committee, 'General Comment No.20: Non-discrimination in economic, social and cultural rights (art 2, para 2, of the International Covenant on Economic, Social and Cultural Rights)' (n 406) para 38.
[678]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 43(f).
[679]Ibid para 43(f).
[680]CRC Committee, 'General Comment No.15 on the Right of the Child to the Enjoyment of the Highest Attainable Standard of Health (art 24)' (n 390) para 73(d).
[681]Ibid.

Collectively, these components go a long way to revealing the content of this obligation. However, it still leaves a degree of uncertainty concerning the precise content of a plan to protect the human health and marine biodiversity nexus specifically, and how this plan may fit in with existing State policy and planning processes. Fortunately, decisions of the CBD COP offer further insights that help to fill these knowledge gaps. Put simply, I contend that State plans for the protection of human health and marine biodiversity linkages should contain strategies for the fulfilment of each of the obligations set out in this chapter. CBD COP Decision XIII/6 reinforces the importance of many of these actions, including: developing and ensuring access to scientific research on the human health and marine biodiversity nexus,[682] ensuring individual capacity development concerning the nexus.[683] combatting discrimination concerning the enjoyment of the health benefits derived from biodiversity,[684] mainstreaming the human health and marine biodiversity nexus,[685] and undertaking integrated monitoring and evaluation.[686]

On the question of the form this plan may take, the CBD highlights several types of planning initiatives that likely already exist in most States that could serve as logical platforms on which to develop or integrate plans for the protection of human health and marine biodiversity linkages. Article 6(a) of the CBD obligates States to '[d]evelop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies'.[687] Fulfilment of this obligation was catalysed by target 17 of the Aichi Biodiversity Targets, which prescribed that '[b]y 2015, each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan'.[688] At the time of writing,[689] 194 of 196 CBD parties have developed at least one National Biodiversity Strategy and Action Plan (NBSAP).[690] These offer a logical planning tool into which States may incorporate consideration of human health and marine biodiversity linkages. Indeed, the CBD COP has encouraged States to 'consider the linkages between biodiversity and human health in the preparation of [NBSAPs]', amongst other instruments.[691] In addition to NBSAPs, the CBD COP has suggested several other instruments in which States should consider the intersection of human health and biodiversity. Specifically, it has requested States to:

[682]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para 6.
[683]Ibid paras 4(g)-(h) and 5(b).
[684]Ibid para 4(i).
[685]Ibid paras 4(a), (d),(h) and (i).
[686]Ibid paras 4(c) and (e), and 5(a).
[687]CBD, 'Conference of the Parties to the CBD Dec. XII/21' (n 297) para 2.
[688] CBD, 'Conference of the Parties to the CBD Dec. X/2' (29 October 2010) UN Doc UNEP/CBD/COP/DEC/X/2, Target 17.
[689]12 December 2022.
[690]'National Biodiversity Strategies and Action Plans (NBSAPs)' (*CBD*, ND) <www.cbd.int/nbsap/> accessed 19 December 2022.
[691]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para 4(b).

> consider relevant health-biodiversity linkages in developing and updating relevant national policies and programmes, strategies, plans, and accounts including health strategies, such as national environmental health action plans, national biodiversity strategies and action plans, and sustainable development and poverty eradication strategies.[692]

This list of suggested planning and strategy documents conveys several key factors regarding the choice of instruments. First, each State retains discretion to choose how and where to advance its national strategy for the protection of human health and marine biodiversity linkages, and there is no one universally correct platform. Second, to achieve full integration of human health and marine biodiversity, States should embed consideration of health and biodiversity linkages both into national health plans and biodiversity plans — not just one of these alone. This may also take the form of a stand-alone integrated plan, but crucially the integration is not unidirectional, and it is not sufficient simply to embed one into the other without considering the inverse. Third, planning for protection of health and biodiversity linkages should not be considered a solitary exercise to be undertaken isolation. It should be embedded into planning initiatives for any sector that may impact the integrity of these linkages.

2.2. Ensure non-discrimination in enjoyment of the right to health

As indicated in Chapter 3, State obligations to prevent discrimination in the context of the right to health arise in several guises. ICESCR Article 2(2) expressly stipulates that 'States Parties (…) undertake to guarantee that the rights enunciated in the present Covenant will be exercised without any discrimination of any kind'. In the context of the right to health, I contend that this translates into a State obligation to ensure non-discrimination in access to health care and the underlying determinants of health.[693] An obligation of non-discrimination is also captured as the first MCO under the right to health,[694] and forms a central tenet of the tripartite typology of obligations.[695] Finally, the AAAQ standards also require that health facilities, goods and services are accessible to all in accordance with the principle of non-discrimination and that any measures taken by States towards fulfilment of the right to health are acceptable to all.[696] In this section I demonstrate that, in the current context, the obligation of non-discrimination requires States to develop and ensure access to disaggregated research into the human health and marine biodiversity nexus, develop a plan to combat discrimination in access to marine biodiversity as an underlying

[692]Ibid.
[693]See ch 3 sec 2.4.
[694]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 43(1)(a).
[695]See ch 4 sec 2.9.
[696]See ch 4 sec 2.10.

determinant of health, ensure participation of vulnerable groups in ocean governance, and combat any instances of discrimination.

As discussed in Chapter 3, the scope for discrimination in the enjoyment of human health and marine biodiversity linkages is significant, with the greatest risks facing women, children, the elderly, and indigenous, rural and coastal communities.[697] The elevated risks faced by such groups may arise due to their increased exposure and/or susceptibility to health risks from waterborne pathogens and pollution, their dependency on specific marine species for traditional medicines, and/or their reliance on marine biodiversity as a source of income with which to feed themselves and their families and to gain access to essential health facilities, goods and services. In Chapter 3 I also suggested several steps that States should take in furtherance of their obligation of non-discrimination. These include advancing research into the connections between vulnerable groups and marine biodiversity (including the identification of vulnerable groups), developing plans to counteract discriminatory outcomes, facilitating procedural environmental rights, and taking affirmative action to support vulnerable groups in realising the right to health. The purpose of this section is to build out these suggestions further.

Before proceeding further, I note that the concept of 'vulnerability' has given rise to extensive academic debate.[698] For current purposes, I use the term 'vulnerable' to refer to groups of individuals who, based on a shared characteristic, may experience curtailment of their ability to enjoy the highest attainable standard of health due to loss or degradation of marine biodiversity. Based on the state of knowledge at the time of writing, throughout this thesis I pinpoint women, children, indigenous peoples and coastal communities as particularly vulnerable to degradation of marine biodiversity.[699] Nonetheless, as research into linkages between human health and marine biodiversity advances, I caution against becoming entrenched in traditional categorisations of vulnerable groups, and encourage critical and innovative thinking when it comes to defining human vulnerability arising from biodiversity loss.[700] Inequalities in access to underlying determinants of health resulting from loss of marine biodiversity may fall along traditional lines based on, for example, socioeconomic status, race or gender. Alternatively, the portion of society that suffers most may be delineated by entirely new characteristics, such as reliance on seafood or proximity to the coast.

[697]See ch 3 sec 2.4.
[698]Lourdes Peroni and Alexandra Timmer, 'Vulnerable groups: The promise of an emerging concept in European Human Rights Convention law' (2013) 11 International journal of constitutional law 1056; Martha Albertson Fineman, 'The Vulnerable Subject: Anchoring Equality in the Human Condition' (2008) 20 Yale journal of law and feminism 1.
[699]See ch 3 sec 2.4.
[700]For more information on identification of groups most vulnerable to marine environmental issues (including biodiversity loss), see Nathan Bennett and others, 'Environmental (In)justice in the Anthropocene Ocean' (2023) 147 Marine policy article 105383 <https://doi.org/10.1016/j.marpol.2022.105383> accessed 23 December 2022.

At this juncture, I also acknowledge that, although I have placed the obligation of non-discrimination under the category of obligations requiring immediate fulfilment, not all the components of this obligation can be realised immediately. Larger systemic and structural changes required to counteract existing de facto discrimination will necessarily take time to implement. However, certain aspects of the obligation do require immediate fulfilment, including removing any pre-existing drivers of formal discrimination and refraining from implementing any new discriminatory measures (e.g., conservation programmes that deny indigenous groups access to resources necessary for traditional medicines). The ESCR Committee has observed that 'State Parties have immediate obligations in relation to the right to health, such as the guarantee that the right will be exercised without discrimination of any kind'.[701] It also noted that failure to take appropriate measures to combat discrimination cannot be attributed to lack of resources, since many measures to combat discrimination in access to healthcare and the underlying determinants of health can be 'pursued with minimum resource implications through the adoption, modification or abrogation of legislation and the dissemination of information'.[702] It is therefore clear that the obligation of non-discrimination under the right to health transcends the doctrine of progressive realisation, and must be considered an obligation that requires immediate fulfilment, at least in part.

Non-discrimination in enjoyment of the right to health, in the context of marine biodiversity, abuts several adjacent bodies of law and jurisprudence including the right to a healthy environment, the right to freedom from discrimination, and the concept of environmental justice. Scholars have recently coined the term 'marine justice' to refer to the study of environmental justice in the context of the marine environment.[703] Each of these bodies of law, including wider consideration of the obligation of non-discrimination under IHRL, helps to inform the nature of State obligations concerning non-discrimination under the right to health in the context of marine biodiversity.

First, as already noted in Section 1.1, the obligation to develop research on the human health and marine biodiversity nexus must include disaggregated research that analyses how different groups relate to the nexus. Such research will support identification of vulnerable groups that, for various reasons, may face an elevated risk of harm from loss of marine ecosystem services or exacerbation of negative human health and

[701]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 30. See also ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para 1.
[702]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233).
[703]Martin and others (n 415). See also Patricia Widener, 'Coastal People Dispute Offshore Oil Exploration: Toward a Study of Embedded Seascapes, Submersible Knowledge, Sacrifice, and Marine Justice' (2018) 4 Environmental sociology 405; and Stefano Longo and Brett Clark, 'An Ocean of Troubles: Advancing Marine Sociology' (2016) 63 Social problems 463.

marine biodiversity interactions.[704] This research must then underpin subsequent State actions to combat discriminatory outcomes of marine biodiversity loss. Without disaggregated research, the inability to identify vulnerable groups effectively could present the largest challenge to fulfilling the obligation of non-discrimination.

Second, and as already discussed in the previous section, States must establish a national plan to combat all forms of discrimination, including those that relate to the human health and marine biodiversity nexus. This obligation is rooted in the obligation of non-discrimination,[705] in addition to the obligation to take steps[706] and the MCOs under the right to health.[707] Support can also be found within decisions of the CBD COP, which have encouraged States to 'integrate relevant biodiversity concerns into national public health policies, with particular emphasis on the needs of indigenous peoples and local communities'.[708]

Third, States must ensure the participation of vulnerable groups in decision-making processes regarding ocean governance.[709] The international nature of ocean governance necessitates innovative new mechanisms for inclusive decision making, with potential lessons to be learned from fishery conservation programs and marine spatial planning.[710] Public participation will be considered in greater detail in Section 3.1 below. For current purposes I conclude that ensuring the participation of vulnerable groups in decision-making processes will be a core component for ensuring outcomes that do not disproportionately disadvantage any specific group.

Finally, where instances of discrimination are identified, States must take appropriate corrective action.[711] The specific measures required in any given instance will depend upon the facts at hand. However, these may include measures to ensure that vulnerable groups may continue to reap the rewards of positive human health and marine biodiversity linkages, and measures to protect them from linkages that impact negatively on their health.

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[704]HRC, 'Report of the Independent Expert on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment, John H. Knox' (n 414) paras 71 and 74; Martin and others (n 415) 239.
[705]ESCR Committee, 'General Comment No.20: Non-discrimination in Economic, Social and Cultural rights (art 2, para 2, of the International Covenant on Economic, Social and Cultural Rights)' (n 406) para 38.
[706]See ch 4 secs 2.1 and 2.3.
[707]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 43(f).
[708]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para 4(i).
[709]ESCR Committee, 'General Comment No.20: Non-discrimination in Economic, Social and Cultural rights (art 2, para 2, of the International Covenant on Economic, Social and Cultural Rights)' (n 406) para 36; ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 54; Martin and others (n 415) 239-240.
[710]Martin and others (n 415) 239.
[711]ESCR Committee, 'General Comment No.20: Non-discrimination in Economic, Social and Cultural rights (art 2, para 2, of the International Covenant on Economic, Social and Cultural Rights)' (n 406) para 37.

2.3. Maintain existing levels of protection for marine biodiversity and ensure non-retrogression

In Chapter 3, I observed that the principle of non-retrogression (often also referred to as non-regression) is well established within human rights law and has also gained significant traction as an emerging core principle of environmental law.[712] It therefore follows logically that States are obligated to avoid unjustifiable retrogressive measures that cause harm to the environment (including marine biodiversity) and, in doing so, undermine full realisation of human rights (including the right to health). This means that the obligation of non-retrogression under the right to health requires States to refrain from taking actions that reduce existing levels of protection afforded to marine biodiversity without adequate justification. In this section, I explore further the types of actions that may be considered retrogressive and the circumstances in which a retrogressive action may be considered justifiable.

Retrogressive measures may be de jure through the revocation of existing legal protections, or they may be de facto through reduction in implementation and enforcement of legal norms (or indeed reduction in resources made available to facilitate enforcement). Prieur noted that retrogression can take many forms, and governments rarely do so explicitly for fear of backlash.[713] Retrogressive measures may occur at the international, regional or national level.[714] At an international level, this may involve a refusal to be bound by or to implement international environmental treaties, or may even involve a State actively denouncing them — as Canada did with the Kyoto Protocol during the 2011 UNFCCC COP.[715] At a regional level, this may involve weakening or revocation of existing environmental standards that could — depending on the nature of regional integration or harmonisation in place — lower the environmental obligations imposed on States in the region.[716] At a national level, retrogressive actions could include the repeal or amendment of existing environmental standards, thus reducing the level of legal protection afforded to the marine environment. However, it would also be retrogressive if a State were to take steps to limit public participation in decision making around ocean governance.[717] Retrogressive action may therefore be procedural or substantive in nature. Logically, it must also be considered prima facie retrogressive if a State takes actions or authorises actions of third parties that are likely to cause harm to the marine environment. There are also potential instances where actions that are progressive from an environmental protection standpoint could be retrogressive from a human rights standpoint. Consider, for example, the establishment

[712]Prieur (n 379). See ch 3 sec 2.2.
[713]Ibid 53.
[714]Ibid 53-54.
[715]Ibid 54.
[716]Ibid.
[717]Ibid.

of a marine conservation area that unreasonably restricts access of an indigenous community to essential ingredients for traditional medicines, or to essential food sources.

This then poses the question of which retrogressive actions may be considered 'reasonable'. The test of 'reasonableness' was expressly incorporated into the 2008 Optional Protocol to the ICESCR as the standard by which the ESCR Committee is to assess States' compliance with their obligations. Article 8(4) of the Optional Protocol prescribes that:

> The Committee shall consider the reasonableness of the steps taken by the State Party in accordance with part II of the Covenant. In doing so, the Committee shall bear in mind that the State Party may adopt a range of possible policy measures for the implementation of the rights set forth in the Covenant.[718]

The criteria by which reasonableness is to be determined continues to be the subject of debate.[719] In the context of the right to health, Tobin asserted that, to be considered reasonable, a decision-making process must be principled (i.e., informed by the full range of obligations under the Covenant and particularly the obligation of non-discrimination), evidence based (as opposed to speculative), consultative and participatory to the extent possible, transparent, and evaluative (i.e., decisions remain subject to review and monitoring).[720] To ensure that a decision is evidence based, decision-making processes must demonstrate consideration of the relevant human health and marine biodiversity linkages through appropriate health and environmental impact assessment processes.

By way of example, if a State was to authorise an activity in its territorial waters that poses a significant threat to marine biodiversity, the decision-making process by which this activity is authorised would need to demonstrate several components. First, it would need to foster procedural environmental rights, including public access to environmental information, public participation in decision making and the availability of review procedures for any decision to be challenged. It would also need to have been based on adequate information including, for example, the findings of a comprehensive impact assessment. The decision resulting from such a process would also need to satisfy several criteria. It must not give rise to an undue

[718]UNGA, 'Optional Protocol to the International Covenant on Economic, Social and Cultural Rights : Resolution Adopted by the General Assembly' (5 March 2009) UN Doc A/RES/63/117.
[719]See Bruce Porter, 'The Reasonableness of Article 8(4) – Adjudicating Claims from the Margins' (2009) 27 Nordic Journal of Human Rights 40; Joie Chowdhury, 'Unpacking the Minimum Core and Reasonableness Standards' in Jackie Dugard and others (eds), *Research Handbook on Economic, Social and Cultural Rights as Human Rights* (Edward Elgar Publishing Limited 2020); Tobin (n 318) ch 6.
[720]Tobin (n 318) 237.

burden on any specific subset of people. As discussed above, determination of the most vulnerable groups must continue to evolve as scientific understanding develops. Finally, if an impact assessment foresaw a significant risk to marine biodiversity, a decision to authorise the activity regardless must be justifiable based on a reasoned balancing of rights. If any of these criteria are not satisfied, it is likely that such a decision could be considered unreasonably retroactive based on its impact to marine biodiversity and, by extension, the realisation of the right to health.

3. Obligations requiring non-immediate fulfilment

I collectively characterise the obligations in this section as requiring non-immediate fulfilment. I do so to distinguish them from the obligations requiring immediate fulfilment, as outlined in the previous section. The main distinguishing feature is that the obligations considered in this section do not transcend the doctrine of progressive realisation, thus granting States a broader time window in which to fulfil them, taking account of their resources and priorities. Many of the obligations set out here will necessarily take time and resources to implement, such as the development of infrastructure to facilitate mainstreaming of the human health and marine biodiversity nexus.[721] On this basis, there are several foreseeable challenges that States will face in satisfying these obligations. The first is the availability of adequate resources. In accordance with the discretion afforded to States under the doctrine of progressive realisation, it is reasonable to assume that they may not consider the actions below to be the most efficient use of resources to pursue realisation of the right to health. This will be true particularly in the case of many developing States who may have more pressing public health issues to address. In addition to resource availability, States' capacities to implement the obligations below are contingent on progress in our understanding of marine biodiversity generally, and the human health and marine biodiversity nexus specifically. For these reasons, progress on the foundational obligations set out in Section 1 of this chapter will be essential to enable fulfilment of these non-immediate obligations.

3.1. Ensure procedural rights in marine biodiversity management

The notion of State obligations to facilitate procedural rights in decision making that impacts the environment is neither a new concept, nor unique to the right to health. In 2017, Special Rapporteur Knox posited that:

[721] See ch 4 sec 3.3.

> The procedural human rights obligations of States in relation to the environment include duties: (a) to assess impacts and make environmental information public; (b) to facilitate public participation in environmental decision-making (…); and (c) to provide access to remedies for harm.[722]

Moreover, he added that 'Each of these obligations applies to measures that affect biodiversity in ways that threaten the full enjoyment of the human rights that depend on its components'.[723] Thus, there is a clear argument in favour of a State obligation to facilitate procedural rights in management of the marine environment on human rights grounds, considering the potential for such activities to affect marine biodiversity with knock-on implications for full enjoyment of the right to health.

I have grouped this obligation under obligations requiring non-immediate fulfilment because the systemic and infrastructure changes required to facilitate full enjoyment of procedural rights will likely take time and resources. However, I nonetheless acknowledge that some aspects of procedural rights fall outside the doctrine of progressive realisation and must therefore be realised immediately. These include ensuring participation in development of health-related planning processes as required under the MCOs and ensuring participation of particularly vulnerable groups as required under the obligation to ensure non-discrimination.[724] With those two exceptions aside, the remainder of this section focuses on the longer-term obligation to ensure widespread procedural rights in ocean governance and decisions that impact marine biodiversity. I demonstrate that there is a strong basis for the existence of this obligation, and that it requires States to ensure procedural rights in all aspects of ocean governance. I close by highlighting the importance of procedural rights in the current context and offering suggestions concerning their implementation.

The existence of an obligation to ensure procedural rights in ocean governance arises from multiple aspects of the right to health. First and foremost, the ESCR Committee has expressly recognised access to health-related information and participation in health-related decision making as underlying determinants of the right to health.[725] Procedural obligations also arise under the MCOs, whereby States are obligated to 'adopt and implement a national public health strategy and plan of action (…) on the basis of *a participatory and transparent process*'.[726] On this point, the ESCR Committee noted that 'Promoting health must involve effective community action in setting priorities, making decisions, planning, implementing and evaluating

[722]HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166) para 27.
[723]Ibid para 28.
[724]See ch 4 secs 2.1 and 2.2, respectively.
[725]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) paras 11 and 54.
[726]Ibid para 43(f). Emphasis added.

strategies to achieve better health'.[727] The obligation to ensure procedural rights also arises under the obligation of non-retrogression whereby a prima facie retrogressive action may only be considered reasonable if, amongst other things, it has been reached through a participatory and inclusive process.[728] Ensuring procedural rights also represents a core component of the obligations to ensure both non-discrimination and the acceptability of any actions taken towards realising the right to health.[729] Participation of all concerned human rights holders in decision-making processes, particularly vulnerable and traditionally marginalised groups, is essential to ensure that their interests and perspectives are not overlooked. For the same reason, public participation is key to enable States to respect, protect and fulfil the right to health for all, by granting everyone a voice to help decision makers understand the ways in which the actions of States or third parties may impair the enjoyment of the right to health by another subset of society. In the context of the obligation to respect the right to health, the ESCR Committee explicitly noted that 'States should refrain from (…) withholding or intentionally misrepresenting health-related information (…), as well as from preventing people's participation in health-related matters'.[730] Considering all these above points together, it is clear that States are subject to a procedural obligation under the right to health to ensure procedural rights in marine biodiversity management.

I posit that the procedural obligation on States encompasses the three components captured by Knox above: making available to the public information concerning the impacts of activities upon marine biodiversity; facilitating public participation in decision making concerning ocean governance; and providing access to remedies for harm. This also aligns with the three pillars of procedural rights promoted under the Aarhus Convention,[731] the Escazú Agreement,[732] and Principle 10 of the Rio Declaration on Environment and Development, which is regarded as an emerging customary duty under international law.[733]

Theoretically these obligations do not extend to facilitating procedural rights in all aspects of ocean governance, but rather only activities and decisions that can impact marine biodiversity and, ultimately, human health. However, it is difficult to pinpoint any human activity in the marine environment that is definitively incapable of impacting on biodiversity to some degree. Moreover, considering our current knowledge gaps in understanding precisely how human activities impact upon the marine environment,

[727]Ibid para 54.
[728]See ch 4 sec 2.3.
[729]ESCR Committee, 'General Comment No.20: Non-discrimination in Economic, Social and Cultural rights (art 2, para 2, of the International Covenant on Economic, Social and Cultural Rights)' (n 406) para 36.
[730]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 34.
[731]Aarhus Convention (n 188).
[732]Escazú Agreement (n 505).
[733]Willaert (n 190) 4.

States must exercise the precautionary principle in acknowledging the possibility of harm, therefore further broadening the pool of marine decision-making processes in which rights holders should be invited to participate. Therefore, in practice, the list of situations in which States are not obligated to facilitate public participation in ocean governance will be extremely slim.[734] The spectrum of issues falling under the umbrella of 'ocean governance' is broad. As noted by Zervaki:

> It encompasses different sectoral policies, ranging from maritime transport, fisheries and the exploitation of marine resources to marine environmental protection, blue energy or underwater cultural heritage. Additionally, ocean governance implicates different levels of decision-making (international, regional, national and sub-national) and involves various actors that either take part in decision-making processes or are affected by them, including national and local authorities, international organisations, private companies, NGOs, local communities and individuals.[735]

In the remainder of this section, I address two points. First, I briefly highlight why these specific procedural obligations are important and, second, I offer some thoughts on the form that participation in decision making may take in the current context.

The benefits of public participation in decision making are now well understood, and I do not revisit them in detail here.[736] Amongst other things, the requirement to share information on the impacts of decision-making processes for health and biodiversity linkages necessarily obligates States to first conduct research into such impacts, thus advancing understanding of these linkages. By educating the public on the existence of the human health and marine biodiversity nexus and the activities that may impact it, it empowers individuals to represent their own interests in decision-making processes concerning activities that otherwise they may not have known could impact them adversely.[737] In doing so, public participation also promotes the acceptability, legitimacy and quality of resulting decisions, with potential to yield stronger measures for protection of human health and marine biodiversity linkages.[738]

[734]Morgera and Lily (n 171) 377-378.
[735]Antonia Zervaki, 'The Ecosystem Approach and Public Engagement in Ocean Governance: The Case of Maritime Spatial Planning' in David Langlet and Rosemary Rayfuse (eds), *The Ecosystem Approach in Ocean Planning and Governance*, vol 87 (BRILL 2018), 223.
[736]Yankun Zhao and Bill Butcher, 'Coming to terms with public participation in decision making: Balancing clarity and impact in the Aarhus Convention' (2022) 31 REV EUR COMP INT ENV 210.
[737]Chiara Armeni, 'Participation in Environmental Decision-making: Reflecting on Planning and Community Benefits for Major Wind Farms' (2016) 28 Journal of environmental law 415, 419.
[738]Zhao and Butcher (n 736) 211.

The specific types of participation mechanisms to be used will depend on the activity to which the decision-making process relates. In many cases, frameworks will already exist to facilitate participation in marine planning processes, including authorisation of extractive industries or commercial fishing activities. Therefore, as already indicated, the main differences brought about by this package of procedural obligations will be to modify how States operate these pre-existing frameworks, by expanding the types of information to be collected and shared, and the spectrum of individuals and communities to be involved.

States should also seek creative ways to involve the public in decision-making processes. For example, Jarvis et al. argued that, in the context of marine spatial planning, citizen science is a powerful tool for maximising citizen engagement, while gathering the information to inform decision making.[739] They noted that 'Citizen science has been described as a public good itself, as it increases the scientific knowledge held by the public while also promoting environmental stewardship'.[740] Whatever frameworks a State chooses to facilitate public participation in ocean governance, they must be clearly thought out. They must not be duplicative nor leave gaps where participation is not facilitated and must be adequately supported by information dissemination and capacity development.

3.2. Monitor marine biodiversity and linkages to human health

I posit that States are under an obligation to monitor the status of marine biodiversity and the knock-on impacts for enjoyment of the right to health. In this section, I demonstrate that this obligation has a strong basis in both IHRL and international environmental law.

The existence of an obligation to monitor marine biodiversity and linkages to human health derives in large part from the MCOs under the right to health. Specifically, amongst the package of MCOs, the ESCR Committee stipulates that States Parties to the ICESCR must:

> adopt and implement a national public health strategy and plan of action (…) addressing the health concerns of the whole population; the strategy and plan of action shall (…) include methods, such as right to health indicators and benchmarks, *by which progress can be closely monitored*.[741]

[739]Rebecca M. Jarvis and others, 'Citizen Science and the Power of Public Participation in Marine Spatial Planning' (2015) 57 Marine policy 21, 21.
[740]Ibid.
[741]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 43(f). Emphasis added.

Read strictly, this text does not obligate States to undertake monitoring per se, but rather obligates them to develop methods during the planning phase that make monitoring activities possible. However, the development of indicators and benchmarks alone is a futile exercise unless they are built into monitoring activities to enable States to measure and guide their efforts to achieve change. It is therefore reasonable to infer that that the ESCR Committee also intended States to be subject to a concurrent monitoring obligation, since an isolated obligation to develop indicators and benchmarks is devoid of purpose. The language of the ECSR Committee also emphasises that monitoring obligations are coupled with an obligation to develop relevant indicators and metrics concerning health and biodiversity linkages, to guide monitoring activities.[742] The CRC Committee has also reinforced the existence of an environmental monitoring obligation, concluding that 'States should regulate and monitor the environmental impact of business activities that may compromise children's right to health (…)'.[743] The World Health Assembly (WHA) has noted that 'The development of common metrics and the linkage of indicators on biodiversity with those on health, coupled with economic valuation tools, would also contribute to the evaluation of measures and the monitoring of their impacts on both biodiversity and human health'.[744]

Monitoring also plays a central role in States' reporting requirements under all IHRL, including the ICESCR. UN general reporting requirements require States to report on 'both the de jure *and the de facto situation* with regard to the implementation of the provisions of the treaties to which States are a party' and should include 'the actual political, economic, social and cultural realities and general conditions existing in the country'.[745] Regarding the ICESCR specifically, State reports must contain 'information on recent developments in law *and practice* affecting the full realisation of the rights recognised in the Covenant' and should indicate 'any mechanisms in place to monitor progress towards the full realisation of the Covenant rights'.[746] While this does not conclusively prove the existence of a State monitoring obligation, it is unlikely a State could fully satisfy its reporting obligations without undertaking some degree of environmental observation and monitoring. This logic may also be applied more broadly: from a logical standpoint it is difficult to envision how a State could progressively realise its obligation to respect, protect and fulfil the right to health without undertaking monitoring to understand the health status of its population and the drivers that impact it, including environmental changes.

[742]Ibid.
[743]CRC Committee, 'General Comment No.15 on the Right of the Child to the Enjoyment of the Highest Attainable Standard of Health (art 24)' (n 390) para 49. Emphasis added.
[744]WHO (n 80) para 14.
[745]United Nations, 'Compilation of Guidelines on the Form and Content of Reports to be Submitted by States Parties to the International Human Rights Treaties' (3 June 2009) UN Doc HRI/GEN/2/Rev.6, ch 1 para 25. Emphasis added.
[746]Ibid ch 2 paras 2 and 3(b), respectively. Emphasis added.

Considering the above components from IHRL in isolation, one could argue that States are not legally obligated to conduct monitoring; rather, it is something they have to do in practice to satisfy their other more explicit human rights obligations. However, the case for an express obligation to monitor marine biodiversity and linkages to human health solidifies when we look to the body of State responsibilities under international environmental law. As noted by the HRC in the context of the right to life, environmental issues pose some of the strongest threats to the enjoyment of human rights, and therefore:

> Obligations of States Parties [to the ICCPR] should thus inform the contents of article 6 of the Covenant [on the right to life], and the obligations of States Parties to respect and ensure the right to life should also inform their relevant obligations under international environmental law.[747]

Although this statement was made in the context of the right to life, the logic applies equally to the right to health. With this in mind, there exists an array of environmental monitoring obligations under environmental law that inform the substance of State obligations under the right to health.[748] The CBD obligates all States Parties to:

> as far as possible and as appropriate, (…) monitor, through sampling and other techniques, the components of biological diversity (…) paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use.[749]

Furthermore, States are also obligated to 'identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects through sampling and other techniques'.[750] The CBD COP has explicitly invited States to develop frameworks to monitor for potential health threats from ecosystem change, and has encouraged them to develop integrated metrics and indicators to this end.[751] The need for biodiversity monitoring is also implicit in the ecosystem approach, which requires adaptive management to account and correct for changes to biodiversity over time.[752]

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[747]HRC, 'General Comment No.36 on Article 6 of the International Covenant on Civil and Political Rights, on the Right to Life' (n 243) para 62.
[748]For a comprehensive overview of State obligations concerning marine monitoring and observation, see Young-Kyung Yoon, 'States' Obligations Relating to Marine Monitoring and Observation' (2011) 10 WMU J Marit Affairs 25.
[749]CBD (n 22) art 7(b).
[750]Ibid art 7(c).
[751]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) paras 4(c) and 5(a).
[752]CBD, 'Report of the Fifth Meeting of the Conference of the Parties to the Convention on Biological Diversity' (n 3) Annex III Decision V/6, para.4 and Principles 6 and 9.

In a similar vein, parties to UNCLOS are obligated to, 'as far as practicable, (…) observe, measure, evaluate and analyse, by recognised scientific methods, the risks or effects of pollution on the marine environment'.[753] This is twinned with an obligation to 'keep under surveillance the effects of any activities which they permit or in which they engage in order to determine whether these activities are likely to pollute the marine environment'.[754] Parties to the 1995 United Nations Fish Stocks Agreement are further obligated to 'implement and enforce conservation and management measures through effective monitoring, control and surveillance'.[755] Similar marine monitoring obligations can also be found under various regional agreements, including the Helsinki Convention,[756] the OSPAR Convention,[757] and the EU Marine Strategy Framework Directive.[758]

Each of these obligations to conduct monitoring, observation and surveillance differ slightly in scope, which led Yoon to conclude that 'it can be said that global, general and absolute obligations relating to marine monitoring and observation as well as to contributing to an international system cannot yet be found'.[759] While I agree that there is no universal monitoring obligation that applies to every scenario, collectively the obligations highlighted above create a far-reaching network of obligations that require States to monitor the state of the marine environment and biodiversity on an ongoing basis, in addition to the environmental impacts of activities conducted by the State themselves or by third parties. Read in conjunction with human rights obligations in accordance with the principle of mutual supportiveness, these monitoring obligations do not stop at simply tracking changes in the environment. Rather, they must include monitoring the impacts of these changes on the enjoyment of human rights, including the right to health. For these reasons, I posit that a holistic reading of State obligations under international environmental law and IHRL supports the conclusion that States are obligated to monitor marine biodiversity — including the impacts of State and third-party activities — and the knock-on impacts for enjoyment of the right to health. This includes a concurrent obligation on States to develop appropriate metrics and indicators to help guide and inform monitoring. It is beyond my expertise or academic discipline to speculate about the necessary substantive

[753]UNCLOS (n 16) art 204(1).
[754]UNCLOS (n 16) art 204(2).
[755]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) art 5(l).
[756]Convention on the Protection of the Marine Environment of the Baltic Sea Area (adopted 9 April 1992, entered into force 17 January 2000) 2009 UNTS 197 (the Helsinki Convention) art 24.
[757]Convention for the Protection of the Marine Environment in the North-East Atlantic (adopted 22 September 1992, entered into force 25 March 1998) 2354 UNTS 67 (OSPAR Convention) Annex IV art 2(a).
[758]Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 Establishing a Framework for Community Action in the Field of Marine Environmental Policy [2008] OJ L164/19 (EU Marine Strategy Framework Directive) art 11.
[759]Yoon (n 748) 42.

content of such indicators, or indeed the technicalities of any required monitoring mechanism. For this reason, these issues are not considered here.

Finally, resource availability will influence the ability of States to implement this obligation fully. Therefore, fulfilment of international assistance and technology transfer obligations by developed States will be essential to enable developing States to implement comprehensive and effective monitoring systems.

3.3. Mainstream the human health and marine biodiversity nexus

To respect, protect and fulfil the right to health, I contend that States are obligated to mainstream the human health and marine biodiversity nexus into relevant systems, institutions and processes. In this section I begin by exploring the basis for the existence of such an obligation, then I demonstrate that it necessitates consideration of the human health and marine biodiversity nexus across all sectors that can impact on this nexus, such as fisheries, tourism and extractive industries.

The obligation to mainstream the human health and marine biodiversity nexus is not explicit in IHRL. However, as analysed in Chapter 3,[760] the right to health, like all ESC rights, imposes obligations on States to take 'all appropriate means' to progressively achieve its full realisation, including obligations to respect, protect and fulfil the right. Considering the essential role that human health and marine biodiversity linkages play in enabling rightsholders to fully realise their highest attainable standard of health, I contend that mainstreaming these linkages is not only an 'appropriate' step for States to take, but an essential one. A similar view has been expressed by UN Special Rapporteur Boyd who asserted that States are obligated under IHRL to 'mainstream biodiversity into other policy areas'.[761]

State obligations to undertake biodiversity mainstreaming can also be found in international biodiversity law. The CBD contains several articles that require biodiversity mainstreaming, and the topic has gained increased attention in recent years within the CBD COP.[762] Article 6(b) of the CBD obligates States Parties to 'integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral and cross-sectoral plans, programmes and policies'. Article 10(a) obligates States Parties to 'integrate consideration of the conservation and sustainable use of biological resources into national decision-making'. Biodiversity mainstreaming is also a core focus of the Aichi Biodiversity Targets, which requires States to 'address the underlying causes of biodiversity loss by mainstreaming

[760]See ch 3 secs 2.8 and 2.9.
[761]UNGA, 'Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2020) (n 623) para. 70(c).
[762]See eg CBD, 'Conference of the Parties to the CBD Dec. XIII/3' (16 December 2016) UN Doc CBD/COP/DEC/XIII/3.

biodiversity across government and society'.[763] On the issue of the human health and biodiversity nexus specifically, the CBD Subsidiary Body on Implementation (SBI) stated that 'mainstreaming the links between biodiversity and human health is central to achieving the Sustainable Development Goals and the 2030 Agenda for Sustainable Development'.[764]

As already noted, the HRC acknowledged that, given the intrinsic role that a healthy environment plays in protecting human rights, the nature of State obligations under IHRL must be informed by State obligations under international environmental law.[765] Considering the importance of protecting the human health and marine biodiversity nexus for the achievement of State obligations under the right to health, there is a strong argument in favour of a State obligation to mainstream the nexus across relevant sectors and regulatory regimes.

To understand the types of action this obligation requires from States, it is first necessary to determine the meaning of the term 'mainstreaming'. The CBD Subsidiary Body on Scientific, Technical and Technological Advice defined it as 'integrating or including actions related to conservation and sustainable use of biodiversity at every stage of the policy, plan, programme and project cycle (…)'.[766] Smith et al. concluded that many definitions of biodiversity mainstreaming include 'a process approach to mainstreaming across the whole "policy" cycle from analysis to planning, implementation and monitoring'.[767] There are therefore visible parallels between the concepts of mainstreaming and capacity development,[768] since mainstreaming requires developing capacity at a systemic, institutional and individual level to deal with issues that have not traditionally been considered. As noted in Section 1.2 in this chapter, UNDP proposed that capacity development should be undertaken at three levels: the system (enabling environment), the entity or organisation and the individual.[769] Like the above definitions of mainstreaming, UNDP highlighted that capacity development at the systems level necessitates multiple dimensions of change: changes to legal and policy frameworks, management and accountability structures, allocation of resources (including human, financial and information), and processes including relationships and flow of information between institutions.[770] At the organisational level, capacity development involves

[763]CBD, 'Conference of the Parties to the CBD Dec. X/2' (n 688) para 13, Strategic goal A.
[764]CBD, 'Mainstreaming of Biodiversity Within and Across Sectors and Other Strategic Actions to Enhance Implementation' (6 June 2018) UN Doc CBD/SBI/2/4, para 18.
[765]HRC, 'General Comment No.36 on Article 6 of the International Covenant on Civil and Political Rights, on the Right to Life' (n 243) para 62.
[766]CBD, 'Biodiversity and Health' (9 April 2021) UN Doc CBD/SBSTTA/24/9, Glossary.
[767]Jessica Smith, Steve Bass and Dilys Roe, 'Biodiversity Mainstreaming: A review of current theory and practice' (IIED 2020) <https://iied.org/17662iied> accessed 22 December 2022, 5.
[768]See ch 4 sec 1.2.
[769]UNDP (n 592).
[770]Ibid xii.

revision of organisational mandates and strategies, structures and competencies, and operating processes.[771] UNDP's observations on capacity development at the systems and organisational level help clarify the precise dimensions at which mainstreaming should occur, thus bringing form to the proposed mainstreaming obligation.

It is important to stress at this juncture that the mainstreaming obligation I propose here is not identical to the biodiversity mainstreaming obligation present under the CBD and highlighted by Special Rapporteur Boyd in the context of IHRL. Rather, I propose that States are obligated to go one step further, to mainstream the nexus between human health and marine biodiversity specifically. This falls under the category of 'multiple mainstreaming': a term coined by Smith et al., who listed the benefits of such an approach to include:

> improved innovation (…), coordination and coherence to promote greater collaboration and synergies; reduce duplication of effort in implementation and save time in reporting; open up funding opportunities; unify government ministries strategies, message and external image; and show, for example, how issues such as health, climate change, land degradation and water relate strongly to biodiversity.[772]

Thus, effective protection of the human health and marine biodiversity nexus requires multiple mainstreaming of marine biodiversity and health. Crucially, an obligation to mainstream health and biodiversity linkages does not equate to an obligation to protect these linkages in every instance. It is an obligation to undertake necessary structural changes to ensure that these linkages are duly considered in decision-making processes, to enable identification and balancing of trade-offs, and to ensure policy coherence across sectors.[773] There will inevitably be circumstances in which protection of health and biodiversity linkages takes lower priority than other factors in the equation. Moreover, protection of health and marine biodiversity will not always be on the same sides of the equation. For example, implementation of exclusionary marine conservation areas may offer the strongest protection to marine biodiversity but may simultaneously deny indigenous and local communities' access to essential inputs for traditional medicines.[774]

[771]Ibid xii.
[772]Smith, Bass and Roe (n 767) 16.
[773]Ibid 14.
[774]See United Nations Human Rights Special Procedures, 'Human rights-based approaches to conserving biodiversity: equitable, effective and imperative - A policy brief from the UN Special Rapporteur on Human Rights and the Environment, David R. Boyd and Stephanie Keene' (Policy Brief No.1 2021)

Various decisions of the CBD COP and reports of the WHA offer insights into how States may mainstream health and biodiversity linkages specifically.[775] Foremost amongst these is institutional reform that promotes closer collaboration between institutions responsible for biodiversity, health and other relevant sectors,[776] in addition to developing the capacities of public and private actors to understand and address health and biodiversity linkages.[777] The CBD and WHA also promote an array of changes to planning and management processes, including: conducting interdisciplinary scientific research on health and biodiversity linkages to help inform planning and development of indicators;[778] incorporating health and biodiversity considerations into policies, strategies, plans, programmes, standards, protocols, accounts and regulatory frameworks;[779] considering health and biodiversity linkages in environmental and health impact assessment processes;[780] and developing integrated monitoring systems that, amongst other things, evaluate any 'unintended and undesirable negative impacts of biodiversity interventions on health and of health interventions on biodiversity'.[781] Several of these components have been considered earlier in this chapter. However, the aspect of institutional cooperation and collaboration warrants further consideration as this is foundational to effective mainstreaming of the nexus.

The development of mechanisms for coordination and cooperation amongst relevant institutions is an essential step in mainstreaming the human health and marine biodiversity nexus. The CBD SBI noted that 'One of the most important measures that can be taken by Parties to advance the mainstreaming of biodiversity is to establish effective institutional mechanisms that ensure the consideration of biodiversity in decisions that could impact it'.[782] Therefore it is not sufficient simply to coordinate the actions of entities responsible for biodiversity and health, respectively. States must also facilitate dialogue between all sectors that are capable of impacting upon this nexus.[783] Moreover, institutional coordination must take place at all

<www.ohchr.org/sites/default/files/Documents/Issues/Environment/SREnvironment/policy-briefing-1.pdf> accessed 22 December 2022.

[775]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2); CBD, 'Mainstreaming of Biodiversity Within and Across Sectors and Other Strategic Actions to Enhance Implementation' (n 764); WHO (n 80).

[776]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para 4(a); WHO (n 80) para 19(a).

[777]WHO (n 80) para 19(g).

[778]CBD, 'Mainstreaming of Biodiversity Within and Across Sectors and Other Strategic Actions to Enhance Implementation' (n 764) para 21(a).

[779]Ibid para 21(e); CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para 4(b); WHO (n 80) para 19(c).

[780]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para. 4(d); CBD, 'Mainstreaming of Biodiversity Within and Across Sectors and Other Strategic Actions to Enhance Implementation' (n 764) para 21(b); WHO (n 80) para 19(d).

[781]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para 4(d); WHO (n 80) para 19(h).

[782]CBD, 'Mainstreaming of Biodiversity Within and Across Sectors and Other Strategic Actions to Enhance Implementation' (n 764) para 56.

[783]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para 4(a); WHO (n 80) para 19(a).

relevant levels, from the subnational to international level.[784] Inspiration for multisector collaboration can be taken from the multilateral collaboration between the FAO, WHO, World Organisation for Animal Health (WOAH) and UNEP, which was established in 2010 to tackle health risks at the interface of humans, animals and ecosystems.[785] Under the collaboration agreement, the FAO, WOAH and WHO (with support in recent years from UNEP) have taken various steps to ensure alignment of their activities, including undertaking joint planning and priority setting, developing a joint secretariat comprised of representatives from each of the organisations, and conducting coordinated research, development, monitoring and reporting.[786] In the context of the health and biodiversity interface specifically, since 2012 the CBD and WHO have operated a Joint Work Programme on Biodiversity and Health. Amongst other things, they have established an Interagency Liaison Group on Biodiversity and Health to share knowledge and coordinate their activities.[787] While these are examples of collaboration between intergovernmental organisations at an international level, the tools that they use for collaboration could equally be applied across all scales and sectors.

3.4. Take all measures necessary to ensure protection and restoration of marine biodiversity and ecosystem services

The final non-immediate State obligation that I interpret from the right to health is a due diligence obligation to take all measures necessary to ensure protection of marine biodiversity and ecosystem services. I frame this as a due diligence obligation because,[788] due to the inherently international and transboundary nature of actions required to effectively protect marine biodiversity, it is beyond the power of an individual State to unilaterally ensure protection and restoration of marine biodiversity. Thus, if framed in such absolute terms, States would be subject to an obligation that, despite their best efforts, they would be unable to fulfil. I contend this due diligence obligation requires States to take all necessary measures to preserve positive human health and marine biodiversity linkages and to minimise the occurrence of negative ones.

[784]Caroline Petersen and Brian Huntley, *Mainstreaming Biodiversity in Production Landscapes* (GEF Working Paper No 20 2005), 6.
[785]See FAO, OIE, WHO and UNEP, *Strategic Framework for Collaboration on Antimicrobial Resistance: Together for One Health* (FAO, WOAH, WHO and UNEP 2022), 3-4.
[786]Ibid, 2-4.
[787]'Biodiversity and Health: the WHO-CBD Joint Work Programme' (*WHO*, 1 January 2020) <www.who.int/news/item/01-01-2020-biodiversity-and-health-the-who-cbd-joint-work-programme> accessed 21 December 2022.
[788]The language 'take all measures necessary to ensure (…)' is consistent with State obligations under art 194 of UNCLOS (n 16) to prevent, reduce and control pollution of the marine environment.

The concept of due diligence has emerged in recent decades as a key element of international environmental law.[789] As stated by the International Tribunal on the Law of the Sea (ITLOS), a due diligence obligation does not inherently incur liability for a State's failure to achieve a desired outcome.[790] Rather, 'It is an obligation to deploy adequate means, to exercise best possible efforts, to do the utmost, to obtain this result'.[791] In other words, a due diligence obligation is one of conduct, not result.[792] Crucially, as stated by the International Court of Justice (ICJ) in its judgement in the *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)*, a due diligence obligation 'entails not only the adoption of appropriate rules and measures, but also a certain level of vigilance in their enforcement and the exercise of administrative control applicable to public and private operators, such as the monitoring of activities undertaken by such operators'.[793] Thus, the State obligation to take all measures necessary to ensure protection of marine biodiversity and ecosystem services will not only necessitate an array of policy, legislative and other actions to ensure protection of the marine environment, but also diligent implementation and enforcement of such measures. In this section I begin by setting out the basis for this obligation, and then proceed to suggest actions that States may take towards its fulfilment.

The grounds for the existence of a State obligation to protect marine biodiversity under the right to health are set out extensively in Chapter 3 and I will not repeat them in full here.[794] In short, an obligation to protect marine biodiversity and ecosystem services stems from two places. First, Article 12(2)(b) of ICESCR requires States to ensure 'the improvement of all aspects of environmental and industrial hygiene', which includes an obligation to reduce the population's exposure to 'detrimental environmental conditions that directly or indirectly impact upon human health'.[795] This clearly obligates the avoidance of actions capable of yielding negative health outcomes, such as marine pollution or overfishing. It also requires States to avoid negative health outcomes through omission, such as through failure to regulate the actions of third parties. However, I posit that it also obligates States to take all necessary measures to prevent the loss of existing positive human health and marine biodiversity linkages (i.e., marine ecosystem services) since the loss of these services would impact negatively upon enjoyment of the right to health. This therefore imposes an obligation on States to take all necessary steps to maintain and protect marine biodiversity and to restore

[789]Medes Malaihollo, 'Due Diligence in International Environmental Law and International Human Rights Law: A Comparative Legal Study of the Nationally Determined Contributions under the Paris Agreement and Positive Obligations under the European Convention on Human Rights' (2021) 68 Neth Int Law Rev 121, 124.
[790]ESCR Committee, 'General Comment No.25 (2020) on Science and Economic, Social and Cultural Rights (art 15 (1) (b), (2), (3) and (4) of the International Covenant on Economic, Social and Cultural Rights)' (n 269) para 110.
[791]Ibid.
[792]Ibid.
[793]*Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)* (Judgement) [2010] ICJ Rep 14, para 197.
[794]See ch 3 sec 1.
[795]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 15.

degraded ecosystems. In this regard, States should also apply the precautionary approach to account for the prevailing knowledge gaps concerning linkages between marine biodiversity and human health.[796] Second, the ESCR Committee confirms that the right to health also includes a right of access to the underlying determinants of health.[797] The ESCR Committee explicitly lists amongst these a healthy environment and an adequate supply of safe food and nutrition, both of which are facilitated in part by marine biodiversity.[798] Moreover, given the non-exhaustive and evolutionary character of the body of underlying determinants, I posit that the conservation and sustainable use of marine biodiversity should be considered a stand-alone determinant of health in light of the human health and marine biodiversity nexus, as supported by the scientific literature considered in Chapter 1.[799]

It is beyond the scope of my thesis to explore the full variety of options available to States to protect marine biodiversity. However, in the remainder of this section I explore several key considerations. Amongst other things, ecosystem restoration must play a central role in protection and preservation of marine ecosystem services necessary for human health. Importantly, fulfilment of the obligation to protect marine biodiversity and restore degraded ecosystems will depend, to varying extents, upon State action to realise each of the obligations highlighted earlier in this chapter (particularly the foundational obligations). States are subject to an explicit obligation to rehabilitate and restore degraded ecosystems under the CBD,[800] which was reinforced by several of the Aichi Biodiversity Targets.[801] Biodiversity protection and ecosystem restoration measures must be based on sound scientific knowledge and must be developed and implemented by actors with adequate capacity. However, lack of scientific knowledge should not preclude precautionary protection measures and States should readily exercise the precautionary principle.[802] In this vein, the WHA urges States to take 'no regrets' measures, even where scientific uncertainty exists.[803] Effective conservation will also depend upon international cooperation and policy alignment, with deployment of maximum available resources. This will be especially important to empower developing States to take effective biodiversity conservation measures. To ensure a unified and effective approach to conservation, it must stem from extensive planning processes that embrace procedural rights and that are committed to non-discriminatory outcomes. Effective monitoring frameworks will play an essential role in measuring the

[796]See ch 1 sec 2.
[797]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) paras 4 and 11.
[798]Ibid.
[799]See ch 1 sec 2.
[800]CBD (n 22) art 8(f).
[801]CBD, 'Conference of the Parties to the CBD Dec. X/2' (n 688) Annex, Targets 14 and 15.
[802]UNGA, 'Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2020) (n 623) para 71.
[803]WHO, 'Health, Environment and Climate Change: Human Health and Biodiversity, Report by the Director-General' (n 80) para 16.

impact of protection measures, both for marine biodiversity and, by extension, for human health. Finally, mainstreaming the human health and marine biodiversity nexus will play an instrumental role in promoting widespread systemic protection of the marine environment from all sectors.

In practice, States will need to develop a diverse package of measures tailored to their specific geographical context, and such measures should be informed by existing commitments under international environmental and biodiversity law. For example, while marine protected areas will serve as a valuable tool, Redford et al. observed that 'Even if the effectiveness of existing protected areas is increased and new ones are established there will always be a critical need to work outside the boundaries of protected areas as much of the earth's biodiversity is found in such settings'.[804]

Special Rapporteur Boyd has highlighted a range of pre-existing obligations under the CBD that should inform State obligations to protect biodiversity under IHRL, including: developing national biodiversity plans; mainstreaming biodiversity into other policy sectors; establishing protected areas and other conservation measures; developing legislation to protect threatened species; restoring degraded ecosystems; preventing introduction and spread of invasive alien species; and providing incentives for conservation and sustainable use of biodiversity.[805]

In addition to establishing positive financial incentives to protect biodiversity, States should also remove any financial mechanisms that promote environmental harm or degradation of biodiversity.[806] This may include financial mechanisms that encourage the use of harmful fertilisers and pesticides that pollute coastal areas. Similarly, States must consider the indirect and unintended consequences of conservation efforts. For example, development of marine protected areas may result in increased harvesting of marine resources in other areas, thus undermining and maybe even negating the anticipated benefits of the protected area.[807] In general, regulatory responses that effectively control the actions of third parties must be at the core of any package of measures to protect biodiversity.

[804]Kent H. Redford and others, 'Mainstreaming Biodiversity: Conservation for the Twenty-First Century' (2015) 3 Frontiers in ecology and evolution article 137 <https://doi.org/10.3389/fevo.2015.00137> accessed 23 December 2022, 2.
[805]UNGA, 'Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2020) (n 623) para 70; CBD (n 22) arts 6 and 8.
[806]Redford and others (n 804) 3; CBD, 'Conference of the Parties to the CBD Dec. X/2' (n 688) Target 3.
[807]This is based on a similar example proposed in the context of deforestation by Felix Lim and others, 'Perverse Market Outcomes from Biodiversity Conservation Interventions: Perverse Market Outcomes of Conservation' (2017) 10 Conservation letters 506, 507.

4. Conclusions

In Chapter 3, I demonstrated that conservation and sustainable use of marine biodiversity is a prerequisite to the full realisation of the right to health. Consequently, the right to health must be interpreted in a manner that incurs a series of State obligations concerning management of marine biodiversity.[808] To understand the parameters of these obligations, I systematically interpreted each of the pre-existing State obligations under the right to health in light of contemporary scientific literature on the human health and marine biodiversity nexus. My analysis revealed a complex and often recurring web of overlaps between marine biodiversity and State obligations under the right to health.[809]

In the current chapter, I organised this web of connections into three distinct groups of coherent and mutually supportive obligations. For each obligation, through reference to IHRL, international environmental law and academic literature, I clarified its basis, defined its normative content and offered suggestions on steps that States may take towards its fulfilment. In doing so, I am contributing to an emerging body of legal scholarship that seeks to ascertain the state obligations under IHRL that stem from loss and degradation of biodiversity.[810] I also highlight the potential for mutually supportive interpretations of IHRL and international environmental law. In addition to interpreting the parameters and content of each obligation, by aggregating them into three groups based on their relationship to one-another and the time frame within which they must be fulfilled, I present a roadmap of the steps that States should take, and the order in which they should take them, to fulfil their obligations under the right to health pertaining to marine biodiversity.

I categorise the first group of obligations as foundational, on the basis that it comprises obligations that States must take action to fulfil, in order to accrue the knowledge, capacity and resources necessary to fulfil any of the obligations listed in the remaining two categories. I contend that States are subject to four foundational obligations: to develop and ensure access to scientific research on human health and marine biodiversity linkages; to ensure individual capacity development concerning human health and marine biodiversity linkages, to cooperate through relevant international fora to conserve and sustainably use marine biodiversity, and to mobilise maximum available resources.[811]

[808]See ch 3 sec 1.
[809]See ch 3 sec 2.
[810]See HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166).
[811]See ch 4 secs 1.1-1.4, respectively.

The second category of obligations is those that require immediate fulfilment. I categorise them as such because each is either already explicitly recognised as transcending the doctrine of progressive realisation or derives from an obligation that is recognised as such. These obligations therefore require immediate State fulfilment, and failure to do so cannot be justified by lack of adequate time or resources. While I use the term 'immediate' to mirror the language of the ESCR Committee,[812] this should not be interpreted as requiring 'instant' fulfilment since this is a logical impossibility.[813] Rather, 'immediate' means that they must be fulfilled with urgency, and States will not be granted a broad window of time in which to do so based on their available resources and national priorities.[814] I posit that States are subject to three obligations requiring immediate fulfilment: to develop a plan for protection of human health and marine biodiversity linkages, to ensure non-discrimination in enjoyment of the right to health, and to maintain existing levels of protection for marine biodiversity and ensure non-retrogression.[815]

The ability of States to fulfil these immediate obligations will depend upon prior progress on the foundational obligations. Adequate knowledge of the human health and marine biodiversity nexus (in addition to capacity, resources and cooperation as necessary) will be essential to develop evidence-based plans, identify and protect groups that may face discriminatory outcomes from loss or degradation of marine biodiversity, and identify actions that may regress or undermine existing levels of protection afforded to marine biodiversity. International assistance, including technology transfer, will play an essential role in empowering less wealthy States to satisfy these obligations.

The third and final category of obligations comprises those that require non-immediate fulfilment. Unlike obligations that require 'immediate' fulfilment, non-immediate obligations fall within the doctrine of progressive realisation. Thus, States are granted a broader time window in which to achieve their fulfilment, taking account of a State's available resources and priorities. I posit that States are subject to four obligations requiring long-term fulfilment: to ensure procedural rights in marine biodiversity management, to monitor marine biodiversity and linkages to human health, to mainstream the human health and marine biodiversity nexus, and to take all measures necessary to ensure protection and restoration of marine biodiversity and ecosystem services.[816]

[812]See eg ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para 1.
[813]Young (n 363) 20-21.
[814]For more detailed discussion on 'immediate' obligations under IHRL see ibid.
[815]See ch 4 secs 2.1-2.3, respectively.
[816]See ch 4 secs 3.1-3.4, respectively.

The ability of States to fulfil these obligations will again depend on progress made under the foundational obligations. However, they are also mutually supportive with the immediate obligations. The immediate obligation to make plans should inform and guide all actions taken to fulfil the non-immediate obligations. Actions to combat discrimination of the right to health require, amongst other things, initial progress towards ensuring procedural rights in marine biodiversity management. Finally, the obligation of non-retrogression serves as an essential prerequisite to taking tangible steps towards protecting and restoring marine biodiversity and ecosystem services.

In summary therefore, in this chapter I demonstrate that States are subject to a package of obligations under IHRL that help define their relationship and responsibilities towards marine biodiversity and its connection to human health. In the next chapter, I apply these obligations to the case study of DSM. I do so to determine whether these obligations can challenge the status quo, requiring States to provide stronger protection to the human health and marine biodiversity nexus than is required at present. I begin by exploring the ways in which DSM may impact on the human health and marine biodiversity nexus. I then proceed to analyse the compatibility of the regulatory framework for DSM in ABNJ with the IHRL obligations that I set out in this chapter.

Chapter 5

THE ROLE OF THE RIGHT TO HEALTH IN SHAPING THE REGULATORY FRAMEWORK FOR DEEP SEABED MINING IN AREAS BEYOND NATIONAL JURISDICTION

In the previous chapter I demonstrated that the inherent nexus between human health and marine biodiversity gives rise to a package of State obligations under the right to health in international human rights law (IHRL). This chapter builds on these findings by applying these obligations to a case study on deep seabed mining (DSM) in the Area.[817] Specifically, I demonstrate that the regulatory regime being developed under the International Seabed Authority (ISA) to govern the exploitation of seabed mineral resources is not in conformity with the State obligations outlined in the previous chapter. In doing so, I argue that recognising the human health and marine biodiversity nexus as an intrinsic part of the right to health has the potential to generate a paradigm shift in how we think about ocean governance.

I begin this chapter with an introduction to DSM in the Area, after which I set out the precise parameters of the case study and my reasons for its selection. I then explain the ways in which DSM in ABNJ may impact upon human health. Finally, I explore how DSM relates to each of the obligations I outlined in the previous chapter, and the extent to which the draft regulatory regime for DSM under the ISA does and should align with State obligations under the human right to health.

[817]The 'Area' is defined in UNCLOS (n 16) art 1(1) as 'the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction'.

1. Introduction to deep seabed mining

The term 'deep seabed' is widely understood to refer to the seabed at depths below 200 metres.[818] The portion of the seabed in areas beyond national jurisdiction (ABNJ) is called 'the Area' and is regulated by Part XI of the 1982 United Nations Convention on the Law of the Sea (UNCLOS). The Area comprises the portion of the seabed beyond the limits of a State's designated exclusive economic zone (EEZ) or continental shelf, which may extend up to 200 or 350 nautical miles, respectively, from the State's baseline — namely the line along a State's coast from which the breadth of the territorial sea is measured.[819]

The rapidly growing demand for minerals available on the seabed for use in various technologies (e.g., electronics, information and communication technology, and battery storage) has amplified global incentives for DSM.[820] Many DSM proponents argue that it is necessary to enable a transition to a low-carbon future.[821] It is against this backdrop that we have witnessed intensified efforts to operationalise DSM in recent years, with projections that commercial exploitation of deep seabed resources in international waters could commence within a matter of years.[822]

Prospective mining activities target three distinct types of marine metallic resources: polymetallic nodules found on abyssal plains,[823] polymetallic sulphides in the form of mineral deposits located around hydrothermal vents,[824] and cobalt-rich ferromanganese crusts that form around the peaks and slopes of seamounts.[825] Collectively, these resources offer a rich source of valuable minerals including cobalt, copper, gold, lithium, manganese, nickel, silver and zinc.[826] While technologies for mining each of these resources

[818]Walter Leal Filho and others, 'Deep Seabed Mining: A Note on Some Potentials and Risks to the Sustainable Mineral Extraction from the Oceans' (2021) 9 Journal of Marine Science and Engineering 521 <http://dx.doi.org/10.3390/jmse9050521> accessed 23 December 2022, 2.
[819]UNCLOS (n 16) arts 1(1), 57 and 76(6).
[820]WWF, 'In Too Deep: What We Know, And Don't Know, About Deep Seabed Mining' (WWF 2021) <https://wwfeu.awsassets.panda.org/downloads/wwf_intoodeep_what_we_know_and_dont_know_about_deepseabedmining_report_february_2021.pdf> accessed 22 December 2022, 3; Leal Filho and others (n 816) 2.
[821]See eg 'FAQs' (*The Metals Company*, ND) <https://metals.co/frequently-asked-questions/> accessed 22 December 2022; Kathryn Miller and others, 'Challenging the Need for Deep Seabed Mining From the Perspective of Metal Demand, Biodiversity, Ecosystems Services, and Benefit Sharing' (2021) 8 Frontiers in Marine Science article 76161 <https://doi.org/10.3389/fmars.2021.706161> accessed 23 December 2022, 1.
[822]Helen Scales, 'Deep-sea Mining Talks End With no Agreement on Environmental Rules' *Guardian* (London, 10 August 2022).
[823]Chin and Hari (n 97) 6.
[824]Pippa Howard and others, 'An Assessment of the Risks and Impacts of Seabed Mining on Marine Ecosystems' (Fauna and Flora International, 2020) <www.fauna-flora.org/app/uploads/2020/03/FFI_2020_The-risks-impacts-deep-seabed-mining_Report.pdf> accessed 22 December 2022, 13; Miller and others, 'An Overview of Seabed Mining Including the Current State of Development, Environmental Impacts, and Knowledge Gaps' (n 163) 3.
[825]Miller and others, 'An Overview of Seabed Mining Including the Current State of Development, Environmental Impacts, and Knowledge Gaps' (n 163) 4.
[826]Lisa Levin, Diva Amon and Hannah Lily, 'Challenges to the Sustainability of Deep-seabed Mining' (2020) 3 Nature sustainability 784, 785.

will vary, all are anticipated to require the same fundamental infrastructure: tractor-like remote operated vehicles (ROVs) on the seabed and a production support vessel on the surface. Materials harvested by the ROVs will be transported to the production support vessel via a riser pipe, where they will be processed to separate the valuable minerals from the waste materials. Once processed, the waste sediment will be released back into the ocean via a return pipe.[827]

While some highlight the potential benefits of DSM, many also warn of its potentially catastrophic environmental impacts.[828] These concerns are exacerbated by a pervading lack of knowledge about the deep sea environment, in addition to lack of clarity concerning the nature and scale of the impacts from deep seabed mining.[829] These unknowns make it extremely difficult to accurately predict (and therefore manage and mitigate) the environmental impacts of DSM.[830] The prevailing uncertainty concerning the environmental impacts of DSM has led various multinational companies and national governments to call for a moratorium on DSM until the risks are fully understood.[831]

Despite many unknowns, we do know that many deep sea species are extremely slow growing, reproduce late in life, and are highly sensitive to environmental change.[832] Consequently, deep sea ecosystems are especially vulnerable to destructive human activities such as DSM.[833] Moreover, the interconnectivity of ocean ecosystems means that the impacts of DSM would likely not be limited to the deep seabed environment and could have significant and widespread implications for the entire ocean.[834] I consider several anticipated environmental impacts in greater detail in later sections of this chapter, in addition to their implications for human health. However, in brief, these include: destruction of biota and their habitats by mining vehicles; noise and light pollution, both from processing surface vessels and ROVs on the seabed; sediment plumes generated by ROVs and disposal of waste materials from processing surface vessels; and elevated concentrations of nutrients and metals in the water.[835]

[827]Miller and others, 'An Overview of Seabed Mining Including the Current State of Development, Environmental Impacts, and Knowledge Gaps' (n 163) 10.
[828]UNGA, 'Promotion and Protection of Human Rights in the Context of Climate Change' (26 July 2022) UN Doc A/77/226, para 25. For a comprehensive review of academic and grey literature on the anticipated environmental impacts of DSM, see Chin and Hari (n 97).
[829]Chin and Hari (n 97) 2; Howard and others (n 824) 55.
[830]Chin and Hari (n 97) 3.
[831]Reid (n 164); MacLellan (n 164). At CBD COP in November 2022, President Macron of France called for an outright ban on DSM (Woody (n 164)).
[832]Howard and others (n 824) 181.
[833]Ibid; Chin and Hari (n 97) 22.
[834]Holly Niner and others, 'Deep-sea Mining With No Net Loss Of Biodiversity — An Impossible Aim' (2018) 5 Frontiers in Marine Science article 53 <https://doi.org/10.3389/fmars.2018.00053> accessed 23 December 2022; Howard and others (n 824) 92.
[835]See Chin and Hari (n 97) 21-41; Howard and others (n 824) 159-275.

DSM in ABNJ is governed by the ISA — an autonomous intergovernmental body established under UNCLOS,[836] whose membership comprises all parties to the Convention (167 Member States in addition to the European Union).[837] Broadly speaking, the ISA is responsible for regulating and managing the exploitation of resources in the Area, in addition to protecting the marine environment in the Area.[838] To do so, the ISA is in the process of finalising a regulatory framework called the 'Mining Code' — a compendium of rules, regulations, and procedures that regulate the three phases of DSM: prospecting (i.e., searching for deposits of valuable natural resources), exploration (i.e., assessing the suitability of any identified resources for commercial exploitation) and exploitation (i.e., full-scale commercial seabed mining).[839] To date, the ISA has developed regulations and procedures governing the prospecting and exploration phases of DSM.[840] At the time of writing, the ISA is in the advanced stages of developing regulations, standards and guidelines to govern the exploitation phase, after which full-scale commercial DSM may commence. A time limit has recently been imposed on their adoption process by the Republic of Nauru which, in June 2021, triggered the 'two-year rule' which requires the ISA to finalise the Mining Code by 9 July 2023 or, failing that, to consider applications for exploitation contracts under whatever rules are in place at that time.[841] I analyse the ISA and the draft Mining Code in greater detail in Section 4 below.

2. Case study purpose, scope and limitations

In this section, I explain why deep seabed mining offers a potent case study for testing the potential implications of States' IHRL obligations under the human right to health (as identified in Chapter 4) for the governance of marine biodiversity. I demonstrate why it is important for policy makers in the sphere of ocean governance to account for human health and marine biodiversity linkages — and their importance for enjoyment of the right to health — in their decision-making processes.

First, a focus on DSM is extremely timely. As noted above, at the time of writing, the ISA is in the latter stages of finalising the draft exploitation regulations. Second, by analysing the compatibility of the draft

[836]UNCLOS (n 16) art 156(1).
[837]UNCLOS (n 16) art 156(2); 'Member States' <www.isa.org.jm/member-states> (*ISA*, ND) accessed 22 October 2022.
[838]UNCLOS (n 16) arts 145, 153(1) and 157(1).
[839]UNCLOS (n 16) Annex III arts 2(1)(b) and 3; ISA, 'Decision of the Council of the International Seabed Authority Relating to Amendments to the Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area and Related Matters' (22 July 2013) ISBA/19/C/17, Annex pt 1, reg 1(3)(a), (b) and (e) (Nodule Prospecting and Exploration Regulations), as approved by ISA, 'Decision of the Assembly of the International Seabed Authority Regarding the Amendments to the Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area' (25 July 2013) ISBA/19/A/9.
[840]'The Mining Code' <www.isa.org.jm/index.php/mining-code> (*ISA*, ND) accessed 23 October 2022.
[841]Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 (adopted 28 July 1994, entered into force 28 July 1996) 1836 UNTS 3 (Part XI Implementing Agreement), Annex, sec 1 paras 15(b) and (c); ISA, 'Letter Dated 30 June 2021 from the President of the Council of the International Seabed Authority Addressed to the Members of the Council' (1 July 2021) ISBA/26/C/38, Annex II.

exploitation regime with IHRL, I contribute to the body of knowledge that may be used to facilitate informed decision making concerning the regulation of DSM. This is essential given that, unless regulated appropriately, DSM threatens catastrophic impacts on our oceans and essential ecosystem services.[842] Craig Smith has warned that 'Deep-sea mining could end up having the largest footprint of any single human activity on the planet in terms of area of impact'.[843] Third, analysing the implications of DSM for human rights and human health is an innovative and incipient line of research.[844] To date, discourse surrounding DSM has focused heavily on potential implications for international development, balanced against anticipated environmental impacts.[845] Through my research I help expand this debate by conducting original research on the implications of DSM for enjoyment of the right to health, complementing parallel research on the impacts of DSM for procedural environmental rights and the rights of indigenous peoples.[846] In doing so, I provide additional insights into how DSM should be regulated to minimise harm to human and ocean health alike.

Finally, a case study on DSM showcases the versatility of IHRL. At first glance, it may appear as though State obligations under IHRL have no bearing on the seabed mining regime for two reasons. First, IHRL imposes obligations on States, whereas seabed mining in the Area is regulated primarily by the ISA, which is an international organisation.[847] Second, in its traditional conceptualisation, IHRL is generally understood to impose obligations on States with regard to harm that occurs within their national territory (although there is rapidly expanding legal discourse on the extraterritorial application of human rights treaties, which is outside the scope of this thesis),[848] whereas sources of harm from seabed mining in the Area, by definition, originate outside the national territory of States. However, neither of these points preclude the applicability of IHRL to seabed mining in the Area. As an intergovernmental body, the ISA's membership comprises States that are themselves bound by IHRL and thus must exercise their decision-making powers in the ISA with due consideration to their other obligations under IHRL. This is required by the obligation to cooperate internationally to realise human rights;[849] the legal principle *pacta sunt servanda*, which prescribes that

[842]Olive Heffernan, 'Seabed Mining is Coming - Bringing Mineral Riches and Fears of Epic Extinctions' (*Nature*, 24 July 2019) <www.nature.com/articles/d41586-019-02242-y> accessed 22 December 2022.
[843]Letman (n 162).
[844]Morgera and Lily (n 171); Aguon and Hunter (n 171); Seto and others (n 171).
[845]See Miller and others, 'Challenging the Need for Deep Seabed Mining From the Perspective of Metal Demand, Biodiversity, Ecosystems Services, and Benefit Sharing' (n 821).
[846]See Morgera and Lily (n 171); and Aguon and Hunter (n 171), respectively.
[847]In addition to the ISA, sponsoring States—discussed below—play an essential role in regulating the actions of mining contractors. For a comprehensive overview of the role and responsibilities of sponsoring States, see ITLOS (n 340).
[848]For further information, see Marko Milanovic, *Extraterritorial Application of Human Rights Treaties: Law, Principles, and Policy* (Oxford University Press 2011).
[849]ICESCR (n 316) art 2(1).

treaties are binding on States parties and thus must be observed and fulfilled in good faith;[850] and Article 138 of UNCLOS which requires that State actions in relation to the Area shall be conducted in accordance with 'other rules of international law' in addition to the provisions of UNCLOS itself. Moreover, States that decide to sponsor mining contractors (discussed further in Section 4.1) must also implement national regulatory frameworks, which must be developed with due consideration of the State's obligations under IHRL.

Under the right to health, States are obligated to refrain from 'interfering directly or indirectly with the enjoyment of the right to health'.[851] Logically, this obligation extends to State actions within the realm of international law making. To be adopted, mining regulations must be approved by States as the final decision makers in the ISA, as discussed further below.[852] Therefore, the content of the regime for seabed mining under the ISA is determined by States that are also obligated not to impede enjoyment of the right to health. Thus, Member States must ensure that the regime for the exploitation phase of seabed mining, which they are currently developing under the ISA, conforms with their obligations under the right to health. Of course, it remains to be seen to what extent failure by States to consider potential health implications in the development of a seabed mining regime would result in a tangible indirect interference with the enjoyment of the right to health. A conclusive determination on this point requires the knowledge gaps highlighted in Section 3 to be addressed. Finally, regarding the traditionally territorial nature of human rights obligations, while seabed mining may occur in areas beyond national jurisdiction, Section 3 demonstrates that it could nonetheless have significant implications for the health of individuals located within national jurisdiction and thus within the jurisdiction of individual States.[853] Thus the application of IHRL to harm caused by activities undertaken outside national jurisdiction is not dependent upon the extraterritorial application of human rights, which is not discussed further in this thesis.

3. Deep seabed mining and human health

At present, the precise environmental and health impacts of DSM are shrouded in uncertainty, due to limited understanding of both the deep-sea environment generally and the specific infrastructure that will be used for extraction of seabed resources. However, recent scientific research reveals a high degree of connectivity between marine ecosystems, both horizontally and vertically within the water column, meaning that disturbances to marine biodiversity in areas beyond national jurisdiction can have significant implications

[850]Vienna Convention (n 183) art 26.
[851]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 33.
[852]UNCLOS (n 16) art 162(2)(o)(ii).
[853]Aguon and Hunter (n 171) 7.

for coastal marine ecosystems and human communities dependent on them.[854] This means that the magnitude of risk to human health is not contingent on physical proximity to the drivers of harm to marine biodiversity. This should give rise to concern for potential human health impacts from DSM in the Area.

Despite prevailing knowledge gaps, from the available literature on the prospective environmental impacts of seabed mining one can discern at least three potential pathways for environmental harm to negatively impact human health. These are: (1) impacts upon fisheries with knock-on implications for food security and nutrition;[855] (2) increased metal concentrations in deep-sea ecosystems, which may enter the food web and ultimately present food safety risks to humans;[856] and (3) interruptions to the carbon cycle that may exacerbate climate change and threaten human wellbeing.[857] These three pathways are considered in further detail below.

3.1. Fisheries disruption, food security and nutrition

One of the primary anticipated environmental impacts of DSM is its impact on marine life (particularly migratory fish stocks) and fisheries.[858] This will likely have negative knock-on implications for fisheries, with potential repercussions for food security and nutrition, particularly amongst vulnerable coastal communities that are highly dependent on seafood.[859] Viewed from a human rights perspective, this threatens rights holders' enjoyment of the right to health by undermining access to 'an adequate supply of safe food', which is an established underlying determinant of the right to health.[860] In particular, this is likely to disproportionately impact poor coastal communities that are heavily dependent upon seafood as an accessible source of nutrition, and who may lack the financial resources to acquire alternative sources of nutrition in the event that fisheries are disrupted.[861]

DSM is anticipated to impact fish stocks across the full extent of the water column. At the ocean surface, the presence of semi-permanent ships and support platforms may interrupt fish migration patterns by deterring fish through light and noise pollution, in addition to harmful discharges.[862] Mid-water, fish stocks may be interrupted by the presence of riser pipes transporting mined minerals to surface vessels, the vertical

[854]See Ekaterina Popova and others, 'Ecological Connectivity Between the Areas Beyond National Jurisdiction and Coastal Waters: Safeguarding Interests of Coastal Communities Iin Developing Countries' (2019) 104 MAR POLICY 90; O'Leary and Roberts (n 93).
[855]See ch 5 sec 3.1.
[856]See ch 5 sec 3.2.
[857]See ch 5 sec 3.3.
[858]Chin and Hari (n 97) 3.
[859]WWF, 'In Too Deep: What We Know, And Don't Know, About Deep Seabed Mining' (n 820) 5; Chin and Hari (n 97) 32-36.
[860]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 11.
[861]WWF, 'In Too Deep: What We Know, And Don't Know, About Deep Seabed Mining' (n 820) 5.
[862]Ibid 32.

movement of mining vehicles and potentially also the disposal of waste sediment from surface vessels (known as 'dewatering plumes').[863] The depth at which dewatering plumes are discharged is anticipated to have a significant impact upon the harm that they may inflict, with shallower discharges presenting a greater risk.[864] Research suggests that the higher in the water column waste is released, the greater the risks to the marine environment.[865] Finally, at the seabed level, marine ecosystems face significant risks through destruction of habitats and biota, generation and spread of sediment plumes from mining equipment (known as 'collector plumes'), and noise and light pollution.[866] Given the slow growth rates, fragility and high species diversity of deep-sea ecosystems, it is anticipated that ecosystem destruction from mining, including the removal of nodules which serve as a foundation for ecosystem health and abyssal plain food webs, could have significant adverse impacts on ecosystem function and marine food web stability.[867]

Collectively, these disturbances to marine ecosystems through the full spectrum of the water column could have significant negative consequences for global fisheries, with repercussions for food security — particularly among coastal and indigenous communities that are highly dependent on marine ecosystems as an essential source of nutrition.[868] While the precise scale of this impact has yet to be fully quantified, it is reasonable to conclude that seabed mining likely presents some degree of risk to global fisheries and, by extension, global food security and human health.[869] Already, multiple indigenous Pacific Island communities have reported negative impacts to their fisheries practices from exploratory seabed mining activities.[870]

3.2. Metal toxicity, bioaccumulation and food safety

Another environmental concern from seabed mining is the potential impact of increased ambient metal concentrations on marine ecosystems.[871] For the reasons set out in the following paragraphs, I contend that this threatens enjoyment of the human right to health by restricting access to safe and nutritionally adequate

[863]Ibid 26.
[864]Jeffrey C. Drazen and others, 'Midwater Ecosystems Must be Considered When Evaluating Environmental Risks of Deep-Sea Mining' (2020) 117 Proceedings of the National Academy of Sciences - PNAS 17455, 17456.
[865]Chin and Hari (n 97) 33.
[866]Ibid 32.
[867]See Tanja Stratmann and others, 'Polymetallic Nodules are Essential for Food-Web Integrity of a Prospective Deep-Seabed Mining Area in Pacific Abyssal Plains' (2021) 11 Scientific Reports 12238 <https://doi.org/10.1038/s41598-021-91703-4> accessed 23 December 2022, 6; Levin, Amon and Lily (n 826) 787.
[868]Chin and Hari (n 97) 32–36.
[869]Ibid 5.
[870]Aguon and Hunter (n 171) 13–15.
[871]Chris Hauton and others, 'Identifying Toxic Impacts of Metals Potentially Released During Deep-Sea Mining — A Synthesis of the Challenges to Quantifying Risk' (2017) 4 Frontiers in Marine Science article 368 <https://doi.org/10.3389/fmars.2017.00368> accessed 23 December 2022.

food through contamination of seafood with elevated metal concentrations.[872] I further posit that this will impose a disproportionate burden on poor coastal communities and indigenous communities that are highly dependent on local marine ecosystems as a source of food.

Scientists anticipate that DSM will release metal deposits into the surrounding environment through destruction of mineral deposits during the mining process.[873] While the precise impacts of elevated metal concentrations will depend upon the specific metals that are released, they may generally be divided into three groups: sub-lethal toxicity; lethal toxicity; and behavioural avoidance whereby species avoid areas with higher ambient metal concentrations.[874] Individually or collectively, these impacts can result in reduced ecosystem structures (i.e., reduced species abundance, distribution, or diversity), with consequences for ecosystem service delivery.[875] Potentially the largest threat that this presents to human health is through bioaccumulation of metals in marine food webs which could ultimately enter the human food chain.[876] The magnitude of this risk remains unclear due to, among other things, limited knowledge on the impacts of elevated ambient metal concentrations on deep sea ecosystems and the extent to which deep sea food webs, in which metals from seabed mining activities may accumulate, overlap with food webs from which humans harvest species for consumption.[877]

Research further intimates that the ways in which metals will impact marine species also depend upon the state that the metals assume. Metals released through DSM may enter an aqueous state (i.e., in solution), enabling them to be taken up through the gills, body wall and digestive tract of marine species.[878] Alternatively, the metals may remain in a solid state and be ingested.[879] However, despite prevailing uncertainties and in light of developing understanding of the high degree of connectivity between marine ecosystems, there is sufficient evidence to suggest that bioaccumulation of metals from seabed mining could present a threat to human health and wellbeing. Furthermore, the risk of metals entering the human food chain increases if dewatering plumes — which could also contain metal particles — are released into the surface or mid-water, thus directly overlapping with food webs from which species are harvested for human consumption.[880]

[872]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) paras 11 and 43(b).
[873]Hauton and others (n 871) 2.
[874]Ibid 4.
[875]Ibid.
[876]See eg Tiphaine Chouvelon and others, 'Patterns of Trace Metal Bioaccumulation and Trophic Transfer in a Phytoplankton-Zooplankton-Small Pelagic Fish Marine Food Web' (2019) 146 Marine Pollution Bulletin 1013.
[877]Hauton and others (n 871) 26.
[878]Ibid 2.
[879]Ibid.
[880]Chin and Hari (n 97) 26.

There remains uncertainty around the precise health impacts of ingesting higher-than-usual metal concentrations. However, while the risks will depend on the metals in question, existing research suggests that specific societal groups, including children and pregnant women, may be particularly susceptible to adverse health outcomes.[881]

3.3. The carbon cycle, sediment disruption and climate change

Finally, DSM could accelerate global climate change, which presents an array of risks to human health, including exposure to increased occurrence of extreme weather events, altered distribution of infectious diseases (e.g., malaria) and secondary effects including famine, civil war and forced migration.[882] Needless to say, climate change threatens enjoyment of the right to health in a host of ways that are well documented in the literature, including through extreme weather events, expanded disease vectors and reduced access to adequate and safe food, water and housing[883]

The ocean plays an essential role in regulating Earth's climate.[884] Scientists estimate that the ocean stores up to 60 times more carbon than the atmosphere,[885] and that the ocean has absorbed approximately 30 percent of global anthropogenic carbon dioxide since the beginning of the industrial revolution.[886] A portion of absorbed carbon is transported to the seafloor by a process called the carbon pump, where it can be sequestered in sediment for millennia.[887] While the precise proportion of global carbon sequestered in marine sediment is currently unknown,[888] Atwood and colleagues posited that 'Marine sediments are one of the most expansive and critical carbon reservoirs on the planet'.[889] The role that seabed sediment plays in sequestering carbon has triggered concern that seabed mining will disturb and resuspend these sediments

[881]Zorimar Rivera-Núñez and others, 'Association of Biomarkers of Exposure to Metals and Metalloids with Maternal Hormones in Pregnant Women from Puerto Rico' (2021) 147 Environ Int 106310 <https://doi.org/10.1016/j.envint.2020.106310> accessed 23 December 2022, 2; Muwaffak Al osman, Fei Yang and Isaac Yaw Massey, 'Exposure Routes and Health Effects of Heavy Metals on Children' (2019) 32 Biometals 563, 563.
[882]Colin D. Butler and others, 'Climate Change and Human Health' in Stephen J. Williams and Rod Taylor (eds), *Sustainability and the New Economics: Synthesising Ecological Economics and Modern Monetary Theory* (Springer 2022), 55–60.
[883]See eg Margaux J. Hall, 'Advancing Climate Justice and the Right to Health Through Procedural Rights' (2014) 16 Health Hum Rights 8; Marlies Hesselman and Brigit Toebes, 'The Human Right to Health and Climate Change: A Legal Perspective' (Global Health Law Groningen Research Paper 2015/1, 2015) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2688544#references-widget> accessed 22 December 2022.
[884]O'Leary and Roberts (n 93) e00433.
[885]Oka (n 9) 1.
[886]Jin, Hoagland and Buesseler (n 94) 141358–141359.
[887]Ibid 141358.
[888]Trisha B. Atwood and others, 'Global Patterns in Marine Sediment Carbon Stocks' (2020) 7 Frontiers in Marine Science article 165 <https://doi.org/10.3389/fmars.2020.00165> accessed 23 December 2022, 2.
[889]Ibid 1.

in the water column, potentially releasing sequestered carbon.[890] Resuspended sediments are exposed to oxygen, enabling embedded carbon to be re-oxidised to carbon dioxide, which could potentially be re-released into the atmosphere.[891] At present, the extent to which disruption of marine sediment could impact atmospheric carbon dioxide concentrations remains unknown.[892] In addition to climate risks from the release of sequestered carbon, there remains uncertainty around whether mining activities could interrupt other essential regulating ecosystem services such as the absorption of atmospheric oxygen.[893] On the issue of sequestered methane specifically, Associate Professor Thurber of Ohio State University has stressed that 'There is more methane on the ocean floor than there are other forms of fossil fuels left in the ocean, and if it were all released it would be a doomsday climatic event'.[894]

In summary, although significant uncertainties remain, there is sufficient evidence of potential negative health impacts to trigger application of the precautionary principle by States, thus necessitating consideration of potential health impacts in the development of the international DSM regime. As discussed in Chapter 3,[895] the precautionary principle demands that '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' or harm to human health.[896] To be triggered, the precautionary principle requires the potential harm to be of sufficient gravity (e.g., significant, serious or irreversible) and to have a sufficient probability of materialising (Trouwborst proposed there must be 'reasonable grounds for concern' that harm may occur).[897] In the context of seabed mining in the Area, States are already under a clear obligation to apply the precautionary principle with regard to environmental harm.[898] Concerning risks to human health, there is a strong argument that the risks highlighted in this section (including health impacts of impaired food security and safety) are of sufficient gravity to trigger precautionary measures. Additionally, one may also contend that there are reasonable grounds for concern that these risks may materialise, on the basis that there is a logical chain of cause and effect whereby mining activities result in harm to human health vis-à-vis marine biodiversity. The remaining uncertainty lies in quantifying both the gravity and probability of such risks with a higher degree of precision. However, as noted by the International Tribunal on the Law of the Sea (ITLOS), the obligation to apply the precautionary principle

[890]Chin and Hari (n 97) 38.
[891]Atwood and others (n 888) 1.
[892]Chin and Hari (n 97) 38; Howard and others (n 824) 117.
[893]Hauton and others (n 871) 5.
[894]'Hydrothermal Vents, Methane Seeps Play Big Role in Marine Life, Global Climate' (*Space Daily*, 6 June 2016) <link.gale.com/apps/doc/A454286098/ITOF?u=ustrath&sid=bookmark-ITOF&xid=089c9e1f> accessed 22 December 2022, as cited in: Aguon and Hunter (n 171) 12.
[895]See ch 3 sec 1. Jaeckel (n 339) 27.
[896]Rio Declaration (n 246) Principle 15; Martuzzi (n 339) 569.
[897]Jaeckel (n 339) 38–39.
[898]ITLOS (n 340) paras 125–135.

'applies in situations where scientific evidence concerning the scope and potential negative impacts of the activity in question is insufficient but where there are plausible indications of potential risks'.[899] Therefore, based on the above analysis I contend that DSM presents sufficient risk to human health to trigger application of the precautionary principle by States.

This would not necessarily mean that States should prohibit all DSM. Rather, as stated by Harrison, the precautionary principle means that 'it endorses action for the protection of the environment, even when there is no conclusive proof that environmental harm will occur'.[900] The interpretation of this principle in the context of DSM is the responsibility of the ISA, of States (both in their capacity as members of the ISA and as duty bearers under international environmental and human rights law), and of the wider international community (including academia). While the question of the responsive measures that the precautionary principle demands in relation to DSM is an important area of study, further exploration of this is outside the scope of this thesis.[901] Having demonstrated the potential for DSM to impair the enjoyment of the right to health, in the following Section I analyse the compatibility of the current draft exploitation regime with State obligations under the human right to health.

4. Analysis of the legal regime for exploitation of DSM in ABNJ from the perspective of the human right to health

In the previous Section, I demonstrated that DSM in the Area has the potential to harm human health in various ways and, in doing so, restrict rights holders' enjoyment of the right to health. I further contended, despite prevailing uncertainties, that the precautionary principle mandates States to take action and to factor the right to health into the regulatory regime for DSM that is currently being developed under the ISA. Based on this conclusion, in this Section I analyse the draft regulatory DSM regime to determine whether it is consistent with each of the State obligations outlined in Chapter 4 arising from the human right to health, as a result of the human health and marine biodiversity nexus. Through this exercise, I reveal several areas in which the DSM regime is incompatible with IHRL, and thus areas in which States are failing to satisfy their IHRL obligations in the development of the draft regime. Before proceeding with this analysis, I begin with a brief an overview of the legal regime governing DSM in the Area, to provide necessary context for the subsequent analysis.

[899]Ibid para.131.
[900]Harrison (n 74) 14.
[901]For more detailed analysis on the role of the precautionary principle in the context of DSM, see Jaeckel (n 339).

4.1. Overview of the legal regime governing DSM in ABNJ

The regulatory regime for governance of the Area is set out in UNCLOS and the Agreement Relating to the Implementation of Part XI of UNCLOS.[902] UNCLOS declares the Area and its mineral resources to be the 'common heritage of [hu]mankind',[903] meaning that such resources may not be appropriated unilaterally by any State and any activities in the Area must be conducted 'for the benefit of humankind as a whole', with particular consideration for the interests and needs of developing States.[904] The precise implications and legal significance of the principle of common heritage of humankind continues to be the subject of extensive academic study.[905]

The ISA, as the regulatory body for seabed mining in the Area,[906] has a multi-pronged mandate, including to: 'organise, control and carry out activities in the Area',[907] ensure protection of the marine environment,[908] and promote marine scientific research.[909] The primary tool through which the ISA satisfies these mandates is the Mining Code.[910] Membership of the ISA comprises all States Parties to UNCLOS, in addition to the European Union.[911] The ISA is composed of three principal organs: the Assembly, the Council and the Secretariat.[912] The Assembly is the plenary body comprising all ISA Member States.[913] The Council, composed of 36 ISA Member States, operates as the executive organ and is mandated to, inter alia, provisionally authorise regulations, pending final approval by the Assembly, and to approve or reject applications for exploration and exploitation contracts.[914] The Secretariat is the administrative organ of the ISA.[915] The Council is supported by the Legal and Technical Commission (LTC).[916] While the LTC theoretically operates as an advisory body to the Council on a range of issues including reviewing applications for exploration and exploitation contracts, and drafting the Mining Code,[917] scholars have

[902]Part XI Implementing Agreement (n 841).
[903]UNCLOS (n 16) arts 133(a) and 136.
[904]UNCLOS (n 16) arts 137(3) and 140.
[905]See eg Aline Jaeckel, 'Benefitting from the Common Heritage of Humankind: From Expectation to Reality' (2020) 35 The international journal of marine and coastal law 660; Chuanliang Wang and Yen-Chiang Chang, 'A New Interpretation of the Common Heritage of Mankind in the Context of the International Law of the Sea' (2020) 191 Ocean & Coastal Management 105191 <https://doi.org/10.1016/j.ocecoaman.2020.105191> accessed 23 December 2022.
[906]UNCLOS (n 16) art 156(2).
[907]Jaeckel, *The International Seabed Authority and the Pre-cautionary Principle: Balancing Deep Seabed Mineral Mining and Marine Environmental Protection* (n 339) 88; UNCLOS (n 16) arts 153(1) and 157(1).
[908]UNCLOS (n 16) art 145.
[909]Ibid art 143.
[910]See ch 5 sec 1.
[911]UNCLOS (n 16) art 156(2).
[912] Ibid art 158(1).
[913] Ibid art 159(1) and (6).
[914] Ibid art 162.
[915] Ibid art 166.
[916] Ibid art 165.
[917] Ibid art 165(2).

observed that ISA operating procedures grant significant weight to decisions of the LTC, making it difficult in some instances for the Council to act contrary to the LTC's recommendations.[918] For this reason, Jaeckel concluded that 'In practice the work of the LTC exceeds an advisory mandate'.[919] The de facto power held by the LTC, twinned with its closed-door decision-making processes, has led to widespread criticism concerning the lack of transparency with which the ISA operates.[920] Some commentators suggest that the lack of transparency around LTC decision making is odds with both the principle of common heritage of humankind and IHRL.[921]

The process for development of the Mining Code begins with the LTC, which is responsible for drafting mining regulations.[922] Once drafted, regulations are sent to the Council for review and, ultimately, adoption by consensus.[923] Regulations adopted by the Council are sent to the Assembly for final approval.[924] However, once approved by the Council, regulations apply provisionally pending final approval by the Assembly.[925] At the time of writing,[926] draft exploitation regulations have been drafted by the LTC and await consideration by the Council.[927]

Harrison noted that, since there is no prescribed timeframe within which the Council must revise the regulations in the event of rejection by the Assembly, the provisionally approved regulations could theoretically remain effective indefinitely.[928] In such an event, States that sit on the Council would be exclusively responsible for any incompatibilities between the DSM regime and IRHL. It is therefore advisable for the 36 States on the Council to be especially diligent to incompatibilities between the draft exploitation regime and IHRL. The risk of provisionally approved regulations being used to govern DSM is elevated by Nauru's triggering of the two-year rule in June 2021.[929]

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[918]For further information see Jaeckel, *The International Seabed Authority and the Pre-cautionary Principle: Balancing Deep Seabed Mineral Mining and Marine Environmental Protection* (n 339) 103-106.
[919]Ibid 96.
[920]Willaert (n 190) 4; Jaeckel, *The International Seabed Authority and the Pre-cautionary Principle: Balancing Deep Seabed Mineral Mining and Marine Environmental Protection* (n 339) 260-263.
[921]Jaeckel, *The International Seabed Authority and the Pre-cautionary Principle: Balancing Deep Seabed Mineral Mining and Marine Environmental Protection* (n 339) 97; Morgera and Lily (n 171).
[922]UNCLOS (n 16) art 165(2)(f).
[923]Ibid arts 165(2)(f) and 161(8)(d)-(e).
[924]Ibid art 162(2)(o)(ii).
[925]Ibid.
[926]20 December 2022.
[927]'The Mining Code: Draft Exploitation Regulations' (*ISA*, ND) <https://isa.org.jm/mining-code/draft-exploitation-regulations> accessed 23 December 2022.
[928]James Harrison, *Making the Law of the Sea: A Study in the Development of International Law* (Cambridge University Press 2011), 126.
[929]See ch 5 sec 1; ISA, 'Letter Dated 30 June 2021 from the President of the Council of the International Seabed Authority Addressed to the Members of the Council' (n 841).

The ISA does not operate alone in managing DSM. All contractors that wish to undertake seabed mining must be sponsored by a State party to UNCLOS.[930] Sponsoring States play a fundamental role in the governance of DSM. The DSM regime exists to regulate the actions of mining contractors, who will commonly be non-State actors and thus not bound by public international law. Sponsoring States bridge this gap by developing a domestic regulatory framework under which to hold contractors accountable for their actions, while the sponsoring States themselves remain accountable under UNCLOS for discharging this responsibility adequately.[931]

The Seabed Dispute Chamber (SDC) of ITLOS has elaborated on the responsibilities and liability of sponsoring States, proclaiming that sponsoring States are, inter alia, subject to an obligation to apply the precautionary principle and an obligation of due diligence to take necessary steps to ensure contractors' compliance with DSM requirements under UNCLOS.[932] In establishing national legislation to regulate sponsored contractors, sponsoring States may not implement measures that are less stringent than those required by the Mining Code, but they may implement more stringent requirements provided they are not incompatible with the Mining Code.[933]

It follows that there are three capacities in which States, as central actors within the DSM regime, must be cognisant of their obligations under IHRL: as members of the ISA Assembly, as members of the ISA Council and as sponsoring States.

4.2. Analysis of ISA draft exploitation regulations

The purpose of this section is to assess the compatibility of the regime for the exploitation phase of DSM with the human right to health. In particular, I ascertain whether States, in their capacity as decision makers within the ISA, have discharged their responsibilities regarding each of the obligations that I set out in Chapter 4. Instances where State obligations, under the right to health, have not been discharged adequately, represent areas in which the DSM regime must be further developed to render it compatible and mutually supportive with IHRL. I acknowledge that, at the time of writing, the exploitation regulations and associated

[930]UNCLOS (n 16) art 163(2)(b).
[931]ITLOS (n 340) para 75; Xiangxin Xu and Guifang Xue, 'Potential Contribution of Sponsoring State and its National Legislation to the Deep Seabed Mining Regime' (2021) 13 Sustainability 10784, 10784.
[932]ITLOS (n 340) para 110; UNCLOS (n 16) art 139(2).
[933]Roland Cormier and Andrew Minkiewicz, 'Operational Aspects of Implementing Regulatory Frameworks to Manage Deep-Sea Mining Activities' in Rahul Sharma (ed), *Perspectives on Deep-Sea Mining: Sustainability, Technology, Environmental Policy and Management* (Springer 2021), 594.

standards and guidelines are still in draft form, and thus any areas of misalignment may yet be addressed before the regulations are approved by the ISA Council and Assembly.

In the previous chapter, I identified eleven State obligations under the right to health concerning marine biodiversity, which I categorised into three groups: foundational, immediate, and non-immediate obligations.[934] This section considers each of these groups in turn, including the extent to which they may be impacted by DSM, and the suitability of the DSM regime to facilitate fulfilment of these obligations. I focus primarily on the draft regulations themselves, as the central legal tool that defines the overarching framework for conducting full-scale commercial DSM. However, to the extent necessary, I also consider draft ISA standards and guidelines that are intended to complement and supplement the draft exploitation regulations, in addition to provisions of UNCLOS and the Part XI Implementing Agreement.

Before proceeding to analyse the extent to which States have discharged their obligations under the right to health in the current draft of the DSM regime, I reiterate that ITLOS has proclaimed that sponsoring States are subject to a due diligence obligation to 'take all measures necessary to ensure' that 'the "activities in the Area" conducted by the sponsored contractor are "in conformity" or "in compliance" with the rules' established under UNCLOS and the ISA.[935] At multiple points throughout the following discussion, I denote actions that sponsoring States must take to regulate the actions of contractors to protect the human health and marine biodiversity nexus. I contend that each of these pronouncements may help add definition to the due diligence obligation declared by ITLOS. Conversely, while I contend that the below findings help define this due diligence obligation, so too does the due diligence obligation help inform the nature of the below obligations. Specifically, while I highlight multiple legislative measures that sponsoring States must take, the obligation of due diligence requires that enacting legislation or establishing procedures is not enough.[936] Such legislation and procedures must also be rigorously implemented and enforced for a sponsoring State to satisfy this obligation.[937] Thus, I reiterate that in addition to the specific measures that I suggest in the remainder of this chapter, these incur an implicit assertion that States must also diligently implement and enforce such measures.

4.2.1. *Foundational obligations*

The first category of obligations that I listed in Chapter 4 are the foundational obligations, which require States to: develop and ensure access to scientific research on the human health and marine biodiversity

[934]See ch 4 secs 1-3, respectively.
[935]ITLOS (n 340) paras 103 and 113. See also: paras 110-120.
[936]Ibid para 115.
[937]Ibid para 115.

nexus, ensure individual capacity development concerning the human health and marine biodiversity nexus, cooperate through relevant international fora to conserve and sustainably use marine biodiversity, and mobilise maximum available resources.[938] In this section I demonstrate that all four of these foundational obligations bear a tangible connection to DSM in ABNJ and, while the DSM regime contains provisions that support each of these foundational obligations, more needs to be done to achieve alignment between the DSM regime and the right to health under IHRL.

4.2.1.1. Develop and ensure access to scientific research on the human health and marine biodiversity nexus

In Chapter 4, I contended that States are subject to an implicit obligation to develop and ensure access to research into the nexus between human health and marine biodiversity — including research into drivers of harm to this nexus.[939] This obligation is not explicitly mandated in the text of any human rights treaty: rather, it is a logical prerequisite to enable States to satisfy their explicit obligations to respect, protect and fulfil the human right to health — including their immediate obligations to ensure access to health facilities, goods and services (including underlying determinants of health) on a non-discriminatory and equitable basis.[940] Without detailed understanding of the risks that DSM poses to human health, States cannot hope to mitigate these risks and thus protect enjoyment of the right to health. Although Section 3 of this chapter highlights several potential ways in which DSM may impact marine biodiversity with knock-on implications for human health, knowledge gaps pervade and persist regarding the potential environmental and health impacts of DSM, fuelled in part by a limited understanding of the deep-sea environment generally.[941] Based on interviews with 42 participants including scientific experts, DSM contractors, ISA member country representatives and members of the LTC, and civil society, Amon et al. found that 88 percent of interviewees thought 'deep-sea scientific knowledge is currently too sparse to minimise environmental risks and ensure the protection of the marine environment in the face of large-scale, deep-seabed mining'.[942]

In its current form, the draft regime for the exploitation phase of DSM promotes research in multiple ways. UNCLOS itself mandates the ISA to 'promote and encourage the conduct of marine scientific research in

[938]See ch 4 sec 1.
[939]See ch 4 sec 1.1.
[940]ICESCR (n 316) art 12(1); ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) paras 12(a), 34-37, 43(a) and 43(e).
[941]Diva Amon and others, 'Assessment of Scientific Gaps Related to the Effective Environmental Management if Deep-Seabed Mining' (2022) 138 Marine Policy 105006 <https://doi.org/10.1016/j.marpol.2022.105006> accessed 23 December 2022.
[942]Ibid, 10.

the Area and [to] coordinate and disseminate the results of such research and analysis when available'.[943] UNCLOS also obligates States Parties to 'promote marine scientific research in the Area' by various means.[944] These mandates on the ISA and States Parties to promote marine scientific research are a valuable tool to advance our understanding of the deep seabed environment. However, such obligations are framed in broad language and do not obligate the ISA or UNCLOS States Parties to advance research on the potential health impacts of DSM specifically.

Building on UNCLOS, the draft exploitation regulations (subsequently referred to as the draft regulations) establish similarly broad research agendas, prescribing that: 'Contractors, sponsoring States and members of the Authority shall cooperate with the [ISA] in the establishment and implementation of programmes to observe, measure, evaluate and analyse the impacts of Exploitation on the Marine Environment'.[945]

It is curious that the definition of 'marine environment' in the draft regulations does not expressly include the term 'marine biodiversity'.[946] However, read in conjunction with the definition of 'biological diversity' and 'ecosystem' in the CBD,[947] I contend that the term 'marine environment' within the context of UNCLOS could not be interpreted in good faith in a manner that excludes marine biodiversity. As noted by Harrison, all States Parties to UNCLOS are also parties to the CBD, and therefore, in accordance with Article 31(3)(c) of the Vienna Convention on the Law of Treaties, the content of the CBD may be used to guide the interpretation of relevant provisions in UNCLOS.[948]

The draft regulations also obligate contractors and ISA Member States to '[identify] gaps in scientific knowledge and [develop] targeted and focused research programmes to address such gaps' and to '[promote] the advancement of marine scientific research in the Area for the benefit of mankind as a whole'.[949] Like the obligations established under UNCLOS, these obligations are broadly worded and thus do little to help guide and harmonise international research efforts. The draft regulations also promote dissemination of research outcomes by obligating contractors, sponsoring States and ISA Member States

[943]UNCLOS (n 16) art 143.
[944]UNCLOS (n 16) art 143(3).
[945]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (22 March 2019) ISBA/25/C/WP.1 (n 945) reg 3(e).
[946]Ibid Schedule.
[947]Convention on Biological Diversity (adopted on 22 May 1992, entered into force on 29 December 1993) 1760 UNTS 69 (CBD), art 2.
[948]James Harrison, 'The Protection of Species, Ecosystems and Biodiversity under UNCLOS in light of the South China Sea Arbitration: an Emergent Duty of Marine Ecosystem Restoration?' (University of Edinburgh School of Law Research Paper Series No 2019/20 2019) <http://dx.doi.org/10.2139/ssrn.3388657> accessed 22 December 2022, 7; Vienna Convention (n 183) art 31(3)(c).
[949]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) reg 3(f).

to 'share the findings and results of such programmes with the [ISA] for wider dissemination'.[950] Moreover, they establish a mechanism to support funding of such research through the establishment of an Environmental Compensation Fund (ECF), the express purposes of which include 'the promotion of research into methods of marine mining engineering and practice by which environmental damage or impairment resulting from Exploitation activities in the Area may be reduced'.[951] However it is premature to celebrate the value of the ECF as we await detailed operating procedures from the ISA that will help us to understand the amount of financial support that the ECF will be able to offer in practice and precisely how it may be used.[952] I suggest there would be value in explicitly acknowledging the health and environment nexus within the draft regulations. For example, the explicit purposes of the ECF may be reframed to include, 'the promotion of research into methods of marine mining engineering and practice by which environmental damage or impairment[, *and related risks to human health*,] resulting from Exploitation activities in the Area may be reduced'.[953]

In addition to the explicit research obligations considered above, the draft regulations also promote research through environmental impact assessments (EIAs), which every prospective contractor must include in their application for an exploitation contract in the form of an environmental impact statement (EIS).[954] The EIA and EIS present a valuable opportunity to obligate contractors to consider the potential health implications of mining activities vis-à-vis their environmental impacts. Unfortunately, the draft regulations fail to capitalise on this opportunity and EIA and EIS requirements are silent on the issue of human health impacts. The template EIS presented in the draft regulations does consider 'impacts on the socioeconomic environment' and explicitly references impacts on fisheries, marine traffic and tourism, amongst others, but does not explicitly reference human health.[955] Inclusion of an explicit obligation to consider human health would guarantee that such impacts are afforded due consideration. Without it, there are no legal grounds to ensure that an EIA or EIS considers the health impacts of their proposed actions. This therefore represents a missed opportunity for States to explicitly mandate contractors to help advance research into the impacts of DSM on important human health and marine biodiversity linkages.

[950]Ibid reg 3(e).
[951]Ibid reg 55(b).
[952]Pradeep A. Singh, 'The Two-Year Deadline to Complete the International Seabed Authority's Mining Code: Key Outstanding Matters That Still Need to be Resolved' (2021) 134 Marine Policy 104804 <https://doi.org/10.1016/j.marpol.2021.104804> accessed 23 December 2022, 5.
[953]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) para 55(b). Italicised text in parenthesis added.
[954]Part XI Implementing Agreement (n 841) Annex, Section 1, para 7; Ibid regs 7(3) and 47(1), and Annex IV secs 4–6.
[955]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) Annex IV secs 6 and 9.

Therefore, while UNCLOS and the draft regulations impose various research obligations on States (in their capacity as both ISA members and as sponsoring States) to advance research (either directly or through obligations on contractors), such obligations are too broadly worded to support States in satisfying their obligation under the right to health to advance and ensure access to research into the human health and marine biodiversity nexus. The draft regulations and associated standards present an opportunity for States to promote alignment between these two regimes. While the DSM regime obviously cannot expressly stipulate all research priorities or mandate research into every conceivable facet of DSM, I contend that a mandate to research its potential health impacts is sufficiently important to warrant explicit inclusion in the exploitation regulations alongside existing environmental research obligations. There is little logic in pursuing DSM in furtherance of the common heritage of humankind doctrine if the activities required to do so ultimately inflict harm on the beneficiaries that they are intended to serve.

Incidentally, it must also be acknowledged that the economic gains that DSM promises could, in turn, facilitate medical developments that yield a net gain to global public health, despite any adverse health outcomes from harm to marine biodiversity. However, this remains to be seen and such a cost-benefit analysis cannot be performed without a comprehensive understanding of the precise health risks that DSM presents, for which research mandates, like those considered in this section, are essential.

Thus, the obligation to develop and ensure access to research must play a central role in the DSM regime, mandating States to advance knowledge of human health and marine biodiversity linkages to enable them to understand and therefore control for the potential human rights implications of DSM. I posit that the ISA should play a central role in coordinating and harmonising research efforts, in addition to serving as a clearing house for disseminating research findings across its full spectrum of members and the public generally. Sponsoring States, in turn, should ensure that their domestic legislation regulating sponsored contractors obligates contractors to contribute to knowledge development. As a final observation, it is possible that implementation of this obligation may face challenges from actors within the DSM framework that consider such a research mandate an unnecessary use of resources. It is also conceivable that some actors may reject the premise that DSM is capable of harming health for fear this could cause further setbacks for an industry that is already facing significant resistance.[956] To any such objections, I respond that failure to take such action would constitute a breach of the precautionary principle and IHRL.

[956]Reid (n 164); MacLellan (n 164); Woody (n 164).

4.2.1.2. Ensure individual capacity development concerning the human health and marine biodiversity nexus

The second foundational obligation that I propose States are subject to under the right to health is an obligation to ensure individual capacity development concerning the human health and marine biodiversity nexus.[957] This obligation is highly pertinent in the context of DSM and goes hand in hand with the obligation to develop research, discussed immediately above. In this section, I contend that while the draft DSM regime takes steps to develop capacity, it does not go far enough to mandate capacity development concerning the potential health impacts of DSM. States must therefore exercise their responsibility, as States Parties to UNCLOS, members of the ISA, and as sponsoring States, to develop stakeholder capacity to better understand these impacts and thus factor them into decision making.

As noted in Chapter 4, beneficiaries of capacity development can be divided into three groups: knowledge (also referred to as 'evidence') consumers, knowledge producers, and knowledge brokers.[958] In the current context, knowledge consumers comprise: decision makers within the ISA and sponsoring States that are developing the regulatory framework for DSM; private sector mining operators who will conduct DSM; civil society and industry groups; and the general public as rights holders under IHRL. Each group has distinct capacity needs. Decision makers need sufficient knowledge of human health and marine biodiversity linkages to enable them to understand and balance the potential impacts that may arise from their decisions concerning the shaping and operation of a DSM regime. Mining operators also require detailed knowledge of the marine environment and correlated human health considerations to develop equipment and operating protocols that minimise harm to both. Civil society and industry groups must sufficiently understand human health and marine biodiversity linkages threatened by DSM to enable them to represent the interests of their respective stakeholders. The general public needs to be aware of health risks that they may face from DSM. Knowledge producers comprise the research community seeking to generate the knowledge required by knowledge consumers. Thus, their capacity needs may include research facilities and equipment, in addition to funding. Finally, knowledge brokers in this instance would include the ISA itself which must play a central role in gathering knowledge from evidence producers and sharing it with knowledge consumers. Knowledge brokers' needs may therefore include networks and infrastructure for information gathering and dissemination — such as an online library of relevant open-access resources. NGOs, policy think-tanks and similar organisations also require access to research findings to perform their

[957] See ch 4 sec 1.2.
[958] Li and others (n 596) 7.

role as evidence brokers. With these capacity needs in mind, the question is therefore whether the DSM regime contains mechanisms to support the needs of each of these distinct groups.

Capacity development is intrinsically linked to the issue of technology transfer.[959] Less wealthy States may lack the resources required to enable knowledge producers to conduct scientific research, while knowledge consumers lack access to the information they need due to, amongst other things, paywalls or lack of adequate IT infrastructure. For this reason, transfer of technology — an inherent part of the State obligation to cooperate, discussed in Section 4.2.1.3 below — has a fundamental role to play in developing human and technical capacity. In this regard, UNCLOS obligates States Parties to cooperate through 'competent international organisations and the [ISA]' to facilitate the transfer to developing States of 'skills and marine technology with regard to activities in the Area'.[960] Similarly, the ISA is obligated to 'promote and encourage the transfer to developing States of such technology and scientific knowledge so that all States Parties benefit from [activities in the Area]'.[961] It is therefore clear that the ISA has a strong role to play in facilitating capacity development. As noted by Amon et al.:

> The ISA would ideally promote the translation, dissemination, exchange and sharing of scientific data and deep-sea research outputs to increase deep-sea literacy. This includes scientific data and information from contractors to scientific experts, as well as packaging relevant scientific knowledge in an understandable way for stakeholder groups, including policymakers and the public.[962]

The draft exploitation regulations make several references to developing individual capacity, primarily of knowledge consumers. Regulation 3 obligates ISA Member States and contractors to:

> use their best endeavours, in conjunction with the [ISA], to cooperate with each other, as well as with other contractors and national and international scientific research and technology development agencies, with a view to (…) undertaking educational awareness programmes for Stakeholders relating to activities in the Area.

[959]ISA, 'Decision of the Assembly of the International Seabed Authority Relating to the Strategic Plan of the Authority for the Period 2019−2023' (27 July 2018) ISBA/24/A/10, para 18.
[960]UNCLOS (n 16) art 273.
[961]UNCLOS (n 16) art 144(1)(b).
[962]Amon and others (n 941) 13.

This provision is broadly worded and cannot be interpreted as an explicit obligation on States and contractors to build capacity around human health and marine biodiversity linkages specifically. In the absence of an explicit mandate to this effect (or indeed a general mandate to develop capacity concerning the health impacts of DSM) then it remains to be seen whether States will choose to discharge this general obligation in a manner that incorporates consideration of human health. To satisfy their obligations under the right to health, States, in their capacity as members of the ISA, should promote educational programs to strengthen public awareness of important human health and marine biodiversity linkages, and the potential impacts of DSM. Similarly, sponsoring States should ensure that their national legislation requires contractors to contribute to educating the public in such matters.

Capacity development is also listed as one of the purposes of the ECF: '[e]ducation and training programmes in relation to the protection of the Marine Environment'.[963] Framed in this language, it is possible that the ECF could be used to support initiatives to develop the capacity of knowledge consumers, or it could be used to fund research initiatives or knowledge exchange, thus supporting knowledge producers and brokers. However, like the research obligation considered in the preceding section, while the ECF may explicitly be used to develop capacity around environmental impacts of DSM, this does not extend to the potential knock-on health impacts. While developing capacity to factor environmental considerations into decision making may indirectly support positive health outcomes, this does not build the necessary capacity for decision makers to comprehend and balance the potential implications of DSM for human health and the right to health into decision-making processes. While the list of purposes for which the ECF may be used is not exhaustive, there would be value in explicitly listing capacity development concerning human health and marine biodiversity linkages as one of the purposes for which the ECF may be used, to solidify this as a priority area. In the absence of such, then the contribution that the ECF may make to advancing capacity development on human health and marine biodiversity linkages depends upon how States, as members of the ISA, choose to allocate the ECF's resources.

In summary, under UNCLOS and the draft regulations, the ISA, its Member States, contractors, and sponsoring States, are all subject to broadly worded capacity development obligations, but none that explicitly mandate development of capacity concerning the potential health implications of DSM. The question of whether this responsibility will be discharged in a manner that satisfies the corresponding State obligation under the right to health to ensure capacity development concerning the human health and marine biodiversity nexus remains to be seen. To do so, ISA Member States must ensure that this is included

[963]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) reg 55(c).

amongst the capacity development-related initiatives advanced by the ISA, in addition to the causes to which the ECF is applied. Sponsoring States in turn must ensure that sponsored contractors are obligated to advance knowledge growth. To facilitate equitable and universal capacity development, developed States must promote the transfer of technologies to developing States, and capacity development and ocean research agendas should be shaped as much by the Global South as the Global North.[964]

4.2.1.3. Cooperate through relevant international fora to protect human health and marine biodiversity linkages

The third foundational obligation is the obligation to cooperate through relevant international fora to protect human health and marine biodiversity linkages. In this section, I contend that while the DSM regime mandates cooperation on protection of the marine environment,[965] it falls short of satisfying the current obligation because it does not explicitly mandate cooperation in the protection of human health, including harm that may result from disruptions to human health and marine biodiversity linkages. In Chapter 4,[966] I emphasised the importance of international cooperation for the protection of marine biodiversity due to the migratory nature of many marine species, the interconnected nature of the marine environment and the fact that 95 percent of the ocean by volume exists in ABNJ.[967] The importance of cooperation for the protection of marine biodiversity and health remains paramount in the current context due to the extraterritorial nature of DSM in the Area, in addition to the shared State responsibility to uphold the common heritage of humankind principle.

Cooperation will be essential for several reasons, including: to conduct and disseminate research concerning the linkages between DSM, marine biodiversity and human health; to achieve joint development of technologies and technology transfer; and to undertake joint initiatives for protection of marine biodiversity. Technology transfer will play an important role in the biodiversity protection agenda by enabling all DSM actors to use the most efficient and least harmful technologies available, in addition to filling gaps in scientific knowledge, which will in turn be essential to develop capacity around human health and marine biodiversity linkages. Various obligations to promote cooperation and technology transfer can be found in both UNCLOS and the draft exploitation regulations. UNCLOS prescribes that ‘States and competent

[964]Harriet Harden-Davies and others, 'Capacity Development in the Ocean Decade and Beyond: Key Questions About Meanings, Motivations, Pathways, and Measurements' (2022) 12 Earth System Governance 100138. <https://doi.org/10.1016/j.esg.2022.100138> accessed 23 December 2022.
[965]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) reg 3(e).
[966]See ch 4 sec 1.3.
[967]FAO, *Terminal Evaluation of the Areas Beyond National Jurisdiction (ABNJ) Deep-Sea Project, Part of the "Sustainable Fisheries Management and Biodiversity Conservation of Deep-Sea Living Marine Resources and Ecosystems in ABNJ"* (Project Evaluation Series 10/2020 2020), 1.

international organisations shall promote international cooperation in marine scientific research for peaceful purposes' in pursuit of protection of the marine environment,[968] and States Parties are required to 'promote international cooperation in marine scientific research in the Area'.[969]

Additionally, States and the ISA are obligated to cooperate, directly and through relevant international organisations, to promote and facilitate the transfer of technology, with particular regard to the needs of developing States.[970] The draft regulations also promote cooperation, including a duty on States (as members of the ISA) and contractors to cooperate and exchange information.[971] Embedded within this provision is an obligation on the ISA to 'consult and cooperate with sponsoring States, flag States, competent international organisations and other relevant bodies as appropriate, to develop measures to (…) promote the health and safety of life and property at sea and the protection of the Marine Environment'.[972]

This obligation is paired with a concurrent obligation on contractors, sponsoring States and members of the ISA to 'cooperate with the [ISA] in the establishment and implementation of programmes to observe, measure, evaluate and analyse the impacts of Exploitation on the Marine Environment'.[973] Moreover, ISA members and contractors are also obligated to cooperate with each other in pursuit of several objectives, including '[s]haring, exchanging and assessing environmental data and information for the Area', '[i]dentifying gaps in scientific knowledge and developing targeted and focused research programmes to assess such gaps', and '[p]romoting the advancement of marine scientific research in the Area for the benefit of mankind as a whole'.[974] These obligations are a welcome inclusion as they create a clear legal duty on States and contractors to cooperate on protection of the marine environment, both in conducting research to advance knowledge of the marine environment, and in implementing substantive protection measures.

The regulations afford relatively little attention to the issue of technology transfer. They specify that 'Transfer of technology to the Enterprise and Developing States as provided for in the Convention and the Agreement' is to be one of the principles guiding activities in the Area, with a view to promoting development of the global economy and particularly the economies of developing States.[975] Furthermore, the draft regulations provide that:

[968]UNCLOS (n 16) Art. 242.
[969]UNCLOS (n 16) Art. 143(3).
[970]UNCLOS (n 16) Arts. 271-274.
[971]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) reg 3.
[972]Ibid reg 3(d)(i).
[973]Ibid reg 3(e).
[974]Ibid reg 3(f).
[975]Ibid reg 2(b)(iv). The Enterprise is a subsidiary body of the ISA, established to serve as its commercial arm to carry out DSM (UNCLOS (n 16) arts 158(2) and 170).

> The Council may provide incentives, including financial incentives, to those Contractors entering into joint arrangements with the Enterprise under article 11 of annex III to the Convention, and developing States or their nationals, to stimulate the transfer of technology thereto and to train the personnel of the Authority and of developing States.[976]

However, the draft regulations fail to establish any substantive system for facilitating technology transfer.

Across UNCLOS and the draft regulations, there is therefore a clear obligation on both the ISA and States Parties to UNCLOS to collaborate on the protection of the marine environment which, as discussed in Section 4.2.1.1, must include marine biodiversity. There is no text that could be construed as an obligation to cooperate on the protection of biodiversity and health linkages or ecosystem services. However, this does not preclude States from doing so in practice. In this regard, I suggest it would be beneficial for the ISA to establish partnerships with relevant international organisations that can work together to operationalise DSM in a manner that simultaneously seeks to minimise harm to marine biodiversity and human health. In particular, the CBD Secretariat, the World Health Organization (WHO) and the United Nations Environment Program (UNEP) stand out as logical partners which, together, hold deep expertise on DSM, biodiversity and health. There are numerous examples of diverse agencies cooperating to solve common problems and collaboratively pursue their respective agendas, including the collaboration between the WHO, the United Nations Food and Agriculture Organization (FAO), the World Organisation for Animal Health (WOAH) and UNEP to address the issue of antimicrobial resistance.[977] In addition to strengthening interorganisational connections at an international level, I also contend that it would be beneficial for the national institutions within sponsoring States that are responsible for administration of DSM activities to partner with corresponding institutions that are responsible for public health and environmental protection, to promote institutional alignment and enhanced decision making.

In summary, international cooperation has an essential role to play in the protection of marine biodiversity, and biodiversity and health linkages. The DSM regime obligates States, as both members of the ISA and parties to UNCLOS, to cooperate to protect the marine environment. While cooperation on protection of ecosystem services and biodiversity and health linkages is not explicitly required, I posit that this should be pursued through strategic partnerships between the ISA and relevant international organisations — particularly the CBD secretariat, WHO and UNEP.

[976]Ibid reg 63(2).
[977]See ch 4 sec 1.1.

4.2.1.4. Mobilise maximum available resources

The final foundational obligation to be considered is the obligation to use maximum available resources to realise the right to health.[978] I contend that, unlike the other obligations considered earlier in this section, for the DSM regime to support fulfilment of the obligation to use maximum available resources, it need not necessarily focus expressly on human health and marine biodiversity linkages. It simply requires States to provide tools through which to access resources that may be used to support protection of the marine environment from DSM, and thus protection of the right to health. In this section I contend that the DSM regime contains several promising mechanisms to unlock such resources, but these are either reactive in nature thus only unlocking funds once harm has occurred, and/or lack adequate detail to with which to discern their potential value in practice.

As set out in previous chapters, the obligation to use maximum available resources is multifaceted and encompasses the quantity, type (i.e., both financial and non-financial) and source (i.e., public sector, private sector and international community) of resources, in addition to the manner in which they are allocated to pursue full realisation of the right to health as efficiently as possible.[979] Several of these components fall outside the scope of the regulatory regime for DSM, including assessment of whether States are deploying the *maximum* available resources and the efficiency with which they are used. What the DSM regime may do, however, is implement mechanisms that facilitate greater access to resources available from both the international community and the private sector. The ways in which the DSM regime promotes cooperation, and thus access to resources available through the international community has already been considered in Section 4.2.1.3 above. Therefore, in this section I focus on the ways in which the DSM regime, including national legislation of sponsoring States, may promote access to private sector resources that may be allocated to marine protection and thus protection of the right to health.

UNCLOS establishes a fundamental basis for accessing private resources by declaring that 'The contractor shall have responsibility or liability for any damage arising out of wrongful acts in the conduct of its operations, account being taken of contributory acts or omissions by the [ISA]'.[980] However, for several reasons, establishing contractor liability for harm is not necessarily enough on its own to unlock the full wealth of resources available through the private sector. First, we do not yet know the threshold at which the acts of contractors will be considered wrongful, thus potentially creating situations where contractors cause significant levels of environmental harm without violating any terms of their authorisation. In such a

[978]See ch 4 sec 1.4.
[979]See ch 3 sec 2.6 and ch 4 sec 1.4.
[980]UNCLOS (n 16) Annex III art 22.

situation, they are not required to undertake restorative action.[981] Moreover, even if contractors are deemed to have caused harm as a result of wrongful acts, this declaration is inconsequential if the contractor does not have sufficient resources with which to compensate for the harm caused.[982] Art. 235(3) of UNCLOS attempts to fill these liability gaps by prescribing that 'with the objective of assuring prompt and adequate compensation in respect of all damages caused by pollution of the marine environment', States Parties shall develop and implement mechanisms to establish liability and provide compensation in the event that damage occurs, 'such as compulsory insurance or compensation funds'.[983] In essence, this mandates States Parties to implement the polluter pays principle in the context of harm to the marine environment. The draft exploitation regulations acknowledge this link explicitly, by including amongst the list of principles guiding protection of the marine environment: 'the application of "the polluter pays" principle through market-based instruments, mechanisms and other relevant measures'.[984]

The draft regulations establish several mechanisms to operationalise Art. 235(3) of UNCLOS and close liability gaps, including mandatory insurance requirements for contractors, and the ECF.[985] The mandatory insurance requirement on contractors and subcontractors is a valuable step towards optimising access to private sector resources, but faces several limiting factors. Feichtner contended that securing insurance to satisfy this obligation may itself be a challenge in practice — as a new extractive industry with many knowledge gaps, prospective insurance companies will likely face significant challenges in developing models to adequately calculate the financial risk they are exposing themselves to.[986] This may therefore make it challenging for contractors to secure insurance.[987] It also remains to be seen how courts will calculate the level of diligence required by contractors to absolve them of liability for harm, thus further complicating risk calculations for the purposes of obtaining insurance.[988] On a positive note, it is possible that such uncertainty could lead insurers to impose additional environmental protection requirements on contractors to reduce the risk of harm, thus strengthening protection afforded to the marine environment and human health and marine biodiversity linkages.[989]

[981]Xiangxin Xu and Guifang Xue, 'The Environmental Compensation Fund: Bridging Liability Gaps in the Deep Seabed Mining Regime' (2021) 49 Coastal management 557, 560.
[982]Ibid 560; Isabel Feichtner, 'Contractor Liability for Environmental Damage Resulting from Deep Seabed Mining Activities in the Area' (2020) 114 Marine Policy 103502 <https://doi.org/10.1016/j.marpol.2019.04.006> accessed 23 December 2022, 8.
[983]UNCLOS (n 16) art 235(3).
[984]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) reg 2(e)(iv).
[985]Ibid regs 36 and 54-56, respectively.
[986]Feichtner (n 982) 8.
[987]Ibid.
[988]Xu and Xue, 'The Environmental Compensation Fund: Bridging Liability Gaps in the Deep Seabed Mining Regime' (n 981) 560; Feichtner (n 982) 8.
[989]Feichtner (n 982) 8.

I contend that sponsoring States also have an important role to play by embedding mandatory insurance requirements in their domestic legislation governing DSM contractors. Willaert observed that while some sponsoring States require contractors to obtain insurance, others instead allow contractors to prove that they have adequate resources to cover costs of compensation in the event that harm occurs, or to enable them to pay a security deposit to guarantee the availability of funds.[990] While the latter may offer some value, it is recommended that all sponsoring States embed mandatory insurance requirements in their domestic legislation as a tool to action the polluter pays principle and facilitate access to maximum available resources for restoration of the environment in the event of harm.[991]

The ECF is another important tool to unlock resources available from the private sector. It will be funded by a percentage of fees and penalties paid to the ISA, compensation recovered by the ISA, or any funds as determined by the Council.[992] ECF funds may be used to cover costs of remedial action (including environmental restoration and rehabilitation) that are not otherwise paid for by the responsible contractor, insurance company and/or sponsoring State, in addition to funding research and capacity development initiatives.[993] In this sense, the ECF is a more versatile tool than insurance when it comes to unlocking private sector resources, as it allows for resources to be used for a wider range of purposes that include proactive initiatives (such as research and capacity development) rather than only being available for use once harm has already occurred. However, like contractor insurance, there are various steps that must be taken before the ECF may be utilised and its true value assessed. Foremost, while the draft regulations provide for the establishment of the ECF, they do not offer any clarity concerning how it will actually function in practice, or how the ISA intends to ensure that the ECF is adequately funded to effectively fulfil the purposes for which it is created.[994] These details are yet to be prescribed by the Council.[995] Furthermore, Xue and Xu proposed that there are additional ways in which the ECF could be funded that could offer consistent income, in addition to fees and penalties paid by polluters.[996] For example, they contended that, similar to compensation schemes for nuclear accidents, all parties actively involved in DSM, including sponsoring States, contractors and subcontractors, could pay a periodic fee that is linked to the scale of their

[990]Klaas Willaert, 'Crafting the Perfect Deep Sea Mining Legislation: A Patchwork of National Laws' (2020) 119 Marine Policy 104055 <https://doi.org/10.1016/j.marpol.2020.104055> accessed 23 December 2022, 4.
[991]Ibid.
[992]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) reg 56.
[993]Ibid reg 55.
[994]Xu and Xue, 'The Environmental Compensation Fund: Bridging Liability Gaps in the Deep Seabed Mining Regime' (n 981) 562; Feichtner (n 982) 8.
[995]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) reg 54(2).
[996]Xu and Xue, 'The Environmental Compensation Fund: Bridging Liability Gaps in the Deep Seabed Mining Regime' (n 981) 564-566.

DSM activities.[997] Sponsoring States could also support the ECF by channelling into it a portion of any fees that they recover from sponsored contractors under their domestic DSM legislation.

The DSM regime therefore establishes several mechanisms that facilitate the flow of resources from the private sector to support with protection of the marine environment, in line with the polluter pays principle. These include rendering contractors liable for any harm that they cause, establishing mandatory insurance requirements for contractors and subcontractors, and establishing the ECF. However, more detail is required before we can gauge the effectiveness of these mechanisms in helping States to discharge their obligation to use maximum available resources. Next steps to operationalise these tools must come from the ISA itself, together with sponsoring States who must take steps through their national legislation to uphold the polluter pays principle and, in doing so, promote access to maximum available resources. It would also be valuable to see more financing mechanisms emerge that enable proactive investment in environmental protection, compared to liability and insurance mechanisms which are inherently reactive in nature and thus only unlock access to funds once harm has occurred.

In summary therefore, each of the foundational obligations that I set out in Chapter 4 are relevant in the context of DSM. Research into the potential impacts of DSM on the human health and marine biodiversity nexus is needed to understand and mitigate the potential human rights impacts, which must be complemented by capacity development initiatives to facilitate widespread understanding of these linkages and to provide the research community with the requisite capacity to advance the current state of knowledge. While the DSM regime contains provisions that mandate both scientific research and capacity development, they do not contain any explicit reference to health considerations. Therefore, it is important that States Parties (as members of the ISA), and sponsoring States, implement the DSM regime in a manner that promotes knowledge and capacity development regarding the potential impacts of DSM on human health and marine biodiversity linkages.

International cooperation will also be essential to achieve effective protection of marine biodiversity, and to facilitate sharing of knowledge and technologies. To promote cooperation on issues at the interface of health, biodiversity and DSM, I recommend that ties should be strengthened between the ISA, the CBD secretariat, WHO and UNEP. At a national level, sponsoring States could also benefit from promoting cooperation between public institutions responsible for administration of DSM, and institutions responsible for public health and the environment. Finally, the regulatory regime for DSM has a role to play in

[997]Ibid 565.

facilitating access to resources from both the international community and the private sector, with which to pursue full realisation of the right to health. By promoting interstate cooperation, the regime fosters access to resources available through the international community. It also takes steps to enable access to private sector resources through various mechanisms that promote the polluter pays principle, including contractor liability, mandatory insurance requirements, and establishment of the ECF. For each of these, there are many details yet to be established that will determine whether they will be effective in practice.

4.2.2. *Obligations requiring immediate fulfilment*

The second category of State obligations under the right to health that I set out in Chapter 4 are the obligations requiring immediate fulfilment. This category comprises obligations to: develop a plan for protection of the human health and marine biodiversity nexus, ensure non-discrimination in enjoyment of the right to health, and maintain existing levels of protection for marine biodiversity and ensure non-retrogression.[998] In this section I demonstrate that each of these obligations are relevant in the context of DSM, and that in its current form the DSM regime does not include the requisite measures to enable States to satisfy these obligations.

4.2.2.1. Develop a plan for protection of the human health and marine biodiversity nexus

As discussed in Chapter 4, the State obligation to develop a plan for the protection of human health and marine biodiversity linkages emerges from the explicit obligation to take steps towards progressive realisation of the right to health.[999] I noted that, while States retain discretion concerning precisely how and where they wish to set out their national plan and/or policy to protect human health and marine biodiversity linkages, ultimately consideration for the protection of these linkages should be embedded, both in national health plans, national biodiversity plans, in any plans or policies concerning industries that are capable of impacting upon these linkages.[1000] DSM falls into the latter category. Therefore, national planning initiatives for protection of these linkages must cover much more considerations than just DSM alone, but nonetheless plans for the protection of human health and marine biodiversity linkages should be included in regulatory regimes for DSM.

In short, there is no discernible evidence of such planning processes being undertaken at present in the realm of DSM. This is despite the fact that the ISA is explicitly mandated under UNCLOS to 'ensure effective protection of human life (…) with respect to activities in the Area'.[1001] The ISA Strategic Plan

[998]See ch 4 sec 2.
[999]See ch 4 sec 2.1.
[1000]See ch 4 sec 2.1.
[1001]UNCLOS (n 16) art 146.

2019-2023 acknowledges this mandate and purports that its successful implementation will 'result in the delivery of (…) a comprehensive legal framework for carrying out activities in the Area (…) including necessary measures to ensure (…) effective protection of human life'.[1002] However, in the absence of any acknowledgement of the potential for DSM to impact upon human wellbeing beyond the mining site and superadjacent waters, it is unclear how the current ISA plan or legal framework for DSM is expected to fulfil the goal of protecting human life. This suggests that the ISA interprets its mandate to 'ensure effective protection of human life' in a narrow manner that only extends to ensuring the safety of individuals at sea who are directly involved in mining activities.

In the absence of any documented progress towards realising the obligation to plan for the protection of the human health and marine biodiversity nexus, in this section I highlight several steps that States may take towards fulfilling this obligation. Perhaps most obviously, all ISA Member States, as members of the ISA Assembly that vote on the adoption of the ISA strategic plan, must actively seek the inclusion therein of steps for the protection of human health and marine biodiversity linkages. Additionally, sponsoring States should ensure that protection of these linkages is also built into their national plans or policies for the development of their domestic DSM regime through which they will govern contractors.

A challenge to implementation of this obligation at present is the paucity of detailed knowledge concerning the precise risks that DSM presents to human health and marine biodiversity linkages. In the absence of detailed research, States should exercise the precautionary principle where they have reason to believe that DSM could harm human health — such as the various potential linkages that I set out in Section 3 above.

In addition to the consideration of biodiversity and health linkages within international planning initiatives under the ISA and domestic planning initiatives of sponsoring States, I contend that contractors must also factor such considerations into their planning processes. As already noted above, every prospective contractor must submit a Plan of Work in application for an exploitation contract. In its current form, the proposed application process for an exploitation contract does not require contractors to consider, let alone set out plans to mitigate, the potential health impacts of their activities beyond the direct mining site. I contend that contractors should be required to undertake a health impact assessment (HIA) and a human rights impact assessment (HRIA), in addition to the already-required EIA, that feeds into their Plan of Work. However, since contractors, as non-State actors, are not duty bearers under IHRL, it is incumbent on States to build HIA and HRIA requirements into specific legislation and application processes for

[1002]ISA, 'Decision of the Assembly of the International Seabed Authority Relating to the Strategic Plan of the Authority for the Period 2019−2023' (n 959) Annex paras 10 and 35(a)(ii).

prospective contractors. This must be done at an international level by Member States of the ISA: particularly members of the Council who have the strongest influence in the development of the draft exploitation regulations and associated standards. However, I suggest that sponsoring States should also include such requirements in any processes by which prospective contractors apply for sponsorship.

Finally, plans for the protection of human health and marine biodiversity linkages from DSM should be based on science, developed using a transparent and participatory process, and include mechanisms to facilitate monitoring and evaluation over time.[1003] In terms of substance, such plans should embody human rights norms, including steps to combat discrimination and prioritise the needs of vulnerable groups.[1004]

4.2.2.2. Ensure non-discrimination in enjoyment of the right to health

The second immediate State obligation is the obligation to ensure non-discrimination in enjoyment of the right to health, including access to underlying determinants of health.[1005] As noted earlier in this chapter, there are several grounds on which DSM has the potential to impose a disproportionate health burden on specific groups of people. As discussed in Chapter 3, this constitutes substantive and indirect discrimination by imposing a de facto disproportionate burden on a subset of people based on a shared characteristic.[1006] Research indicates that increased exposure to heavy metals in seafood, which I highlighted above as one possible impact of DSM, has particularly strong repercussions for the wellbeing of pregnant women and children.[1007] It is also well established that climate change, which may be accelerated by disturbance of sequestered seabed carbon by DSM activities, will not impact all communities equally.[1008] At a global level, developing States (particularly small, island developing States) experience the highest degree of risk.[1009] Within national boundaries, coastal communities and communities that depend on coral reefs for food and livelihood, are subject to heightened threats to life and health through rising sea levels, and loss of coral reef ecosystems and essential ecosystem services.[1010] There are already recorded incidents of DSM

[1003]See ch 4 sec 2.1.
[1004]Ibid.
[1005]See ch 4 sec 2.2.
[1006]See ch 3 sec 2.4.
[1007]Rivera-Núñez and others (n 881) 2; Kyi Mar Wai and others, 'Prenatal Heavy Metal Exposure and Adverse Birth Outcomes in Myanmar: a Birth-Cohort Study' (2017) 14 Int J Environ Res Public Health 1339, 1–2; Al osman, Yang and Massey (n 881) 563.
[1008]S Nazrul Islam and John Winkel, *Climate Change and Social Inequality* (United Nations Department of Economic and Social Affairs Working Paper No 152, UN Doc ST/ESA/2017/DWP/152 2017).
[1009]Andrew King and Luke Harrington, 'The Inequality of Climate Change From 1.5 to 2°C of Global Warming' (2018) 45 Geophysical research letters 5030.
[1010]A Holly Dolan and Ian Walker, 'Understanding Vulnerability of Coastal Communities to Climate Change Related Risks' (2006) Special Issue 39 Journal of coastal research 1316; Joshua Cinner and others, 'Vulnerability of Coastal Communities to Key Impacts of Climate Change on Coral Reef Fisheries' (2012) 22 Global environmental change 12.

interfering with traditional fishing practices of indigenous communities in Papua New Guinea.[1011] These are just several ways in which we can reasonably assert that DSM has the potential to impose disproportionate and discriminatory health burdens on specific societal groups. Furthermore, considering the breadth of knowledge gaps concerning the impacts of DSM, it is reasonable to assume that there are a host of ways in which DSM may impact on enjoyment of the right to health that we are yet unaware of. In this regard, I urge caution in the identification of vulnerable groups, to ensure that policy makers consider not only traditional categories of vulnerable groups, but also remain attentive to groups that may suffer a disproportionate burden based on a non-traditional shared characteristic.[1012] This may include proximity to the ocean, or dependence on seafood as a source of nutrition. Until research has been conducted to identify particularly vulnerable groups, this could present an obstacle to State fulfilment of this obligation. Therefore, application of the precautionary principle is of paramount importance.

In Chapter 4, I recommend several courses of action that States should take to fulfil their obligation to ensure non-discrimination in enjoyment of the right to health.[1013] Applied to the context of DSM, these include: conducting research into the human health and marine biodiversity nexus to better understand which groups may be subject to greater health risks from DSM; developing plans to combat discriminatory outcomes from DSM; facilitating procedural environmental rights to ensure that vulnerable groups are informed of the risks they face, able to participate in decision-making processes in a meaningful way, and have access to recourse mechanisms to challenge decisions (e.g., issuance of exploitation contracts); and taking active steps to avoid discriminatory health outcomes from DSM.[1014] In the following paragraphs I comment on whether the DSM regime currently contains mechanisms to facilitate each of these components of the obligation of non-discrimination in the context of the health impacts of DSM, noting overlap with other legal arguments I developed in this chapter where relevant. The first component of the non-discrimination obligation (i.e., to conduct research into the health impacts of DSM with particular consideration for groups that may face elevated risks) is largely addressed in Section 4.2.1.1 above. As already observed, the DSM regime currently does not contain any mechanisms to advance research into its health implications. I purport this omission could be tackled through the addition of an explicit mandate to this effect in the draft exploitation regulations, in addition to both the ISA and sponsoring States mandating contractors to undertake health and human rights impact assessments. For these proposed research and impact assessment requirements to also contribute towards fulfilment of the State obligation to ensure non-

[1011]Kalolaine Fainu, '"Shark calling": Locals Claim Ancient Custom Threatened by Seabed Mining' *Guardian* (London, 30 September 2021).
[1012]See ch 4 sec 2.2.
[1013]Ibid.
[1014]Ibid.

discrimination, they must also give explicit and priority consideration to the risks presented to particularly vulnerable groups. To this end, it is important that any research into the potential health impacts of DSM is disaggregated appropriately to aid the identification of elevated risks to specific groups.

With regard to the second component of the non-discrimination obligation (i.e., the requirement to develop plans to counteract discrimination), the conclusions that I draw above in the context of developing plans to protect human health and marine biodiversity linkages apply equally here. The key addition is that such plans must include measures to combat discriminatory outcomes from DSM. Thus, the ISA's strategic plan, planning processes within sponsoring States, and the Plans of Work submitted by prospective contractors must all include steps to identify the potential for disproportionate and discriminatory health outcomes and include steps to prevent such discrimination. To this end, the DSM regime must require explicitly that Plans of Work consider the potential for discriminatory outcomes from DSM, including health outcomes.

The third component of the obligation to ensure non-discrimination that should be supported within the draft exploitation regulatory framework is to facilitate and encourage groups that are at the greatest risk of adverse health impacts from DSM to participate in decision making. The issue of procedural environmental rights — of which ensuring public participation is part — is considered in greater detail in the following section. For current purposes, I note that the draft regulations, standards and guidelines contain several provisions promoting participatory decision making.[1015] The regulations list 'effective public participation' as an overarching principle to guide environmental protection measures under the draft regulations,[1016] and impose an obligation on the ISA to 'develop, implement and promote effective and transparent (…) public participation procedures'.[1017] In contrast to these provisions, it is notable that the template EIS in the regulations instead requires contractors to 'describe the nature and extent of consultation(s) that have taken place with parties identified *who have existing interests* in the proposed project area and with other relevant *stakeholders*'.[1018] The latter text appears to require a narrower form of consultation that extends only to stakeholders who have an interest in the project, rather than the public at large.

Unfortunately, review of the draft regulations, standards and guidelines does not reveal any tangible mechanism through which the ISA intends to ensure meaningful participation of vulnerable groups in

[1015]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) regs 2(e)(vi)-(vii), 3(c) and 11(1)(a).
[1016]Ibid reg 2(e).
[1017]Ibid reg 3(c).
[1018]Ibid Annex IV sec 13. Emphasis added.

decision making.[1019] In addition, the ISA does not appear to have taken steps to determine how such vulnerable groups may be identified and contacted to encourage their participation. Based on interviews with a diverse range of stakeholders, Amon et al. asserted that 'Thus far, traditional knowledge from Indigenous Peoples and local communities has largely been ignored in decision-making processes and management-mechanism implementation, despite valuable and comprehensive understandings by these important knowledge holders'.[1020]

Moreover, as noted below in the context of the obligation to facilitate broad public participation, the DSM regime currently does not contain any mechanisms to enable third parties — including those facing the highest health risks from DSM — to contest the issuance of exploitation contracts or activities taken under such contracts.[1021]

The final component of the non-discrimination obligation is to take actual tangible steps to combat and prevent discriminatory health outcomes. Given that the exploitation phase of DSM in ABNJ has not yet commenced, it cannot yet trigger discriminatory health outcomes. For this reason, the main tangible steps that States should take to preclude such outcomes are the steps already considered above: conduct research into the impacts of DSM on human health and marine biodiversity linkages; develop plans, both nationally and within the ISA framework, to preclude discriminatory outcomes; and ensure the participation of vulnerable groups in decision-making processes. Since there is no evidence that such steps have yet been taken within the DSM regime, I conclude that States have not yet taken sufficient steps to put them on track to satisfy the obligation to ensure non-discrimination in enjoyment of the right to health, in light of the potential threats posed by DSM.

4.2.2.3. Maintain existing levels of protection and ensure non-retrogression

The final immediate obligation for consideration is the obligation of non-retrogression which, in the context of the human health and marine biodiversity nexus, I frame as an obligation to maintain existing levels of protection and to avoid unjustifiable retrogressive measures.[1022] The existence of an obligation of non-retrogression is explicitly acknowledged in the context of all ESC rights.[1023] The ESCR Committee observed that:

[1019]Such measures are prescribed by Principle 14 of the Framework Principles on Human Rights (HRC, 'Framework Principles on Human Rights and the Environment' (n 566) para 44.
[1020]Amon and others (n 941) 12.
[1021]Willaert, 'Public Participation in the Context of Deep Sea Mining: Luxury or Legal Obligation?' (n 190) 3.
[1022]See ch 4 sec 2.3.
[1023]ESCR Committee, 'General Comment No.3: The Nature of States Parties' Obligations (Art.2, Para. 1, of the Covenant)' (n 357) para 9.

> There is a strong presumption that retrogressive measures (…) are not permissible. If any deliberately retrogressive measures are taken, the State party has the burden of proving that they have been introduced after the most careful consideration of all alternatives and that they are duly justified by reference to the totality of the rights provided for in the Covenant (…).[1024]

Applied to the current context, one may contend that the obligation of non-retrogression requires States to refrain from taking actions, without adequate justification, that reduce existing levels of protection to marine biodiversity, thus endangering enjoyment of the right to health. The criteria by which the justifiability of a retrogressive act is determined remains subject to debate.[1025] In the context of the right to health, Tobin asserted that, to be considered justifiable, a decision-making process must be principled (i.e., informed by the full range of obligations under the Covenant), evidence based, consultative and participatory to the extent possible, transparent and evaluative (i.e., decisions remain subject to review).[1026]

I posit that the obligation of non-retrogression contains both substantive and procedural components. On the one hand, the obligation invokes States to achieve a substantive outcome: the preservation of existing measures designed to protect the underlying determinants of health. On the other hand, if States fail to achieve this substantive goal, the question becomes whether the retrogressive act is justifiable: in other words, whether States have followed necessary procedural requirements to enable them to justify the retrogressive act, such as those proposed by Tobin as set out in the preceding paragraph. While the regulatory framework for DSM may take steps to minimise the harm that DSM causes to marine biodiversity, the inescapable fact remains that, like any extractive industry, DSM is fundamentally an unsustainable activity that will necessarily cause environmental harm.[1027] One must therefore conclude that DSM is necessarily a retrogressive action due to the harm that it will cause to marine biodiversity, with potential knock-on implications for enjoyment of the right to health. Therefore, the substantive aspect of the obligation of non-retrogression no longer applies, and the question becomes whether the process by which a decision to authorise mining activities is reached — as laid out in the draft exploitation regulations — satisfies each of the procedural components outlined by Tobin in the preceding paragraph. If so, the issuance of exploitation contracts may be considered a justifiable retrogressive act. If not, then issuance of exploitation contracts would constitute a breach of the obligation of non-retrogression under the right to health, as it would be an unjustifiable retrogressive act.

[1024]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 32.
[1025]See Porter (n 719); Chowdhury (n 719); Tobin (n 318) ch 6.
[1026]Tobin (n 318) 237.
[1027]See Niner and others (n 834).

The first of the procedural components laid out by Tobin requires the draft regulations to at least require consideration of the potential human rights impacts of authorising an exploitation application. Unfortunately, the DSM regime does not require any form of human rights impact assessment by the applicant, nor does it require the ISA to consider human rights impacts in their deliberations.

The second procedural component requires that the decision be evidence-based. This necessitates, amongst other things, consideration of the potential impacts on human health and marine biodiversity linkages. As discussed in Section 4.2.1. above, the draft regulatory framework does not require any consideration of such linkages or acknowledge the potential for biodiversity loss or environmental harm to yield consequential implications for human health. Moreover, it is widely acknowledged that there is currently insufficient knowledge concerning the environmental impacts of DSM — let alone the health impacts — on which to make an evidence-based decision.[1028]

The third procedural component requires that the decision-making process is consultative and participatory. The issue of public participation, including transparency and access to information, is considered in Section 4.2.3.1 below. For current purposes, it is sufficient to note that the draft DSM regime has notable shortcomings concerning ensuring procedural rights, which mean that the authorisation process for exploitation contracts cannot to be considered sufficiently consultative, participatory or transparent.[1029]

The fourth procedural component requires transparency in the authorisation process. As noted in the preceding paragraph, this is also considered in Section 4.2.3.1, below, where I conclude that transparency in the DSM regime is hindered significantly by lack of transparency around the LTC's decision-making processes, in addition to an absence of controls on how widely data may be deemed confidential.

The final procedural component requires that the process is evaluative, providing mechanisms for the issuance of exploitation contracts to be challenged in an accessible and expeditious manner. This point is also discussed in detail in Section 4.2.3.1 in the context of access to justice in environmental decision making. As discussed below, the draft regulations do not establish any mechanism by which to challenge the issuance of an exploitation contract.

[1028]Amon and others (n 941) p.10.
[1029]See ch 5 sec 4.2.3.1.

Based on this analysis, one must conclude that, in the absence of necessary procedural protection in the draft regulations, the issuance of exploitation contracts must be considered an unjustifiably retrogressive act under the international human right to health. It is therefore incumbent on ISA Member States — particularly those sitting on the Council who currently have the power to influence amendment of the draft regulations — to ensure that the regulations are revised to embody each of the procedural qualities listed above. Similarly, sponsoring States should ensure that their domestic DSM legislation supports each of these components. Only once each of these components is actively embedded in the DSM regime can the issuance of an exploitation contract be considered a justifiable retrogressive act.

In summary therefore, each of the three immediate State obligations under the right to health concerning human health and marine biodiversity linkages are relevant in the context of DSM and, at the time of writing, the DSM regime does not yet contain adequate measures to support States in fulfilling any of these obligations. To take steps towards satisfying the obligation to develop a plan for protection of human health and marine biodiversity linkages, the ISA should embed within its strategic plan steps that it will take to ensure protection of human health and important human health and marine biodiversity linkages. Sponsoring States must also embed such considerations in their national planning initiatives concerning DSM. Finally, both the ISA and sponsoring States should obligate contractors to factor health considerations into their applications for an exploitation contract and sponsorship, respectively. Moreover, States should monitor fulfilment of these requirements by contractors and ensure access to justice in case of violations.

Concerning the State obligation to ensure non-discrimination in enjoyment of the right to health, it is clear that DSM has the potential to impose disproportionate health burdens on vulnerable groups, including women, children, and indigenous peoples and coastal communities. To preclude such outcomes, States must support disaggregated research into the health impacts of DSM, to support better identification of vulnerable groups and detailed understanding of the risks they face. Additionally, planning processes set out earlier in this paragraph should explicitly address the protection of vulnerable groups. To this end, the ISA and sponsoring States must develop mechanisms to support the participation of vulnerable groups in decision making.

Regarding the obligation to maintain existing levels of protection and ensure non-retrogression, DSM inherently constitutes a retrogressive act by threatening harm to marine biodiversity — an underlying determinant of health. The draft exploitation regulatory framework therefore has a key role to play in implementing necessary procedural protections to ensure that processes resulting in the issuance of

exploitation contracts ensure due consideration of potential implications for human health and human rights. Without adequate procedural protections (which are currently absent from the draft regulatory framework), issuance of exploitation contracts must be considered a breach of the obligation of non-retrogression under the right to health.

4.2.3. *Obligations requiring non-immediate fulfilment*

The final category of State obligations under the right to health that I set out in Chapter 4 are obligations requiring non-immediate fulfilment. This comprises the obligations to: ensure procedural rights in marine biodiversity management, monitor marine biodiversity and linkages to human health, mainstream the human health and marine biodiversity nexus, and ensure protection and restoration of marine biodiversity of relevance to human health.[1030]

4.2.3.1. Ensure procedural rights in marine biodiversity management

The first obligation requiring non-immediate fulfilment is the State obligation to ensure procedural rights in marine biodiversity management.[1031] As discussed at length in Chapter 4, under the right to health States are obligated to ensure rights holders' access to the underlying determinants of health, including access to health-related information and participation in health-related decision making.[1032] States are also required to ensure procedural rights in accordance with their obligation to ensure non-discrimination and their obligations to respect, protect and fulfil the right to health.[1033] In this section, I demonstrate that the draft DSM regime currently fails to adequately ensure procedural rights concerning DSM activities.

While there is widespread agreement on the importance of public participation in environmental management generally, there is an even more compelling argument for participation in the management of seabed resources in the Area. As noted, UNCLOS designates mineral resources in the Area as the 'common heritage of [hu]mankind' and 'vested in [hu]mankind as a whole',[1034] thus logically necessitating a level of civil society participation that exceeds business as usual.[1035] For this reason, some commentators suggest that the term 'stakeholder', when used to identify persons entitled to participate in decision-making concerning DSM, must extend to all humankind without restriction.[1036]

[1030]See ch 4 sec 3.
[1031]See ch 4 sec 3.1.
[1032]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 11.
[1033]ICESCR (n 316) arts 2(2) and 3; ibid paras 33, 35–37.
[1034]UNCLOS (n 16) art 136.
[1035]Ardron, Ruhl and Jones (n 190) 59; Maila Guilhon, Francesc Montserrat and Alexander Turra, 'Recognition of Ecosystem-Based Management Principles in Key Documents of the Seabed Mining Regime: Implications and Further Recommendations' (2021) 78 ICES journal of marine science 884, 893.
[1036]Willaert, 'Public Participation in the Context of Deep Sea Mining: Luxury or Legal Obligation?' (n 190) 5.

While the draft regulations contain several mechanisms that promote procedural rights,[1037] legal commentators have highlighted various shortcomings in the DSM framework in this regard. Ardron, Ruhl and Jones observed that the ISA's Mining Code placed greater emphasis on data confidentiality than transparency.[1038] Similarly, Willaert noted that 'though all activities on the deep seabed should, in principle, serve the interests of mankind as a whole (…) little attention seems to be paid to transparency, public participation and access to justice for third parties'.[1039] In particular, he cited several specific shortcomings. Under the ISA's exploration regulations, there is no process for third parties to object to, or submit comment on, the issuance of an exploration contract.[1040] Additionally, although the draft exploitation regulations do invite public comment on aspects of applications for exploitation contracts,[1041] the LTC is simply bound to 'consider' these inputs, with no guarantee that it affords them any weight in formulating a recommendation for the Council.[1042] The value of public contributions are further undermined by the pervading lack of transparency concerning decision-making processes within the LTC.[1043] Furthermore, the Council, in issuing its final decision on an exploitation contract application, need not adhere to the recommendations of the LTC, even though such recommendations may reflect views expressed through public comment.[1044] Moreover, the draft exploitation regulations do not provide any mechanism for third parties to contest the issuance of exploitation contracts.[1045]

Looking beyond the contract approval process, the draft regulatory framework does take steps to foster participation, such as by listing access to data, accountability, transparency and public participation as key principles guiding the ISA's efforts to ensure environmental protection.[1046] However, it also provides that 'confidential information' will not be made publicly available.[1047] While this is a necessary pronouncement, it remains to be seen how widely this caveat will be used and unfortunately the DSM regime does not include any recourse mechanism for third parties to contest the designation of information as

[1037]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) regs 3(c), 17(3) and 89(1).
[1038]Ardron, Ruhl and Jones (n 190) 59; Guilhon, Montserrat and Turra (n 1035) 59.
[1039]Willaert, 'Public Participation in the Context of Deep Sea Mining: Luxury or Legal Obligation?' (n 190) 1.
[1040]Ibid 3.
[1041]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) reg 11.
[1042]Willaert, 'Public Participation in the Context of Deep Sea Mining: Luxury or Legal Obligation?' (n 190) 3.
[1043]Ibid 4; Jaeckel, *The International Seabed Authority and the Pre-cautionary Principle: Balancing Deep Seabed Mineral Mining and Marine Environmental Protection* (n 16) 260–263.
[1044]Willaert, 'Public Participation in the Context of Deep Sea Mining: Luxury or Legal Obligation?' 3; ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) reg 16.
[1045]Willaert, 'Public Participation in the Context of Deep Sea Mining: Luxury or Legal Obligation?' (n 190) 3.
[1046]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) reg 2(e).
[1047]Ibid reg 89(1).

confidential.[1048] This is problematic considering designation of data as 'confidential' has been used as a loophole to hide information across disparate regimes, to the detriment of human rights.[1049]

With these weaknesses in mind, in its current form, the legal regime for DSM cannot be considered compliant with State obligations to facilitate procedural rights under the right to health. To strengthen transparency and participation, ISA Member States should facilitate greater transparency regarding decision making within the LTC, develop clear and restrictive parameters for the designation of information as confidential and establish mechanisms for third parties to challenge the issuance of exploitation contracts, in addition to the designation of information as confidential.[1050] Similarly, sponsoring States should ensure transparency and public participation around decision-making processes concerning the sponsorship of contractors.

4.2.3.2. Monitor marine biodiversity and linkages to human health

The second non-immediate State obligation concerning marine biodiversity that emerges from the right to health is an obligation to monitor marine biodiversity and linkages to human health.[1051] This obligation hinges on the premise that changes to marine biodiversity, ecosystem composition, and functioning of ecosystem services could yield knock-on implications for human health. While some of these linkages are well known, such as the role marine biodiversity plays in facilitating seabed carbon sequestration, there are doubtless many essential marine ecosystem services that are yet to be discovered. This reinforces the importance of the precautionary principle in guiding DSM activities. Biodiversity monitoring enables us to identify changes in the marine environment and to take necessary corrective action to mitigate or avoid harm to environmental and human health. In this section I demonstrate that, while a monitoring framework exists within the draft DSM regime, it is not yet operational due to a lack of detailed standards, likely driven by the paucity of knowledge on the precise environmental impacts of DSM.

Monitoring obligations can be found in several places within the DSM exploitation regime. At the highest level, UNCLOS obligates States Parties to, 'as far as practicable, (…) observe, measure, evaluate and analyse, by recognised scientific methods, the risks or effects of pollution on the marine environment'.[1052] This is twinned with an obligation to 'keep under surveillance the effects of any activities which they permit

[1048]Willaert, 'Public Participation in the Context of Deep Sea Mining: Luxury or Legal Obligation?' (n 190) 4.
[1049]UNGA, 'Principles on Human Rights and the Protection of Workers from Exposure to Toxic Substances: Report of the Special Rapporteur on the Implications for Human Rights of the Environmentally Sound Management and Disposal of Hazardous Substances and Wastes' (2019) UN Doc A/HRC/42/41, paras 60–63.
[1050]Willaert, 'Public Participation in the Context of Deep Sea Mining: Luxury or Legal Obligation?' (n 190) 4.
[1051]See ch 4 sec 3.2.
[1052]UNCLOS (n 16) art 204(1).

or in which they engage in order to determine whether these activities are likely to pollute the marine environment'.[1053] Thus, there is a clear obligation within UNCLOS for States Parties to monitor the environmental impacts of DSM.

In furtherance of these provisions, the ISA draft exploitation regulations set out a series of obligations that collectively aim to establish an environmental monitoring mechanism. In the most general sense, contractors, sponsoring States and members of the ISA are obligated to 'cooperate with the [ISA] in the establishment and implementation of programmes to observe, measure, evaluate and analyse the impacts of Exploitation on the Marine Environment'.[1054] Contractors are obligated to establish monitoring procedures and to report annually to the Secretary General of the ISA on the outcomes of their monitoring activity.[1055] Their monitoring must be guided by an Environmental Management and Monitoring Plan, the purpose of which is to 'manage and confirm that Environmental Effects [of the contractor's DSM activities] meet the environmental quality objectives and standards for the mining operation'.[1056] To achieve this, the plan must set out the details of monitoring procedures, in addition to the management responses that the monitoring outcomes trigger.[1057] In this sense, the Plan gives direction and purpose to monitoring activities by prescribing what will be monitored, appropriate environmental thresholds, and response actions in the event that these thresholds are breached.[1058] Contractors are obligated to review and update monitoring plans periodically.[1059] To guide contractors in their monitoring activities, the draft regulations obligate the ISA to develop standards concerning monitoring procedures.[1060] To date the ISA has produced draft monitoring guidelines, but has not yet released draft standards.[1061]

The draft exploitation regulatory framework therefore takes steps to develop mechanisms to monitor the impacts of DSM on marine biodiversity. However, the proposed system has several shortcomings that cast doubt on its suitability for purpose. Most importantly, the ISA does not explicitly prescribe what should be measured, nor does it set out maximum permissible levels of environmental change. As noted by Komaki and Fluharty:

[1053]UNCLOS (n 16) art 204(2).
[1054]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) reg 3(e).
[1055]Ibid regs 38(2) and 51.
[1056]Ibid reg 48.
[1057]Ibid reg 48.
[1058]Ibid Annex VII para 2(c).
[1059]Ibid reg 52.
[1060]Ibid regs 45(b) and 94.
[1061]ISA, 'Draft Guidelines for the Preparation of Environmental Management and Monitoring Plans' (31 January 2022) ISBA/27/C/6.

> The Draft Exploitation Regulations suggest basic monitoring targets (e.g., areas, effects, and categories) for the EIS and [Environmental Management and Monitoring Plan], but they are ambiguous regarding the degree to which they monitor the targets and environmental indicators, and a large part is entrusted to the contractor's judgment and interpretation, inferred from expressions such as 'impact analysis to predict the nature and extent of the environmental effects' and 'identification of directly and indirectly impacted areas'.[1062]

However, as noted by Van Doorn et al., it is not only sponsoring States and contractors that are subject to monitoring obligations — the ISA itself is obligated to establish a monitoring programme that is up to the task of facilitating 'regular observation, measurement, evaluation and analysis of the risks and effects of pollution to the marine environment that are caused by activities in the Area'.[1063] It remains to be seen whether the ISA will develop detailed standards at a later stage that will support the operation of an adequate monitoring programme. However, the consequences of the current lack of detailed standards and monitoring criteria are significant. It means that monitoring efforts will likely be fragmented, incomparable, and thus limited both in temporal and geographical scope and, ultimately, in effectiveness. Komaki and Fluharty went one step further and proposed that the optimal monitoring system could be achieved by mandating submission of raw data from contractors to a centralised database (including autonomous submission of various datapoints such as vessel location and discharge water quality), to be analysed centrally by the ISA itself.[1064] This would facilitate aggregation of contractors' monitoring data, and enable analysis of trends over broader spatial and temporal scales than individual exploitation contracts. In addition to enabling more effective and comprehensive monitoring, such a system could also reduce overall monitoring costs and, I posit, reduce potential for conflicts of interest on the part of contractors in situations where monitoring data reveals a need to curtail mining activities.[1065]

As noted by several commentators, the current lack of detail concerning environmental monitoring requirements is likely a symptom of a larger problem — the fact that we do not yet have a detailed understanding of deep sea marine ecosystems, or the impacts that DSM will have on them.[1066] Without this information, it is not possible to know which potential impacts and indicators to monitor, or how to

[1062]Kanae Komaki and David Fluharty, 'Options to Improve Transparency of Environmental Monitoring Governance for Polymetallic Nodule Mining in the Area' (2020) 7 Frontiers in Marine Science article 247 <https://doi.org/10.3389/fmars.2020.00247> accessed 23 December 2022, 9.
[1063]Erik van Doorn and others, 'Risk Assessment for Deep-Seabed Mining' in Rahul Sharma (ed), *Perspectives on Deep-Sea Mining: Sustainability, Technology, Environmental Policy and Management* (Springer 2021), 507.
[1064]Komaki and Fluharty (n 1062) 17.
[1065]Ibid.
[1066]Anthony Kung and others, 'Governing Deep Sea Mining in the Face Of Uncertainty' (2021) 279 J Environ Manage 111593. <https://doi.org/10.1016/j.jenvman.2020.111593> accessed 23 December 2022, 9; Komaki and Fluharty (n 1062) 2.

proactively mitigate potential risks.[1067] In support of this point, Kung et al. observed that 'Policy decisions about acceptable thresholds of environmental risk will need to be made on the basis of scientific evidence'.[1068] The fact that a lack of adequate scientific baseline data is driving the development of a DSM regime that is unfit for purpose gives credence to the global calls from countries and companies alike for a moratorium on DSM until we know more about the deep sea environment.[1069]

Another notable shortcoming observed by Komaki and Fluharty in the draft DSM monitoring system is the lack of provision for the ad-hoc reporting of environmental incidents by third parties.[1070] A system that facilitates third-party reporting which, in turn, triggers prompt investigation by the ISA could enable identification and mitigation of environmental harms that are not detected by contractors' monitoring systems (such as harm occurring outside the contracted mining area).[1071]

Finally, a notable omission from the draft exploitation regime monitoring system is any obligation pertaining to monitoring of health-related impacts. This could include an obligation on contractors to monitor health-related indicators, an obligation on the ISA to prescribe health-related indicators that contractors must include in their monitoring programmes and an obligation on sponsoring States to develop regulatory frameworks to ensure that contractors under their responsibility adequately monitor for adverse impacts from their activities. This, of course, brings us back to the inescapable truth that we do not currently know what these indicators would be — thus further cementing the assertion that detailed scientific research into the environmental and health implications of DSM much precede any exploitation activities in the Area.

In summary, although a skeleton monitoring framework exists within the current draft exploitation regime, in its current form it does not contain sufficient detail to be enable identification of potential health impacts of DSM in practice. Therefore, as the state of scientific knowledge advances, States, in their capacity as the decision makers within the ISA that are developing the draft exploitation framework, must ensure that the ISA promulgates detailed monitoring standards that include monitoring for health impacts. Sponsoring States in turn must incorporate adequate legal mechanisms within their national DSM framework and

[1067]Kung and others (n 1066) 9; Komaki and Fluharty (n 1062) 2.
[1068]Kung and others (n 1066) 9.
[1069]Reid (n 164); MacLellan (n 164). At CBD COP in November 2022, President Macron of France called for an outright ban on DSM (Woody (n 164)).
[1070]Komaki and Fluharty (n 1062) 17.
[1071]Ibid.

enforce contractors' compliance with their monitoring obligations (including through mechanisms to ensure access to justice).

4.2.3.3. Mainstream the human health and marine biodiversity nexus

The third non-immediate State obligation is the obligation to mainstream the human health and marine biodiversity nexus. This translates into an obligation to promote awareness of human health and marine biodiversity linkages and to ensure that they are duly factored into decision-making processes. This does not obligate States to protect these linkages at the expense of all competing interests, but rather to ensure that decisions that threatens these linkages are taken consciously, transparently, and with full awareness of the potential health implications. As mentioned in Chapter 4, in practice this will not only require States to factor health considerations into policies and regulatory frameworks related to marine biodiversity, and vice versa. States must also ensure that the human health and marine biodiversity nexus is given due consideration in the regulation of any other sector or industry that is capable of harming human health and marine biodiversity linkages.[1072]

DSM is a prime example of an industry that is capable of harming human health through a negative impact on marine biodiversity. Therefore, awareness and consideration of the human health and marine biodiversity nexus should be built into the regulatory regime for DSM. The regulatory framework that States are developing under the ISA is the primary mechanism for governing DSM in ABNJ, and thus should contain adequate mechanisms to ensure consideration of the human health and marine biodiversity nexus, as discussed further below. Sponsoring States have a particularly strong role to play in mainstreaming the nexus into the regulation of DSM. In addition to the responsibility that they share with all other ISA Member States to develop a comprehensive regulatory framework that is compliant with their obligations under IHRL, sponsoring States must also mainstream the human health and marine biodiversity nexus into their domestic legislation through which they regulate sponsored contractors. For the purposes of this thesis, I do not investigate whether any countries have yet implemented national DSM legislation that adequately embodies the human health and marine biodiversity nexus, as my focus is upon the regulation of DSM at an international level. However, research into the mainstreaming of the nexus within national legislation of sponsoring States would be a valuable subject of future study.

Regrettably, the draft DSM framework currently contains no discernible acknowledgement of the importance of the human health and marine biodiversity nexus, and thus falls significantly short of the

[1072]See ch 4 sec 3.3.

standard required to mainstream the nexus into the DSM regime. This is likely due to a limited awareness, understanding or consideration of the potential health impacts of DSM, perhaps twinned with resistance to acknowledging any further obstacles to the operationalisation of a potentially lucrative industry that is already facing significant resistance.

As noted in Chapter 4, decisions of the CBD COP and reports of the World Health Assembly (WHA) provide guidance on precisely how this nexus may be embedded within a regulatory regime. Specifically, they advocate the prioritisation of research into health and biodiversity linkages to inform planning processes and to identify indicators by which to measure the health of these important linkages;[1073] the consideration of these linkages within impact assessments;[1074] and the development of integrated monitoring systems that allow for identification of and response to any health threats from biodiversity loss and ecosystem change.[1075] As already highlighted earlier in this section, the draft exploitation framework does not incorporate the human health and marine biodiversity nexus into research agendas, impact assessment processes or environmental monitoring frameworks. Therefore, without further revision to the draft exploitation regime, States have not satisfied their obligation under the right to health to mainstream the human health and marine biodiversity nexus into the regulatory regime for DSM.

4.2.3.4. Take all measures necessary to ensure protection and restoration of marine biodiversity and ecosystem services

The final non-immediate State obligation to be considered is the due diligence obligation to take all measures necessary to ensure protection and restoration of marine biodiversity of relevance to human health.[1076] This obligation derives explicitly from Article 12(2)(b) of ICESCR, which requires States to take steps to improve environmental hygiene for the purposes of protecting human health. It also derives from the State obligation to protect the underlying determinants of health, which includes a healthy environment and, I posit, marine biodiversity itself.[1077] Read in its narrowest sense, one may argue that this obligation only requires States to take steps to protect marine biodiversity of relevance to human health. In practice however, I suggest that the preservation of a healthy marine environment depends upon protection of all components of marine ecosystems to avoid disrupting the fragile equilibrium within and between

[1073]CBD, 'Mainstreaming of Biodiversity Within and Across Sectors and Other Strategic Actions to Enhance Implementation' (n 764) para 21(a).
[1074]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para 4(d); CBD, 'Mainstreaming of Biodiversity Within and Across Sectors and Other Strategic Actions to Enhance Implementation' (n 764) para 21(b); WHO, 'Health, environment and climate change: Human health and biodiversity, Report by the Director-General' (n 80) para 19(d).
[1075]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2) para 4(d); WHO, 'Health, environment and climate change: Human health and biodiversity, Report by the Director-General' (n 80) para 19(h).
[1076]See ch 4 sec 3.4.
[1077]See ch 3 sec 1.

ecosystems. Therefore, twinned with State obligations to apply an ecosystem approach and the precautionary principle,[1078] I contend that States are obligated to take all measures necessary to ensure protection and restoration of marine biodiversity and ecosystem services generally, on the basis that a healthy marine environment is beneficial to human health.[1079]

Considering the risks that DSM poses to the marine environment, the question at hand, to understand whether States are in compliance with their obligations under the right to health, is whether the draft exploitation regime for DSM under the ISA contains adequate measures to protect the marine environment. It is beyond the scope of this section to provide a comprehensive and exhaustive answer to this question, as this alone could serve as a PhD research topic. For current purposes, in this section I offer several examples of areas where the DSM regime in its current draft form falls short of the standard required for States to satisfy their human rights obligations.

Before considering the documents produced by the ISA, UNCLOS itself imposes a clear responsibility, both on States Parties and the ISA, to protect the marine environment.[1080] To this end, States are obligated to, inter alia, conduct an impact assessment for planned activities that they have reasonable grounds to believe 'may cause substantial pollution of or significant and harmful changes to the marine environment',[1081] and to take necessary measures to 'prevent, reduce and control pollution of the marine environment from activities in the Area undertaken by vessels, installations, structures and other devices flying their flag or of their registry or operating under their authority'.[1082] The latter will be particularly relevant for sponsoring States under the DSM regime, mandating them to take steps to regulate pollution from the activities of their sponsored contractors. Sponsoring States are also under an obligation of due diligence to take necessary measures to ensure contractors' compliance with applicable obligations under international law, including the ISA regulations and standards.[1083] With regards to the ISA itself, protection of the marine environment comprises a fundamental pillar of its mandate, along with its obligation to promote the development of deep seabed minerals.[1084]

[1078]Sarah Ryan Enright and Ben Boteler, 'The Ecosystem Approach in International Marine Environmental Law and Governance' in Timothy O'Higgins, Manuel Lago and Theodore DeWitt (eds), *Ecosystem-Based Management, Ecosystem Services and Aquatic Biodiversity: Theory, Tools and Applications* (Springer International Publishing AG 2020); ITLOS (n 340) para 135.
[1079]See ch 3 sec 1 and ch 4 sec 3.4.
[1080]UNCLOS (n 16) arts 192 and 145, respectively.
[1081]UNCLOS (n 16) art 206.
[1082]UNCLOS (n 16) art 209(2).
[1083]UNCLOS (n 16) art 139(2); ITLOS (n 340) paras 109-110.
[1084]UNCLOS (n 16) arts 145, 153(1) and 157(1), respectively.

In a general sense, UNCLOS therefore sets out the mandate for States, in their capacity as both sponsoring States and as decision makers within the ISA, to protect the marine environment and, by extension, marine biodiversity. Nonetheless, the obligations under UNCLOS itself are necessarily brief, leaving much detail to be substantiated through the DSM regime under the ISA. The draft exploitation regulations contain multiple mechanisms that promote protection of the marine environment. I do not intend to cover each of these in this section, but will highlight several noteworthy components. The regulations provide that, inter alia, the ecosystem approach and the polluter pays principle must guide the protection of the marine environment under the regulations.[1085] The regulations also explicitly mandate contractors, sponsoring States and the ISA to apply the precautionary approach and to use 'Best Available Techniques' and 'Best Available Environmental Practices' in their activities, to ensure 'effective protection for the Marine Environment from harmful effects'.[1086]

In addition to these guiding principles, the regulations require contractors seeking approval of their Plans of Work (i.e., their application for an exploitation contract) to submit to the ISA, inter alia, an EIS summarising the results of an EIA, and an Environmental Management and Monitoring Plan.[1087] Moreover, as already discussed above, the regulations will establish an ECF, designed to cover the costs of any environmental harm.[1088] The Regulations also obligate the ISA to develop standards regulating environmental quality objectives, explicitly including biodiversity status.[1089] This builds on the pre-existing obligation on the ISA to adopt, 'rules, regulations and procedures incorporating applicable standards for the protection and preservation of the marine environment', as set out in the 1994 Agreement on the implementation of Part XI of UNCLOS.[1090] To date, no such standards have been drafted, but it is important to note that the draft exploitation framework has not been finalised at the time of writing. Noteworthy for current purposes, the regulations also provide that 'The contractor shall temporarily reduce or suspend production whenever such reduction or suspension is required to protect the Marine Environment from Serious Harm or a threat of Serious Harm or *to protect human health and safety*'.[1091]

It remains to be seen how this provision will be interpreted and used in practice, but logically it must be interpreted to include all manner of threats to human health resulting from environmental harm, including loss of biodiversity and interruption of ecosystem services.

[1085]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) reg 2(e).
[1086]Ibid reg 44.
[1087]Ibid regs 7(3)(d) and 47(1).
[1088]Ibid pt IV sec 5.
[1089]Ibid regs 45 and 94.
[1090]Part XI Implementing Agreement (n 841) sec 1(5(g).
[1091]ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) reg 28(3). Emphasis added.

Collectively, the legal tools contained in the draft regulations, a portion of which are considered in the previous paragraphs, establish the foundations for a system designed to protect the marine environment (including marine biodiversity) from the risks posed by DSM. However, the primary criticism that has been levelled against the draft regime by numerous critics is that we currently lack the requisite understanding of the deep seabed environment, or the real-world impacts of DSM, to design appropriate protective measures, and that this undermines the draft regime's efforts at environmental protection.[1092] This is evident in the lack of technical detail set out in the draft exploitation framework. As mentioned above, the framework currently fails to specify precise indicators and thresholds of environmental health,[1093] which undermines the ability of contractors to undertake effective and harmonised monitoring. It also calls into question the ability of contractors to undertake meaningful impact assessments of their proposed activities, in the absence of precise criteria indicating what they should be assessing.[1094] Overall, this reinforces the importance of the State obligation to advance scientific research, as a prerequisite to fulfilling other biodiversity-related obligations under the right to health. It also reinforces arguments from the public and private sector that a moratorium on DSM is required to allow research to inform smart regulatory decisions.[1095]

Another essential consideration is that, as discussed throughout this chapter, effective environmental protection under the DSM exploitation regime does not only depend upon the implementation of effective regulatory tools by the ISA. It also depends heavily upon sponsoring States adopting and enforcing appropriate national legislation to ensure contractors' compliance with the relevant provisions of UNCLOS and the ISA framework.[1096] This obligation on sponsoring States is embedded in the due diligence obligation proclaimed by ITLOS, as discussed in Sections 4.1 and 4.2, above. This then raises the question whether the due diligence obligation obligates sponsoring States to take legislative action to fill gaps in the ISA exploitation regulations and associated standards, to prevent contractors under their supervision from causing unacceptable environmental harm.[1097] If so, this risks creating fragmentation and inconsistency in the ways that sponsoring States regulate their respective contractors. For example, if the ISA exploitation

[1092]Kung and others (n 1066) 8 and 10; van Doorn and others (n 1063) 510; Craig Smith and others, 'Deep-Sea Misconceptions Cause Underestimation of Seabed-Mining Impacts' (2020) 35 Trends in ecology & evolution (Amsterdam) 853, 855 and 857.
[1093]van Doorn and others (n 1063) 510.
[1094]Kung and others (n 1066) 8-9.
[1095]Reid (n 164); MacLellan (n 164); 'Outcomes of the 2019 PIF Civic Society and Private Sector Dialogues Released' (*Pacific Island Forum*, 4 September 2019) <www.forumsec.org/2019/09/04/outcomes-of-the-2019-pif-civil-society-and-private-sector-dialogues-released/> accessed 22 December 2022.
[1096]Xu and Xue, 'Potential Contribution of Sponsoring State and its National Legislation to the Deep Seabed Mining Regime' (n 931) 1-2.
[1097]Ibid 2.

framework lacks sufficiently detailed standards concerning precise indicators and thresholds of environmental monitoring, sponsoring States are logically obligated to develop their own standards to fill this gap. This runs the risks of different States developing different standards, resulting in inconsistent levels of environmental monitoring by contractors. Thus, clarity and detail at the level of the ISA is essential to enable sponsoring States to adequately discharge their duties, and to avoid fragmentation in the DSM regime.

Thus, in its current form, the draft exploitation regime is not yet sufficiently developed to adequately protect marine biodiversity — and by extension human health — from the threats of DSM. In this regard, ISA Member States have not yet fulfilled their obligation under the human right to health to take all measures necessary to ensure protection of marine biodiversity. As scientific knowledge develops, the ISA must promulgate a package of detailed standards necessary to give focus and meaning to the broadly worded environmental protection mechanisms in the DSM regime, and sponsoring States must implement robust domestic legislation to hold contractors accountable to the minimum environmental standards established by the ISA.

In summary, each of the four State obligations under the right to health that require long term fulfilment are highly relevant in the governance of DSM, and none of them have yet been fulfilled by the draft DSM regime in its current form. The obligation to ensure procedural rights in biodiversity management is important in any context, but arguably even more so in the governance of an area that has been declared the common heritage of humankind. While the DSM regime facilitates public participation to an extent, it is restricted both by limited transparency around decision making in the ISA (particularly the LTC) and by the absence of a mechanism for third parties to contest the issuance of an exploitation contract.

The State obligation to monitor marine biodiversity and linkages to human health is partially satisfied by the monitoring mandates imposed on contractors, sponsoring States and the ISA itself. However, the efficacy of such monitoring is undermined by the lack of detail regarding the precise indicators that should be monitored and appropriate thresholds for such indicators. This is likely due to the lack of understanding around the environmental impacts of DSM, or the deep seabed environment itself.

The State obligation to mainstream the human health and marine biodiversity nexus has not been satisfied within the draft DSM regime, which contains no discernible acknowledgement of the linkages between human health and marine biodiversity.

Finally, the obligation to take all measures necessary to ensure protection and restoration of marine biodiversity has received a similar degree of fulfilment to the obligation to monitor marine biodiversity and linkages to human health. While the DSM regime contains a series of measures designed to minimise the harm that DSM will cause to the marine environment, their efficacy is hampered by the lack of detail, which is again likely due to the lack of scientific data on the impacts of DSM.

5. Conclusions

In this chapter, I illustrated the value of applying the theoretical framework that I developed in Chapter 4 for the protection of the marine biodiversity and human health nexus to an ocean governance regime — specifically DSM in ABNJ. In doing so, I demonstrated how this framework can be used to critically assess whether an ocean governance regime is equipped to protect marine biodiversity to the extent necessary to protect enjoyment of the human right to health. Additionally, through this chapter I provided constructive criticism on the current draft regime on the exploitation phase of DSM and its compatibility with relevant IHRL obligations arising from the right to health. In doing so, I provided policy recommendations that, if implemented, would yield a DSM regime that is better aligned with IHRL and international biodiversity law, with the potential to afford stronger protection to human health and marine biodiversity alike.

These findings are timely as humanity finds itself at a tipping point, on the threshold of giving the green light on full-scale commercial DSM, when we still have a window of opportunity in which to develop a regime that can pursue the objective of mineral resource extraction, while simultaneously minimising adverse impacts on human health and marine biodiversity. It is incumbent on the research community to provide evidence — of which my thesis is part — to support informed decision making in the development of such a regime.

Based on my analysis of the draft regime for the exploitation phase of DSM, I have found that each of the eleven obligations I outlined in Chapter 4 is relevant in the context of DSM. However, at present none are adequately supported within the DSM regime. This means that States — as both duty bearers under IHRL and the parties responsible for crafting the DSM regime — are currently not taking the requisite steps to develop the regime in a manner that is compatible with their obligations under IHRL. From this conclusion, I compiled recommendations on how the draft DSM regime should be revised to bring it into closer alignment with IHRL — specifically focussing on the right to health. I summarise these recommendations in the remainder of this conclusion. In addition to promoting alignment between the DSM regime and IHRL,

my recommendations concerning actions required by sponsoring States may also help to flesh out the content of the due diligence obligation on sponsoring States, as proclaimed by ITLOS.[1098]

The first package of obligations that I set out in Chapter 4 — the foundational obligations — comprises obligations to: develop and ensure access to scientific research on the human health and marine biodiversity nexus, ensure individual capacity development concerning the human health and marine biodiversity nexus, cooperate through relevant international fora to protect the human health and marine biodiversity nexus, and mobilise maximum available resources.[1099] Regarding the first of these obligations, at present knowledge gaps pervade regarding the environmental impacts of DSM,[1100] and there is no apparent knowledge base on the health impacts of DSM. While the DSM regime mandates ISA Member States, sponsoring States and contractors to advance marine scientific research including into the impacts of DSM on marine biodiversity,[1101] these obligations do not require consideration of the health impacts that may ensue. To advance research in this area and to pursue fulfilment of the State obligation to advance research into human health and marine biodiversity linkages, States Parties to the ISA should include an explicit mandate for research into health impacts in the draft exploitation regulations, and ISA States parties and sponsoring States must mandate contractors to consider the health implications of their activities in their EIA processes.

The State obligation to develop the capacity of knowledge consumers, producers and brokers regarding the human health and marine biodiversity nexus essentially amounts to an obligation to operationalise the outcomes of research into human health and marine biodiversity linkages, while simultaneously supporting further research in this area. At present, the DSM regime imposes general obligations on the ISA, its Member States, contractors and sponsoring States to undertake capacity development. However, given the generality of their wording, the question of whether these obligations will be discharged in a manner that supports the corresponding State obligation to promote capacity development around human health and marine biodiversity linkages depends on how they will be implemented in practice. To facilitate equal capacity development at a global level, States must also promote technology transfer and ensure equal participation of the Global South in defining ocean research agendas.[1102]

[1098]ITLOS (n 340) para 110; UNCLOS (n 16) art 139(2).
[1099]See ch 4 sec 1.
[1100]Amon and others (n 941) 10.
[1101]UNCLOS (n 16) art 143(2); ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) reg 3(e)-(f), 7(3), 47(1) and Annex IV secs 4-6.
[1102]Harriet and others (n 964).

International cooperation also has an essential role to play to achieve effective protection of human health and marine biodiversity linkages. The DSM regime imposes a package of obligations on the ISA itself, its Member States, sponsoring States and contractors to cooperate in the protection of the marine environment.[1103] There is no explicit mandate, however, to cooperate on the protection of ecosystem services or human health and marine biodiversity linkages. To promote cooperation on issues at the interface of health, biodiversity and DSM, I contend that ties should be strengthened between the ISA, the CBD secretariat, WHO and UNEP. Simultaneously, at a national level, sponsoring States could also benefit from stronger cooperation between public institutions responsible for administration of DSM, public health, and the environment, respectively.

Finally, States are obligated to use maximum available resources in fulfilment of the right to health.[1104] This includes resources available through international cooperation and assistance, and also through the private sector. Through mandating interstate cooperation, the DSM regime promotes access to resources that may be available through the international community. The DSM regime also creates various mechanisms that promote access to private sector resources, through deployment of the polluter pays principle. These include rendering contractors liable for harm that they cause, mandatory contractor and sub-contractor insurance requirements, and establishment of the ECF.[1105] However, for each of these mechanisms, there are many details yet to be established by the ISA and sponsoring States that will determine whether they are effective in practice. Moreover, except for the ECF, these mechanisms are reactive in nature, unlocking funds only once harm to marine biodiversity has already occurred. Therefore, the regime would benefit from additional proactive mechanisms to enable upfront investment in preventive and precautionary measures to protect marine biodiversity.

The second package of obligations that I set out in Chapter 4 — obligations requiring immediate fulfilment — comprises obligations to: develop a plan for protection of the human health and marine biodiversity nexus, ensure non-discrimination in enjoyment of the right to health, and maintain existing levels of protection and ensure non-retrogression.[1106] As DSM is an industry that will likely impact human health and marine biodiversity linkages with negative health outcomes for both human and environmental health, the State obligation to ‘take steps’ under the right to health mandates States to plan for the protection of

[1103]UNCLOS (n 16) arts 143(3), 242 and 271-274; ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) regs 2(b)(iv), 3 and 63(2).
[1104]ICESCR (n 316) art 2(1).
[1105]UNCLOS (n 16) Annex III arts 22, 36 and 54-56, respectively.
[1106]See ch 4 sec 2.

these linkages from DSM.[1107] There is no discernible evidence of such planning activities to date, or mandates to undertake such planning. To take steps towards satisfying this obligation to develop a plan for protection of human health and marine biodiversity linkages, ISA States Parties should embed within the ISA strategic plan steps that the ISA will take to protect important human health and marine biodiversity linkages. Sponsoring States in turn should embed such considerations in their national planning initiatives regarding DSM. Finally, both the ISA and sponsoring States should obligate contractors to factor health considerations into their applications for an exploitation contract and sponsorship, respectively.

Regarding the State obligation to ensure non-discrimination in enjoyment of the right to health, research indicates that DSM has clear potential to impose disproportionate health burdens on vulnerable groups.[1108] To preclude such outcomes, it is imperative that States advance disaggregated research into the health impacts of DSM, which will help to identify groups that experience an elevated health risk from DSM, in addition to aiding identification of ways to combat these risks. Additionally, planning processes considered in the context of the previous immediate obligation must also require explicit planning for the protection of vulnerable groups. Furthermore, the ISA and sponsoring States must develop mechanisms to support informed participation of vulnerable groups in decision making.

Regarding the final immediate obligation — to maintain existing levels of protection and ensure non-retrogression — the issuance of an exploitation contract for DSM is inherently a retrogressive act in light of the harm that it presents to marine biodiversity.[1109] The question is therefore whether issuance of an exploitation is a justifiable or unjustifiable retrogressive act, which depends upon whether the process by which a contract was issued satisfies a series of procedural checks and balances discussed in Section 4.2.2.3 above. In its current form, such procedural requirements are not satisfied, rendering the issuance of an exploitation contract an unjustifiable retrogressive act regarding realisation of the right to health. To rectify this issue, ISA States Parties should push for a regime for issuance of exploitation contracts in a manner that is principled, evidence-based, consultative, participatory, transparent, and evaluative.[1110]

The third and final package of obligations that I set out in Chapter 4 — obligations requiring non-immediate fulfilment — comprises obligations to: ensure procedural rights in marine biodiversity management;

[1107]ICESCR (n 316) art 2(1); Tobin (n 318) 178; ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 43(f); CRC Committee, 'General Comment No.15 on the Right of the Child to the Enjoyment of the Highest Attainable Standard of Health (art 24)' (n 390) para 73(d).
[1108]Rivera-Núñez and others (n 881) 2; Islam and Winkel (n 1008); King and Harrington; Kalolaine Fainu, '"Shark calling": Locals Claim Ancient Custom Threatened by Seabed Mining' *Guardian* (London, 30 September 2021).
[1109]See Niner and others (n 834).
[1110]Tobin (n 318) 237.

monitor marine biodiversity and linkages to human health; mainstream the human health and marine biodiversity nexus; and take all measures necessary to ensure protection and restoration of marine biodiversity and ecosystem services.[1111] The obligation to ensure procedural rights in biodiversity management is of paramount importance in the DSM regime, especially so given that the Area and its resources are deemed the common heritage of humankind.[1112] The DSM regime takes some steps to facilitate participation by, amongst other things, inviting comments on applications for exploitation contracts. However, procedural rights in the DSM regime are undermined by a few key weaknesses, including lack of transparency regarding the LTC's decision-making processes, the absence of a mechanism for third parties to contest issuance of an exploitation contract, and a lack of clear parameters around what data may be deemed 'confidential' and thus hidden from the public eye. To satisfy their obligation to facilitate procedural rights in the DSM regime, ISA States Parties should take steps to address each of these shortcomings.

The second non-immediate obligation — to monitor marine biodiversity and linkages to human health — is partially satisfied within the DSM regime by monitoring mandates on contractors, sponsoring States and the ISA itself.[1113] However, the efficacy of such monitoring is undermined by three factors. First, there is a notable lack of detail regarding the precise indicators that should be monitored and appropriate thresholds for such indicators, beyond which environmental or health impacts must be deemed unacceptable. This is likely due to the paucity of information on the potential impacts of DSM.[1114] Second, there is no mechanism for ad-hoc reporting of environmental incidents by third parties, which means that harm not detected by monitoring systems implemented by contractors, the ISA or sponsoring States may pass unrecorded.[1115] Finally, there is no obligation within the DSM regime to monitor for adverse health outcomes, or to monitor metrics of essential ecosystem services. As the state of scientific knowledge advances, ISA Member States must ensure the ISA's promulgation of detailed monitoring standards (including health-related indicators), and sponsoring States must in turn hold contractors accountable for undertaking such monitoring.

The third non-immediate obligation requires States to mainstream the human health and marine biodiversity nexus into governance frameworks for public health, biodiversity protection, and any sector capable of impacting upon this nexus. At present, the DSM regime contains no discernible recognition of the human

[1111]See ch 4 sec 3.
[1112]UNCLOS (n 16) art 136.
[1113]UNCLOS (n 16) art 204(1) and (2); ISA, 'Draft Regulations on Exploitation of Mineral Resources in the Area' (n 945) regs 3(e), 48, 51 and Annex VII para 2(c).
[1114]Komaki and Fluharty (n 1062) 9.
[1115]Ibid 17.

health and marine biodiversity nexus. This is a significant omission that must be addressed both within the DSM framework under the ISA, and national legal and institutional frameworks of sponsoring States.

The final non-immediate obligation is the obligation to take all measures necessary to ensure protection and restoration of marine biodiversity and ecosystem services. Like environmental monitoring requirements considered above, in its current form the DSM regime includes several mechanisms and mandates to protect marine biodiversity, but currently lacks the necessary detail to operationalise these aspirational provisions. Again, this is reflective of the fact that we currently have no clear understanding of the environmental impacts of DSM, and thus cannot yet develop appropriate regulatory regimes to protect against environmental harm.[1116] As scientific knowledge develops, the ISA must develop detailed standards to flesh out the broad environmental protection mechanisms currently contained within the DSM regime, and sponsoring States must promulgate domestic legislation that enforces contractors' compliance with the ISA's standards.

Through this chapter, I have demonstrated the relevance and value of my research findings in earlier chapters, which culminated in the package of obligations that I prescribed in Chapter 4. I have showcased how this framework of obligations can be used to identify specific policy recommendations for the improvement of ocean governance regimes, to harmonise and promote mutual supportiveness between IHRL, international environmental law, and the law of the sea. In the context of DSM specifically, I hope the policy recommendations that I present in this chapter help promote a DSM regime that respects and protects both marine biodiversity and human health — rather than one that yields catastrophic outcomes for both. In the next and final chapter, I reflect on the key findings from my research, highlight its original contribution to legal scholarship, and highlight several additional areas of potential research that would complement my research findings in this thesis.

[1116]Kung and others (n 1066) 8 and 10; van Doorn and others (n 1063) 510; Smith and others (n 1092) 855 and 857.

Chapter 6

CONCLUSIONS

Through my doctoral research embodied in this thesis, I have added to an emerging body of academic literature on the relationship between international human rights law (IHRL) and biodiversity. My research constitutes the first identifiable piece of literature to clarify the specific relationship between the human right to health under IHRL and marine biodiversity. I have thus filled a knowledge gap concerning the precise State obligations under the right to health regarding the governance of marine biodiversity. In so doing, I have built on the work of former UN Special Rapporteur on Human Rights and the Environment, John Knox, who undertook one of the first analyses of State obligations under IHRL concerning governance of biodiversity.[1117]

The impetus for this thesis stems from the fact that marine biodiversity is now widely understood to be a key source of food, nutrition, essential ecosystem services and biomedical discovery that supports human health and wellbeing. Nonetheless, despite a network of international and domestic law designed to protect our ocean, marine biodiversity continues to decline rapidly, driven by a multitude of anthropogenic factors including overfishing, pollution, habitat destruction and climate change.[1118] Against this backdrop, through this thesis I have answered the following research question:

> *How can the human health and marine biodiversity nexus be better reflected in international law to maximise health benefits, and address trade-offs and common drivers for health risks and marine biodiversity loss?*

[1117]HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166).
[1118]See ch 1 sec 2 for detailed analysis of the human health and marine biodiversity nexus, including the drivers of harm.

While there are numerous bodies of international law that may be mobilised in pursuit of this goal, including environmental law, private law and more progressive concepts such as rights of nature, I chose to focus on IHRL — specifically the human right to health — for several reasons.[1119] Human rights frequently enjoy a status of legal and socio-political priority and are widely considered to comprise 'maximum claims on society, elevating concern for the environment above a mere policy choice that may be modified or discarded at will'.[1120] In addition to promoting positive substantive outcomes, human rights also promote equitable and inclusive decision-making processes that embody democratic values,[1121] as well as unlock access to individual recourse mechanisms under IHRL.[1122] However, while I note the strengths of IHRL, I also acknowledge its limitations in tackling environmental issues.[1123] Foremost amongst these is the criticism that IHRL is fundamentally anthropocentric and thus ill-suited to addressing anything outside the direct sphere of human influence.[1124] However, as we progress towards a more nuanced understanding of humankind's interaction with the natural world that recognises the interconnectedness of all life on Earth, it is becoming increasingly apparent that the objectives of human rights and environmental protection can be mutually supportive.[1125] I also demonstrate that IHRL may operate in a complementary and mutually supportive manner with other areas of law (including international environmental law, private law and rights of nature), to collectively further environmental goals.[1126]

Through this thesis I demonstrate that, by applying an interpretation of 'health' that aligns with current scientific literature, marine biodiversity not only can, but must, be considered a foundational component of the international human right to health. This is an important conclusion because it means that the right to health — which every State is already committed to protect[1127] — in fact gives rise to a package of State obligations concerning the conservation and sustainable use of marine biodiversity, to protect marine ecosystem services and to minimise adverse health outcomes from mismanagement of the marine environment. In doing so, I demonstrate that the right to health under IHRL can be used to better reflect the human health and marine biodiversity nexus in law in order to maximise health benefits, and address trade-

[1119]See ch 2, sec 1 for a breakdown of the strengths and weaknesses of adopting a human rights focus.
[1120]Shelton, 'Human Rights and the Environment: Problems and Possibilities' (n 239) 44.
[1121]Ibid.
[1122]Ibid; Bodansky (n 180) 517.
[1123]See ch 2 sec 1.1.
[1124]Grear (n 199) 152; Borràs (n 199) 115.
[1125]Kotzé (n 178) 265.
[1126]See ch 2 sec 1.2.
[1127]OHCHR, 'Fact Sheet No. 31, The Right to Health' (OHCHR, June 2008) <www.ohchr.org/en/publications/fact-sheets/fact-sheet-no-31-right-health> accessed 19 December 2022, 1. The accuracy of this statement was reaffirmed on 11th April 2022, using the United Nations UN Treaty Body Database ('UN Treaty Body Database' (*United Nations Human Rights Treaty Bodies*, ND) <https://tbinternet.ohchr.org/_layouts/15/TreatyBodyExternal/Treaty.aspx> accessed 19 December 2022), to confirm that each State is bound, through ratification, accession or succession, to at least one of the international human rights treaties listed in footnote 1 above, signifying their commitment to the human right to health.

offs and common drivers for health risks and marine biodiversity loss. In the following section, I synthesise my key research findings.

1. Key findings

To understand the foundation on which my research builds, in Chapter 2 I began with an assessment of primary and secondary sources to ascertain the extent to which the environment, and specifically marine biodiversity, is recognised as essential to the enjoyment of human rights under IHRL. The intersection between environmental issues and human rights has now gained significant traction in IHRL and is reflected in three distinct approaches to integrating the two: the 'greening' of existing substantive rights; recognising procedural environmental rights (including rights of access to information, participation in environmental decision making and access to justice) and recognising a stand-alone right to a healthy environment.[1128] My research falls into the first of these categories ('greening' the right to health to reflect the intrinsic relationship between human health and marine biodiversity). While a healthy natural environmental is now widely recognised as intrinsic to the enjoyment of human rights under IHRL,[1129] the relationship between human rights and biodiversity, specifically, is less well established. The first tangible reference to biodiversity in IHRL can be found in Article 20(1) of the 2018 United Nations Declaration on the Rights of Peasants and Other People Working in rural Areas (Peasants Declaration), which states that:

> States shall take appropriate measures, in accordance with their relevant international obligations, to prevent the depletion and ensure the conservation and sustainable use of biodiversity in order to promote and protect the full enjoyment of the rights of peasants and other people working in rural areas.

I contend that this provision is to the intersection of biodiversity and human rights as the 1972 Stockholm Declaration was to the intersection of the environment and human rights, both representing the first official recognition of these respective relationships. While the biodiversity and human rights connection is not yet well established in IHRL, various publications by the World Health Organization (WHO) and the Convention on Biological Diversity (CBD) suggest that international public health law and international biodiversity law are more advanced in their recognition of the human health and marine biodiversity nexus

[1128] See ch 2 sec 2.1.2.
[1129] See eg HRC, 'General Comment No.36 on Article 6 of the International Covenant on Civil and Political Rights, on the Right to Life' (n 243) para 62.

than IHRL.[1130] In short, little progress has yet been made to recognise this nexus within IHRL.[1131] It is on this baseline that my research builds.

Against this backdrop, in Chapter 3 I demonstrated that there are at least two grounds on which to argue that States are already obligated to protect marine biodiversity under the right to health in IHRL. Both hinge upon the understanding, as validated by the Committee on Economic, Social and Cultural Rights, that the right to health is not a right to be healthy, nor is it simply a right to healthcare. Rather, it is a right to 'the enjoyment of a variety of facilities, goods, services and conditions necessary for the realisation of the highest attainable standard of health'.[1132] In addition to healthcare, these 'facilities, goods, services and conditions' include a non-exhaustive and expanding array of 'underlying determinants' of health, including food and nutrition, housing, access to safe and potable water and adequate sanitation, safe and healthy working conditions, and '*a healthy environment*'.[1133]

The first argument for a State duty to protect marine biodiversity under the right to health stems from the fact that a healthy environment is already recognised as an underlying determinant of the right to health.[1134] Similarly, the International Covenant on Economic, Social and Cultural Rights explicitly obligates States to ensure 'the improvement of all aspects of environmental and industrial hygiene'.[1135] As acknowledged by the former UN Special Rapporteur Knox, 'obligations to protect against environmental harm that interferes with the enjoyment of human rights (…) apply to biodiversity as an integral part of the environment'.[1136] On this basis, there is a strong argument that, as reflected in the increasing scientific understanding of the importance of ecosystem services for supporting human health, existing State obligations to protect the environment in the interests of the right to health can extend to the protection and sustainable use of marine biodiversity.[1137]

The second argument for a state duty to protect marine biodiversity under the right to health rests on the growing body of evidence concerning human health and marine biodiversity linkages, twinned with the fact

[1130]See eg Romanelli and others (n 2); WHO, 'Health, Environment and Climate Change: Human Health and Biodiversity, Report by the Director-General' (n 80); CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2).
[1131]One notable milestone in recognising the intersection between human rights and biodiversity is the following publication by former UN Special Rapporteur John Knox: HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166).
[1132]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 9.
[1133]Ibid para 11. Emphasis added.
[1134]Ibid para 4.
[1135]ICESCR (n 316) art 12(2)(b).
[1136]HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166) para 26.
[1137]See ch 3 sec 1.

that the portfolio of recognised underlying determinants to health continues to grow as understanding of human health develops.[1138] Thus, marine biodiversity should be considered an underlying determinant of the right to health in its own right, due to the intrinsic role it plays in providing essential ecosystem services (including provision of food and nutrition, as well as the regulation of atmospheric oxygen and carbon sequestration).[1139]

While establishing this tangible connection between marine biodiversity and the right to health is an important development in its own right, it follows that the right to health gives rise to a package of State obligations concerning management of the marine environment. In Chapter 4, I present and detail these obligations, and categorise them respectively as foundational, immediate, and non-immediate obligations. Foundational obligations are those that serve as logical prerequisites to enable States to fulfil immediate and non-immediate obligations.[1140] These include obligations to: develop and ensure access to research on human health and marine biodiversity linkages, ensure individual capacity development concerning the human health and marine biodiversity nexus, cooperate through relevant international fora to protect human health and marine biodiversity linkages, and mobilise maximum available resources towards the protection of human health and marine biodiversity linkages. Immediate obligations are named as such either because they are explicitly recognised within IHRL as transcending the doctrine of progressive realisation, or they derive from obligations that transcend the doctrine of progressive realisation. These include obligations to: develop a plan for protection of the human health and marine biodiversity nexus, ensure non-discrimination in enjoyment of the right to health, and maintain existing levels of protection for marine biodiversity and to ensure non-retrogression.[1141] Finally, non-immediate obligations are those that fall within the doctrine of progressive realisation and thus will take both time and resources to satisfy fully, as well as prior action towards fulfilment of the foundational and immediate obligations outlined above. These include the obligations to: ensure participation and procedural rights in marine biodiversity management, monitor marine biodiversity and linkages to human health, mainstream the human health and marine biodiversity nexus, and to take all measures necessary to ensure protection and restoration of marine biodiversity and ecosystem services.[1142]

In Chapter 5, I applied this package of obligations to a case study on deep seabed mining (DSM) in the Area. In doing so, I demonstrated how these obligations can be used as a diagnostic framework to critically

[1138]ESCR Committee, 'General Comment No.14: The Right to the Highest Attainable Standard of Health (Art.12)' (n 233) para 10.
[1139]See ch 3 sec 1.
[1140]See ch 4 sec 1.
[1141]See ch 4 sec 2.
[1142]See ch 4 sec 3.

assess whether an ocean governance regime is adequately equipped to protect marine biodiversity to the extent necessary to protect enjoyment of the human right to health. The precise impacts of DSM both on ocean and human health remain uncertain. Nonetheless, despite prevailing knowledge gaps, from the available literature on the projected environmental impacts of seabed mining, there are at least three potential pathways for environmental harm to negatively impact human health. These are: (1) impacts upon fisheries with consequential implications for food security and nutrition,[1143] (2) increased metal concentrations in deep sea ecosystems that may enter the food web and ultimately present food safety risks to humans,[1144] and (3) interruptions to the carbon cycle that may exacerbate climate change and threaten human wellbeing.[1145] This means that, given the potential for DSM to infringe enjoyment of the right to health, States must duly consider their obligations under the right to health when formulating the regulatory regime for DSM under the auspices of the International Seabed Authority (ISA). Through detailed analysis of the draft regulatory regime for DSM in Chapter 5, I, conclude that thus far States have failed to satisfy any of their obligations under the right to health concerning governance of marine biodiversity, and I offer a series of policy recommendations to rectify the current disharmony. Through this case study analysis, I demonstrate the value of the three categories of obligations that I detailed in Chapter 4. I showcase the value of this framework for identifying opportunities to promote stronger coherence between ocean governance regimes and IHRL, and I demonstrate the importance of embodying the human health and marine biodiversity nexus in international law.

2. Research contributions and limitations

In this Section, I both highlight the contributions that my research makes to the existing body of scholarly literature and reflect on its limitations. My doctoral research makes an original contribution to the bodies of existing literature on the legal protection of the human health and marine biodiversity nexus, and on the relationship between IHRL and biodiversity. The timeliness of this research is evidenced by a decision of the CBD COP calling for further research on the protection of the human health and biodiversity nexus.[1146] Moreover, it adds to a budding body of legal scholarship on the intersection of human rights and biodiversity, on which relatively little research has been undertaken to date.[1147] In addition to advancing the body of academic research on the interaction between human rights and biodiversity, this thesis also offers

[1143]See ch 5 sec 3.1.
[1144]See ch 5 sec 3.2.
[1145]See ch 5 sec 3.3.
[1146]CBD, 'Conference of the Parties to the CBD Decision XIII/6' (n 2).
[1147]See eg HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166); Morgera, 'Dawn of a New Day? The Evolving Relationship Between the Convention on Biological Diversity and International Human Rights Law' (n 170).

timely input into the development of the DSM regime. To date, the DSM regime has already met with significant resistance, primarily based on DSM's unknown potential for environmental harm.[1148] Most recently, this has culminated in French President Emmanuel Macron calling for a complete ban on DSM at the 27th Conference of the Parties to the CBD in November 2022.[1149] My research explores further the grounds for concerns regarding the impacts of DSM, looking beyond just its environmental impacts. In this regard, my research adds to a modest body of literature on the potential human rights implications of DSM in the Area,[1150] and is one of the first pieces of research highlighting the potential impacts of DSM for enjoyment of the human right to health specifically. Given that a narrow window of time still remains for the ISA to make amendments to the draft exploitation regime, I hope that my policy recommendations may help to inform the design of a regulatory regime for DSM that does not yield catastrophic outcomes for both ocean and human health.

In addition to highlighting the benefits and contributions of my research, it is also incumbent on me to acknowledge its limitations. Doctoral research is often necessarily in-depth but narrow in scope, and this is equally true here. My research focuses only on the relationship between marine biodiversity and the right to health. As such, it does not offer any direct insights into the relationship between marine biodiversity and any other human rights, except for highlighting in general terms the relevance of marine ecosystem services for the enjoyment of human rights adjacent to the right to health (e.g., the rights to life, food, work and freedom from discrimination, in addition to the rights of indigenous peoples). Moreover, by focusing explicitly on marine biodiversity, this thesis offers limited insights into the relationship between the right to health and terrestrial biodiversity. While it is likely that the logic linking marine biodiversity to the enjoyment of the right to health may potentially be extrapolated to terrestrial biodiversity,[1151] the obligations that stem from this (as set out in Chapter 4 in the context of marine biodiversity) may be very different.

In addition to thematic limitations presented by the narrow research focus, there are numerous other elements that I was unable to include due to limitations based on time and space. Areas that I did not consider include human rights obligations of non-State actors that stem from the human health and marine biodiversity nexus, and the potential for extraterritorial application of the obligations that I set out in Chapter 4. While these would both be valuable additions to this body of research, I chose to exclude them to retain my focus on more conventional and established human rights norms. In doing so, I demonstrate,

[1148]Reid (n 164); MacLellan (n 164); Woody (n 164).
[1149]Woody (n 164).
[1150]Morgera and Lily (n 171); Aguon and Hunter (n 171); Seto and others (n 171).
[1151]See ch 3 sec 1.

without dependence on potentially controversial or less widely accepted aspects of IHRL, that States are obligated to take stronger steps to protect ocean and human health alike.

Finally, linked to the topic of limitations, I close this section by noting that, while in this thesis I herald the importance of protecting human health and marine biodiversity linkages to facilitate enjoyment of the right to health, this is not always going to be a top priority for States. The doctrine of progressive realisation necessarily affords States a margin of discretion to take whatever steps they feel most appropriate and efficient to achieve full realisation of the right to health (excluding obligations requiring immediate fulfilment), taking account of their national priorities and available resources. Thus, many States may — and in some cases should — decide that they have more pressing health-related issues to address. This will be particularly pertinent for developing States who may lack comprehensive public health infrastructure, in which case filling such gaps would obviously take priority. Nonetheless, States are ultimately obligated, in time, to achieve *full* realisation of the right to health. Therefore, I contend that, sooner or later, all States must grapple with protection of the human health and marine biodiversity nexus, considering the importance of marine biodiversity for enjoyment of the highest attainable standard of health.

3. Continuing the research agenda

As with any body of doctoral research, in addition to advancing the state of academic knowledge and answering pre-existing questions, my research has given rise to multiple new lines of questioning that I am unable to address within the time and length constraints of a doctoral thesis. For this reason, I wish to close by highlighting several key outstanding bodies of research that, if explored, would help to move this research agenda forward.

First, as noted above, this research only applies to the relationship between the right to health and *marine* biodiversity. Further research is needed to ascertain the relationship between the right to health and *terrestrial* biodiversity. Such research would fill this gap and facilitate a holistic understanding of the relationship between the right to health and biodiversity.

Second, on a broader scale, there would be significant value in research into the relationship between biodiversity and the wider corpus of human rights recognised under IHRL. To date, literature has drawn links between biodiversity and a spectrum of human rights on a relatively general level.[1152] In-depth

[1152]See HRC, 'Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' (2017) (n 166).

research into the relationship between biodiversity and a selection of other human rights would offer significant value by helping to identify any complementarities or conflicts between biodiversity obligations stemming from the full spectrum of related rights. Human rights worthy of detailed consideration include the rights to life, food, work, and freedom from discrimination, in addition to the rights of indigenous peoples.

Third, my research focuses exclusively on the obligations, under the right to health, that States are required to fulfil within their national jurisdictions. This research would be complemented by further analysis into both the potential for the human health and marine biodiversity nexus to impose obligations on non-State actors, in addition to the potential for extraterritorial application of the obligations that I detailed in Chapter 4.

Fourth, the scope of this thesis is restricted to international law. However, there are likely valuable lessons to be learned from ascertaining whether, and if so how, States have reflected the human health and marine biodiversity nexus within their domestic human rights legislation and jurisprudence. Lessons learned at the national level could help to inform reinforcement of the nexus within IHRL, in addition to offering strategies to support harmonisation of national legislation across States. For this reason, I suggest there would be value in a detailed course of research into domestic human rights law, and the ways in which various States deal with the human health and marine biodiversity nexus. On a related note, my analysis into the alignment of the DSM regime with the right to health was also restricted to the United Nations Convention on the Law of the Sea, its Part XI Implementing Agreement, and the draft exploitation regulations and corresponding standards and guidelines of the ISA. There would also therefore be value in analysing the extent to which national legislation of sponsoring States aligns with their responsibilities under the right to health in IHRL.

Fifth, in this thesis I have focused primarily on protecting the ecosystem services that humans currently enjoy from marine biodiversity, in addition to preventing mismanagement of the marine environment in a manner that could yield mutual harm for both ocean and human health. However, marine biodiversity also offers invaluable insights and active ingredients to biomedical breakthroughs and pharmaceutical developments.[1153] It is therefore conceivable that some of the greatest contributions that marine biodiversity has to offer have not yet been discovered. And yet, in this thesis I have not been able to identify grounds on which to mobilise the right to health to protect marine biodiversity on the basis of its invaluable

[1153]See ch 1 sec 2.2.3.

biomedical potential. Any advancement on this issue would greatly strengthen the human rights toolkit for protecting the full spectrum of interactions between human health and marine biodiversity.

In closing, I simply wish to contextualise this research within the broader sphere of environmental advocacy and sustainable development. By attaching marine biodiversity to the human right to health, I have presented an additional set of tools through which to strengthen protection of the intrinsic relationship that exists between humans and the natural world. This contributes to a larger movement towards recognising the interconnectedness of all life on Earth and building this reality into our legal and socio-political landscape.[1154] Only through such a foundational realignment of values can we hope to tackle the rising tide of environmental crises, including the sixth mass extinction event and climate change, which threaten the continued existence of the global biome of which we are part. In the words of Sir David Attenborough, 'the truth is: the natural world is changing. And we are totally dependent on that world. It provides our food, water and air. It is the most precious thing we have and we need to defend it'.[1155]

[1154]Eg see literature on the One Health approach and the ecosystem approach.
[1155]Robin McKie, 'Interview: David Attenborough: Force of Nature' *Guardian* (London 27 October 2012).

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