

INTERNATIONAL TRIBUNAL FOR THE LAW OF THE SEA

Case No. 31

**REQUEST FOR AN ADVISORY OPINION SUBMITTED BY THE
COMMISSION OF SMALL ISLAND STATES ON
CLIMATE CHANGE AND INTERNATIONAL LAW**



**WRITTEN STATEMENT OF THE
COMMISSION OF SMALL ISLAND STATES ON
CLIMATE CHANGE AND INTERNATIONAL LAW**

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ABBREVIATED TERMS

AMOC	Atlantic Meridional Overturning Circulation
AOSIS	Alliance of Small Island States
Barcelona Convention	Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean
BBNJ Agreement	Draft 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 (4 March 2023)
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species
COP27	27th Meeting of the Conference of the Parties to the United Nations Framework Convention on Climate Change
COSIS or the Commission	Commission of Small Island States on Climate Change and International Law
COSIS Agreement	Agreement Establishing the Commission of Small Island States on Climate Change and International Law
EEZ	exclusive economic zone
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Pollution
GHG	greenhouse gas
ICAO	International Civil Aviation Organization
ICJ	International Court of Justice
ILC	International Law Commission
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission
IPCC	Intergovernmental Panel on Climate Change
ITLOS or the Tribunal	International Tribunal for the Law of the Sea
MARPOL Convention	International Convention for the Prevention of Pollution from Ships

NDC	Nationally Determined Contribution
OSPAR Convention	Convention for the Protection of the Marine Environment of the North-East Atlantic
Third Conference	Third United Nations Conference on the Law of the Sea
UNCLOS or the Convention	United Nations Convention on the Law of the Sea
UNEP	UN Environment Programme
UNESCO	UN Educational, Scientific, and Cultural Organization
UNFCCC	UN Framework Convention on Climate Change
VCLT	Vienna Convention on the Law of Treaties
WMO	World Meteorological Organization

**PART I:
INTRODUCTION AND BACKGROUND**

**CHAPTER 1:
PRELIMINARY STATEMENT**

1. The Commission of Small Island States on Climate Change and International Law (“COSIS,” or the “Commission”), pursuant to its mandate to promote the development and implementation of international law concerning climate change, has submitted the present request for an advisory opinion from the International Tribunal for the Law of the Sea (“ITLOS,” or the “Tribunal”). The Commission instituted these proceedings in the belief that clarification of the obligations of States Parties under the 1982 United Nations Convention on the Law of the Sea (“UNCLOS,” or the “Convention”) should guide the conduct of the international community to urgently protect and preserve the ocean¹ against the deleterious effects of anthropogenic greenhouse gas (“GHG”) emissions associated with climate change.

2. Climate change poses an existential threat to life on Earth. In the words of the UN Secretary General, the “alarm bells are deafening and the evidence is irrefutable”: climate change is a “code red for humanity,”² and “[w]e must use all our resources to build a sense of urgency” to limit global temperature rise to 1.5°C above pre-industrial levels.³ The failure to meet this target will almost certainly have catastrophic consequences for humankind as a whole, with Small Island States set to suffer disproportionate impacts. In turning to the Tribunal, the Commission recognizes the centrality of the ocean in addressing climate change: the ocean has absorbed over 90 percent of the heat and 25 percent of the carbon dioxide that anthropogenic GHG emissions have trapped in the atmosphere since the pre-industrial era. The introduction of heat and carbon dioxide into the marine environment by GHG emissions has already had deleterious effects: sea-level rise, ocean acidification, ocean warming, collapse of marine ecosystems, displacement of low-lying populations, economic devastation, food insecurity, and other impacts, with the worst yet to come if States do not immediately implement measures to change the present course. Some Small Island States may even vanish due to rising sea levels.

3. Since as early as 1990, the Alliance of Small Island States (“AOSIS”) has warned about the consequences of inaction, and the disproportionate harm inflicted upon vulnerable nations by climate change despite their minuscule contributions to GHG emissions. Intergovernmental negotiations under the 1992 UN Framework Convention on Climate Change (the “UNFCCC”) and the 2015 Paris Agreement have shown some progress since then, but they have been inadequate for addressing the urgency and magnitude of this perilous

¹ The “ocean” not “the oceans” is used throughout this Written Statement, in accordance with its preferred usage by the Intergovernmental Panel on Climate Change (the “IPCC”)—the United Nations body for assessing the science related to climate change—as well as all other ocean-focused entities, given the ocean’s interconnected and inseparable nature. *See, e.g.*, Expert Report of Sarah Cooley, Ph.D., on Impacts of Anthropogenic Greenhouse Gas Emissions on the Marine Environment and Affected Communities (16 June 2023) (“Cooley Report”) (Annex 4), § I.A.

² UN Secretary-General, Statement on the IPCC Working Group 1 Report on the Physical Science Basis of the Sixth Assessment (9 August 2021).

³ *Climate Change: An “Existential Threat” to Humanity, UN Chief Warns Global Summit*, UNITED NATIONS NEWS (15 May 2018).

situation. GHG emissions have reached all-time highs, with scientific evidence establishing that, absent immediate and far-reaching action, sustained temperature rise will be significantly more than 1.5°C above pre-industrial levels by 2030—a mere seven years away.

4. International law must play a critical role in ensuring the collective survival of humankind. The integral link between climate change and the ocean renders UNCLOS a fundamental source of international law with respect to climate change. Although climate change was not explicitly taken into account in the negotiation of UNCLOS in 1982, its significant impacts on the ocean make GHG emissions undoubtedly a “problem[] of ocean space” that the Convention’s Preamble notes must be considered “as a whole.” Part XII of UNCLOS—with its general obligation to protect and preserve the marine environment, and the corresponding duty to “prevent, reduce and control pollution of the marine environment”—is the only binding global instrument that can meaningfully address the greatest threat to the marine environment. In the words of Professor Alan Boyle, Part XII of the Convention “requires states to take the measures necessary to protect the marine environment from the harmful effects of anthropogenic climate change.”⁴

5. As the sole permanent dispute resolution forum established by UNCLOS and with its specialized competence in the law of the sea, the Tribunal is especially well placed to address the questions raised in the request for an advisory opinion. The Tribunal could assist States Parties by identifying obligations that are legally binding rather than discretionary, and defining with greater precision the *specific obligations* under UNCLOS with respect to climate change on the basis of established scientific evidence. That body of evidence—generally accepted by the global community—clearly demonstrates that an increase in global average temperature of 1.5°C above pre-industrial levels constitutes a threshold over which the catastrophic effects of climate change move from moderate to high. The Paris Agreement accordingly set a global standard of holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, while leaving States a measure of discretion in implementing measures designed to reach that goal.

6. The problems of climate change, and thus the solutions to them, are inherently scientific in nature—and the Tribunal has demonstrated that it is particularly adept at considering scientific evidence. COSIS respectfully submits that, in addressing the questions that form the subject matter of the request for an advisory opinion, the Tribunal be guided by this scientific evidence so that it can define with greater precision the specific content of the obligations of UNCLOS States Parties. Up-to-date scientific data are a critical yardstick against which States’ environmental due diligence obligations must be measured.

7. In brief, COSIS is of the view that it is of utmost importance for the Tribunal, by means of a thorough advisory opinion, to provide meaningful guidance to States Parties in safeguarding the ocean, which serves a critical function in mitigating and adapting to the existential threats posed by climate change.

⁴ Alan Boyle, *Protecting the Marine Environment from Climate Change: The LOSC Part XII Regime*, THE LAW OF THE SEA AND CLIMATE CHANGE: SOLUTIONS AND CONSTRAINTS (2021), p. 84.

CHAPTER 2: INTRODUCTION

8. The present request from the Commission marks an important development in efforts by Small Island States to promote and contribute to the clarification of the international law concerning climate change—one of the most pressing global challenges of our time, and an urgent and, in some cases, even existential threat to Small Island States. This Chapter sets out the constitution, purpose, and activities of the Commission (Section I), the procedure in making the present request for an advisory opinion from the Tribunal and the questions in that request (Section II), and an outline of the Commission’s written statement (Section III).

I. Constitution, purpose, and activities of the Commission

9. This Section sets out the Commission’s constitution and composition (Subsection A), purpose and mandate (Subsection B), and activities (Subsection C).

A. Constitution and composition

10. The Commission was established by Antigua and Barbuda and Tuvalu on 31 October 2021 upon their conclusion in Edinburgh of the Agreement for the Establishment of the Commission of Small Island States on Climate Change and International Law (the “COSIS Agreement”) during the 26th Meeting of the Conference of the Parties of the UNFCCC in Glasgow.⁵ The COSIS Agreement entered into force pursuant to its Article 4 upon signature by the Prime Ministers of Antigua and Barbuda and Tuvalu. It was duly registered with the UN Secretariat under Article 102 of the Charter, following which the Secretariat issued Certificate No. 56940 on 3 February 2022 and published the Agreement in the UN Treaty Collection.

11. The COSIS Agreement created the Commission as an intergovernmental organization with international legal personality, thus establishing it as an international organization.⁶ Article 3 provides that the Commission is represented by its Co-Chairs, elected every two years. Antigua and Barbuda and Tuvalu were elected as Co-Chairs on 31 October 2021.

12. Pursuant to Article 3(1) of the COSIS Agreement, membership in the Commission is open to all members of AOSIS. Following Antigua and Barbuda and Tuvalu, the Republic of Palau signed instruments acceding to the COSIS Agreement on 4 November 2021, followed by Niue on 13 September 2022, the Republic of Vanuatu on 2 December 2022, Saint Lucia on 7 December 2022, Saint Vincent and the Grenadines on 9 June 2023, and Saint Christopher (Saint Kitts) and Nevis on 13 June 2023.⁷ All COSIS Member States are also States Parties to the Convention.⁸

⁵ COSIS, 2022 Annual Report (31 October 2022), p. 4.

⁶ COSIS Agreement, Article 1(1)–(2); *see* Vienna Convention on the Law of Treaties, Article 2(1)(i).

⁷ Palau, Instrument of Accession to the COSIS Agreement (4 November 2021) (subject to approval under its internal law); Niue, Instrument of Accession to the COSIS Agreement (13 September 2022); Vanuatu, Instrument of Accession to the COSIS Agreement (2 December 2022); Saint Lucia, Instrument of Accession to the COSIS Agreement (7 December 2022); Saint Vincent and the Grenadines, Instrument of Accession to the COSIS Agreement (9 June 2023) (Annex 1); Saint Christopher (Saint Kitts) and Nevis (13 June 2023) (Annex 2).

⁸ UN Treaty Collection, UNCLOS Status List.

B. Purpose and mandate

13. The COSIS Agreement expresses the Member States' alarm at "the catastrophic effects of climate change which threaten the survival of Small Island States, and in some cases, their very existence," and their determination to "take immediate action to protect and preserve the climate system and marine environment based on equity and the common but differentiated responsibilities of States to combat climate change."⁹ Member States also note the injustice of having to "bear a disproportionate and overwhelming burden of the adverse effects" of global warming even though they emit negligible amounts of GHG emissions.¹⁰

14. The impact of climate change on the ocean is a central element of the Commission's mandate. The Preamble to the COSIS Agreement notes the:

- (a) "[F]undamental importance of the oceans as sinks and reservoirs of greenhouse gases and the devastating impact for Small Island States of related changes in the marine environment";
- (b) "[I]mportance of maritime zones and the significant reliance of Small Island States on marine living resources within such zones, as well as the impacts of climate change on the marine environment including marine living resources"; and
- (c) "[O]bligations of States" under UNCLOS, as well as "other conventions and principles of international law applicable to the protection and preservation of the climate system and marine environment."

15. In the conviction that international law has an important role to play in addressing the climate crisis, the Commission was established with a mandate to:

promote and contribute to the definition, implementation, and progressive development of rules and principles of international law concerning climate change, including, but not limited to, the obligations of States relating to the protection and preservation of the marine environment and their responsibility for injuries arising from internationally wrongful acts in respect of the breach of such obligations.¹¹

16. Specifically, the COSIS Agreement provides that the Commission's activities shall include, *inter alia*:

assisting Small Island States to promote and contribute to the definition, implementation, and progressive development of rules and principles of international law concerning climate change, in particular the protection and preservation of the

⁹ COSIS Agreement, Preamble.

¹⁰ *Id.*

¹¹ *Id.*, Article 1(3).

marine environment, including through the jurisprudence of international courts and tribunals.¹²

COSIS thus provides a vehicle through which Small Island States may cooperate on a global basis to contribute to the rules and principles of international law concerning climate change.

17. The Commission, pursuant to Article 3(3) of the COSIS Agreement, has appointed a diverse and gender-balanced group of 14 international lawyers to its Committee of Legal Experts.¹³ Through its Subcommittees on the Marine Environment, Loss and Damage, Sea-Level Rise, Human Rights, and Litigation Management, the Committee advises the Commission on a wide range of topics related to its mandate and activities.¹⁴

18. Further to the Commission’s mandate and activities—and “[h]aving regard to the fundamental importance of oceans as sinks and reservoirs of greenhouse gases and the direct relevance of the marine environment to the adverse effects of climate change on Small Island States”—Article 2(2) of the COSIS Agreement authorizes the Commission to request advisory opinions from the Tribunal on any legal question within the scope of the Convention, consistent with the Tribunal’s Statute and Rules.

C. Activities

19. In the first year and half of its existence, the Commission has been engaged in conducting activities to fulfill its mandate. The Commission’s 2022 annual report describes these activities in greater detail.¹⁵

20. On 12 December 2022, the Commission initiated these advisory proceedings with a request for an advisory opinion on the questions described in Section II below.

21. COSIS has also been supporting the initiative in the UN General Assembly that led, in March 2023, to the adoption of Resolution 77/276 seeking an advisory opinion from the International Court of Justice (the “ICJ”) on the obligations of States in respect of climate change.¹⁶ Like those at issue in these proceedings, the questions submitted to the ICJ refer to obligations of States under international law, including UNCLOS, to protect and preserve the marine environment, and to the particular vulnerability of Small Island States to the adverse effects of climate change.¹⁷ COSIS has hosted events supporting the initiative in New York and during the 27th Meeting of the Conference of the Parties to the UNFCCC (“COP27”) in Sharm el-Sheikh, and it has sought to provide legal assistance to Small Island States that may wish to participate in the proceedings.¹⁸ Most recently, the Commission has sought leave from the ICJ to furnish information on the questions submitted for an advisory opinion.

¹² *Id.*, Article 2(1).

¹³ *See* COSIS, 2022 Annual Report (31 October 2022), p. 12.

¹⁴ *Id.*, p. 8.

¹⁵ *Id.*, pp. 9–20.

¹⁶ *See* COSIS, 2022 Annual Report (31 October 2022), p. 15.

¹⁷ UN General Assembly, Resolution 77/276, Request for an Advisory Opinion of the International Court of Justice on the Obligations of States in Respect of Climate Change (29 March 2023).

¹⁸ *See* COSIS, 2022 Annual Report (31 October 2022), pp. 20–22.

22. COSIS also has decided to submit a written opinion in response to the request for an advisory opinion on the scope of State obligations for responding to the climate emergency from the Inter-American Court of Human Rights submitted by the Republic of Chile and the Republic of Colombia. That request, too, refers to the harm of sea-level rise and ocean acidification as consequences of climate change.¹⁹

23. The Commission hopes that its submissions in these advisory proceedings before international courts and tribunals, in addition to its other activities, will contribute to the clarification, harmonization, and progressive development of international obligations with respect to climate change.

II. The Commission's request for an advisory opinion

24. This Section sets out the procedure by which the Commission submitted the present request for an advisory opinion (Subsection A), and the questions within that request (Subsection B).

A. Procedure

25. On 24 November 2021, the Co-Chairs requested that the Committee of Legal Experts deliver a recommendation regarding a request for an advisory opinion from the Tribunal. On 18 June 2022, the Committee delivered Recommendation CLE. 1/2022/Rec, which proposed two questions for the Commission to consider referring to the Tribunal consistent with Article 2(2) of the COSIS Agreement. During its Third Meeting on 26 August 2022, COSIS unanimously adopted the Committee's recommendation and decided to refer the two questions to the Tribunal.²⁰

26. On 12 December 2022, the Commission transmitted the request for an advisory opinion to the Tribunal.²¹ In accordance with Article 131 of the Rules of the Tribunal, that transmission enclosed copies of the Decision of the Commission, the COSIS Agreement, and a dossier of documents likely to throw light upon the questions submitted.

B. Questions

27. The Commission has requested an advisory opinion from the Tribunal on the following questions:

What are the specific obligations of State Parties to the United Nations Convention on the Law of the Sea (the "UNCLOS"), including under Part XII:

(a) to prevent, reduce and control pollution of the marine environment in relation to the deleterious effects that result or are likely to result from climate change, including through

¹⁹ See Republic of Colombia and the Republic of Chile, Request for an Advisory Opinion on the Climate Emergency and Human Rights, (9 January 2023), pp. 3–5.

²⁰ COSIS, Decisions of the Third Meeting (26 August 2022), ¶ 1.

²¹ COSIS, Request for an Advisory Opinion from ITLOS (12 December 2022).

ocean warming and sea level rise, and ocean acidification, which are caused by anthropogenic greenhouse gas emissions into the atmosphere?

(b) to protect and preserve the marine environment in relation to climate change impacts, including ocean warming and sea level rise, and ocean acidification?

28. Question (a) focuses on States Parties' obligations under, *inter alia*, Article 194 to prevent, reduce, and control "pollution of the marine environment," which the Convention defines in Article 1(1)(4). Question (b) asks the Tribunal to opine on States Parties' obligation under Article 192 to protect and preserve the marine environment from climate change impacts. The key difference between the first and second questions is that the second question goes beyond the concept of "marine pollution" to encompass the more general obligation to protect and preserve the marine environment in Article 192, independent of the Tribunal's conclusion as to whether certain acts constitute "pollution of the marine environment." As detailed in Chapter 8, where the drivers of climate change cause deleterious effects to the marine environment *other than through marine pollution*, the obligation to protect and preserve the marine environment requires States Parties to take steps to address all those additional drivers and their adverse consequences, including, for example, measures to build resilience, permit adaptation, and restore environments.

29. Although differences exist in relation to the two questions, they are complementary in that both require consideration of the science related to climate impacts, the actual and predicted outcomes for the environment, and the obligations on States, including the duty of due diligence. Both questions call on the Tribunal to apply the settled science of climate change to States Parties' obligations under the Convention.

III. Outline of Written Statement

30. The Commission's Written Statement is in three Parts comprising eight Chapters.²²

- (a) This **Part I** contains introductory remarks and addresses background legal principles. Following the preliminary statement and the present introduction, Chapter 3 addresses jurisdiction, admissibility, and applicable law, including UNCLOS as the living constitution of the ocean.
- (b) **Part II** addresses States Parties' specific obligations to prevent, reduce, and control pollution of the marine environment relevant to Question (a). Chapter 4 sets out the scientific evidence. Chapter 5 explains why GHG emissions constitute pollution of the marine environment. Chapter 6 describes legal principles relevant to States Parties' specific obligations to prevent, reduce, and control GHG emissions constituting pollution of the marine environment, and Chapter 7 sets out those specific obligations.

²² To ensure that its written statement is "as short as possible" in accordance with the Tribunal's Guidelines Concerning the Preparation and Presentation of Cases before the Tribunal, ITLOS/9 (14 November 2006), the Commission has not reproduced documents in its Annex that are readily accessible online. *Cf.* ITLOS Rules, Article 63(1).

- (c) **Part III**, comprising Chapter 8, addresses States Parties' specific obligations to protect and preserve the marine environment relevant to Question (b).
- (d) **Part IV** briefly concludes.

31. On this basis, the Commission seeks clarification of the specific content of State obligations under the Convention so that the advisory opinion to be rendered will meaningfully shape the conduct of States. This is a central objective of the request.

CHAPTER 3: JURISDICTION, ADMISSIBILITY, AND APPLICABLE LAW

32. This Chapter 3 demonstrates that the Tribunal has and should exercise its advisory jurisdiction here (Section I), and addresses the applicable law (Section II), including UNCLOS (Section III).

I. The Tribunal has and should exercise advisory jurisdiction in these proceedings

33. This Section I first recalls the legal basis for the Tribunal’s advisory jurisdiction and shows that the request submitted by COSIS satisfies all the necessary jurisdictional prerequisites for the Tribunal to render an advisory opinion (Section A). It then shows that there are no compelling reasons for the Tribunal to decline to exercise its jurisdiction (Section B). Finally, it explains that the procedural requirements for requesting an Advisory Opinion are met in these proceedings (Section C).

A. Existence of advisory jurisdiction in these proceedings

1. *The legal basis for the Tribunal’s advisory jurisdiction*

34. The primary legal basis for the Tribunal’s advisory jurisdiction stems from its broad powers under Article 21 of its Statute. Article 21 of the Statute of the Tribunal establishes that “[t]he jurisdiction of the Tribunal comprises all disputes and all applications submitted to it in accordance with this Convention and all matters specifically provided for in any other agreement which confers jurisdiction on the Tribunal.”²³ In *Request for an Advisory Opinion Submitted by the Sub-Regional Fisheries Commission (SRFC)*, the Tribunal confirmed that its advisory competence derives from Article 21 of its Statute when read together with an express grant of jurisdiction in an authorizing agreement.²⁴

35. As the Tribunal emphasized in its Advisory Opinion, the terms “disputes” and “applications” in Article 21 of its Statute unequivocally refer to its contentious functions.²⁵ On the other hand, the Tribunal held that the phrase “all matters” encompasses the Tribunal’s advisory function. Specifically, the Tribunal acknowledged that “[t]he words all ‘matters’ (*toutes les fois que cela*’ in French) should not be interpreted as covering only ‘disputes,’ for, if that were to be the case, article 21 of the Statute would simply have used the word ‘disputes.’ Consequently, it must mean something more than only ‘disputes.’ That something more must include advisory opinions, if specifically provided for in ‘any other agreement which confers jurisdiction on the Tribunal.’”²⁶

²³ ITLOS Statute, Article 21.

²⁴ *Request for an Advisory Opinion Submitted by the Sub-Regional Fisheries Commission*, Case No. 21, Advisory Opinion, 2015 ITLOS REP. 4 (2 April) (“*SRFC Advisory Opinion*”), ¶ 58.

²⁵ See ITLOS Statute, Article 23; UNCLOS, Articles 293–294; see also *SRFC Advisory Opinion*, ¶ 55.

²⁶ *SRFC Advisory Opinion*, ¶ 56.

36. Thus, in the words of the Tribunal, “Article 21 and the ‘other agreement’ conferring jurisdiction on the Tribunal are interconnected and constitute the substantive legal basis of the advisory jurisdiction of the Tribunal.”²⁷

2. *The request satisfies all jurisdictional prerequisites for seeking an advisory opinion from the Tribunal*

37. Article 16 of the ITLOS Statute confers on the Tribunal the authority to create rules to govern its proceedings. Accordingly, Article 138 of the Rules of the Tribunal outlines specific requirements for conducting advisory proceedings. Article 138 states:

1. The Tribunal may give an advisory opinion on a legal question if an international agreement related to the purposes of the Convention specifically provides for the submission to the Tribunal of a request for such an opinion.

2. A request for an advisory opinion shall be transmitted to the Tribunal by whatever body is authorized by or in accordance with the agreement to make the request to the Tribunal.

3. The Tribunal shall apply *mutatis mutandis* articles 130 to 137.²⁸

38. As such, ITLOS can exercise its advisory jurisdiction if certain specific prerequisites are met. In *SRFC*, the Tribunal distilled these rules into three prerequisites for establishing its advisory jurisdiction:

[1] an international agreement related to the purposes of the Convention specifically provides for the submission to the Tribunal of a request for an advisory opinion; [2] the request must be transmitted to the Tribunal by a body authorized by or in accordance with the agreement mentioned above; and [3] such an opinion may be given on “a legal question.”²⁹

39. COSIS’s present request satisfies these prerequisites.

40. *First*, the COSIS Agreement is an international agreement related to the purposes of the Convention that specifically provides for the submission to the Tribunal of a request for an advisory opinion. Chapter 2, Article 1(3) establishes the Commission’s mandate “*to promote and contribute to the definition, implementation, and progressive development of rules and principles of international law concerning climate change, including, but not limited to, the obligations of States relating to the protection and preservation of the marine environment.*”³⁰ Part XII of UNCLOS, in turn, is specifically dedicated to the protection and preservation of the marine environment, and the preamble of UNCLOS specifically refers to “the desirability of establishing through this Convention . . . a legal order for the seas and

²⁷ *Id.*, ¶ 58.

²⁸ ITLOS Rules, Article 138.

²⁹ *SRFC* Advisory Opinion, ¶ 60.

³⁰ COSIS Agreement, Article 1(3) (emphasis added).

oceans which will . . . promote . . . the study, protection and preservation of the marine environment.”³¹

41. *Second*, an authorized body submitted the request to the Tribunal. Article 2(2) of the COSIS Agreement specifically authorizes COSIS to request advisory opinions from the Tribunal on any legal question within the scope of the Convention. The present request was authorized in accordance with Article 3(5) of the COSIS Agreement, pursuant to which “[d]ecisions of the Commission shall be made in principle by consensus, or otherwise by a majority of Members present and voting.”³² During its Third Meeting, convened on 26 August 2022, the Commission unanimously decided to submit to ITLOS the present request for an Advisory Opinion.³³ As set out in Chapter 2, the Co-Chairs of the Commission transmitted this request to the Tribunal upon the unanimous decision of COSIS, and pursuant to their authority under Article 3(3) of the COSIS Agreement.

42. *Third*, the questions submitted are of a legal nature and have been framed in legal terms. The questions concern States Parties’ specific obligations under the Convention, which are by nature legal obligations. To respond to these questions, the Tribunal is called upon to interpret provisions of UNCLOS which may inform, or be informed by, obligations to prevent and mitigate climate change and thereby provide critical guidance to the international community. As stated by the Tribunal’s Seabed Disputes Chamber in its advisory opinion on *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area*:

The questions put to the Chamber concern the interpretation of provisions of the Convention and raise issues of general international law. The Chamber recalls that the International Court of Justice (hereinafter “the ICJ”) has stated that “questions ‘framed in terms of law and rais[ing] problems of international law . . . are by their very nature susceptible of a reply based on law.’”³⁴

43. A “further question” is the matters to which the Tribunal’s advisory jurisdiction extends.³⁵ As Article 21 of the Statute provides that such jurisdiction extends to “all matters specifically provided for in any other agreement which confers jurisdiction on the Tribunal,”³⁶ the Tribunal must satisfy itself that “the questions posed . . . constitute matters which fall within the framework”³⁷ of the “other agreement.” As the Tribunal explained in

³¹ UNCLOS, Preamble.

³² COSIS Agreement, Article 3(5).

³³ COSIS, Decisions of the Third Meeting (26 August 2022).

³⁴ *Responsibilities and Obligations of States with Respect to Activities in the Area*, Case No. 17, Advisory Opinion, 2011 ITLOS REP. 10 (1 February) (“*Area Advisory Opinion*”), ¶ 39; *see also Accordance with International Law of the Unilateral Declaration of Independence in Respect of Kosovo*, Advisory Opinion, 2010 ICJ REP. 403 (22 July), ¶ 25; *Western Sahara*, Advisory Opinion, 1975 ICJ REP. 12 (16 October), ¶ 15.

³⁵ *SRFC Advisory Opinion*, ¶ 67.

³⁶ ITLOS Statute, Article 21.

³⁷ *SRFC Advisory Opinion*, ¶ 67.

SRFC, “[i]t is enough if [the] questions have . . . a ‘sufficient connection’ with the purposes and principles of the [other agreement].”³⁸

44. It is plain that the questions posed fall within the framework of the COSIS Agreement, including its Article 1(3). Not only is there a “sufficient connection” between the questions posed and the “purposes and principles” of the COSIS Agreement³⁹; posing these questions plainly contributes to fulfilling the Commission’s mandate.

B. No compelling reasons for the Tribunal to decline to exercise its advisory jurisdiction

45. Article 138 of the Rules of the Tribunal provides that ITLOS “may give an advisory opinion.”⁴⁰ In the *SRFC* Advisory Opinion, the Tribunal observed that this provision implies that it has the discretion to decline to provide an Advisory Opinion, even if all jurisdictional and procedural requirements are met.⁴¹ Nevertheless, it is well-settled that a request for an advisory opinion should not, in principle, be refused except for “compelling reasons.”⁴²

46. The present proceedings do not give rise to any compelling reasons for the Tribunal to decline to answer the questions presented. To the contrary, as explained in Chapter 2, there are compelling reasons for it to proceed expeditiously to answering these questions. The request is not merely admissible, but also necessary.

C. Satisfaction of procedural requirements for requesting an advisory opinion from the Tribunal

47. As set out in Article 138 of the Rules of the Tribunal and confirmed in the *SRFC* Advisory Opinion, the procedure for requesting an *en banc* advisory opinion is the same as that of the Seabed Disputes Chamber. Accordingly, Article 138(5) of the Rules provides that “[t]he Tribunal shall apply *mutatis mutandis* articles 130 to 137.” In particular, Article 131 specifies that a request for an advisory opinion on a legal question must contain a precise statement of the question and be accompanied by all documents likely to throw light upon the question. The present request, lodged on 12 December 2022 and as supported herein, meets these formal requirements for seeking an Advisory Opinion from the Tribunal.

II. The applicable law in these proceedings

48. Article 130(1) of the Rules serves as a *renvoi* provision, which establishes that the law applicable to advisory proceedings is identical to its applicable law in contentious cases, as defined in the ITLOS Statute. Article 23 of the ITLOS Statute specifies such proceedings are to be decided in accordance with Article 293 of UNCLOS.⁴³ In answering these questions,

³⁸ *Id.*, ¶ 68 (internal citation omitted).

³⁹ *Id.*

⁴⁰ ITLOS Rules, Article 138.

⁴¹ *SRFC* Advisory Opinion, ¶ 71.

⁴² *Legality of the Threat or Use of Nuclear Weapons*, Advisory Opinion, 1996 ICJ REP. 226 (8 July) (“*Nuclear Weapons* Advisory Opinion”), ¶ 14; *see also id.*

⁴³ ITLOS Statute, Article 23.

the Tribunal is directed by Article 293 to apply both the Convention itself and other rules of international law not incompatible with it.⁴⁴

49. Article 237 of UNCLOS further provides that the provisions of its Part XII “are without prejudice to the specific obligations assumed by States under special conventions and agreements concluded previously which relate to the protection and preservation of the marine environment and to agreements which may be concluded in furtherance of the general principles set forth in this Convention,”⁴⁵ and that these obligations should be “carried out in a manner consistent with the general principles and objectives of this Convention.”⁴⁶

50. Read together, these provisions make clear that, in answering the questions submitted, the Tribunal can apply other relevant instruments that are not incompatible with the Convention. UNCLOS also includes “rules of reference,” which refers to the incorporation of generally recognized international rules and standards within UNCLOS provisions relating to shipping, navigation, and marine pollution that may inform or help to determine the precise meaning of an UNCLOS provision in practice.⁴⁷ Examples of such rules include Articles 207 and 212, which call on states to adopt laws and regulations to prevent, reduce, and control pollution of the marine environment “taking into account internationally agreed rules, standards and recommended practices and procedures.”⁴⁸ In this manner, the incorporation of generally recognized international rules and standards allows for greater clarity and consistency in the application of UNCLOS provisions.

III. The Convention as the constitution of the ocean and marine environment

51. This Section presents an overview of UNCLOS as the constitution of the ocean, a remarkably broad and enduring legal framework regulating more than 70 percent of the Earth’s surface. The drafters set out the terms of the Convention with a view to meeting future challenges, which today include the existential challenge of climate change.

52. UNCLOS resulted from the Third United Nations Conference on the Law of the Sea (the “Third Conference”), which took place from 1973 to 1982. The mandate of the Third Conference, which had been established by the General Assembly in 1970,⁴⁹ was to “adopt a

⁴⁴ See *Area Advisory Opinion*, ¶¶ 51–52, 125 (referring to Article 293 and other instruments on environmental protection, such as Principle 15 of the Rio Declaration concerning the precautionary principle).

⁴⁵ UNCLOS, Article 237(1).

⁴⁶ *Id.*, Article 237(2).

⁴⁷ See generally W. van Reenen, *Rules of Reference in the New Convention on the Law of the Sea, in Particular in Connection with the Pollution of the Sea by Oil from Tankers*, 12 NETHERLANDS Y.B. INT’L L. (1981).

⁴⁸ UNCLOS, Articles 207, 212; see also *id.*, Articles 208–211.

⁴⁹ UN General Assembly, Resolution 2750(XXV)C, *Reservation Exclusively for Peaceful Purposes of the Sea-Bed and the Ocean Floor, and the Subsoil Thereof, Underlying the High Seas Beyond the Limits of Present National Jurisdiction and use of Their Resources in the Interests of Mankind, and Convening of a Conference on the Law of the Sea* (1970).

convention dealing with all matters relating to the law of the sea, . . . bearing in mind that the problems of ocean space are closely interrelated and need to be considered as a whole.”⁵⁰

53. Over the course of its 320 articles in 17 parts, as well as its nine annexes, UNCLOS covers a broad array of substantive and procedural provisions which establish a general framework for the basic functions of governance of the ocean, such as legislation, application of law, and adjudication. In part due to its comprehensiveness, UNCLOS is often referred to as a “constitution for the oceans.”⁵¹ It is considered a milestone in international relations and enjoys a wide membership, being ratified by 168 countries. It has been successful in promoting international peace and security, and it has enhanced the conservation and utilization of living resources while creating fair and workable institutions for the protection and preservation of the marine environment.

54. The Convention is a living instrument, designed to adapt to changing threats to the marine environment by taking account of current scientific and technical realities to fulfill its object and purpose of addressing “problems of ocean space.”⁵² For example, in *Activities in the Area*, the Seabed Disputes Chamber noted that the Convention’s obligation of due diligence with respect to environmental protection is a “variable concept” that may “change in relation to the risks involved in the activity,”⁵³ and in particular “may change over time as measures considered sufficiently diligent at a certain moment may become not diligent enough in light, for instance, of new scientific or technological knowledge.”⁵⁴ In *SRFC*, Judge Lucky stressed:

The 1982 Convention and the Statute of the Tribunal are ‘living instruments.’ This means that they ‘grow’ and adapt to changing circumstances. . . . The law of the sea is not static. It is dynamic and, therefore, through interpretation and construction of the relevant articles, a court or tribunal can adhere and give positive effect to this dynamism.⁵⁵

55. Interpreting the Convention as such is crucial for ensuring its continued effectiveness and relevance in addressing emerging issues and challenges related to the protection and preservation of the marine environment.

⁵⁰ UN General Assembly, Resolution 3067(XXVIII), Reservation Exclusively for Peaceful Purposes of the Sea-Bed and the Ocean Floor, and the Subsoil Thereof, Underlying the High Seas Beyond the Limits of Present National Jurisdiction and Use of Their Resources in the Interests of Mankind, and Convening of the 3rd United Nations Conference on the Law of the Sea-Bed and the Ocean Floor Beyond the Limits of National Jurisdiction (1973).

⁵¹ Tommy Koh, President of the Third Conference, was the first to characterize it as such. See Tommy Koh, A Constitution for the Oceans (6 December 1982); see, e.g., Tulio Treves, UN Audiovisual Library of International Law, UNCLOS (10 December 1982); Yoshifumi Tanaka, THE INTERNATIONAL LAW OF THE SEA (4th ed. 2023), p. 40.

⁵² UNCLOS, Preamble.

⁵³ *Area Advisory Opinion*, ¶ 117

⁵⁴ *Id.*

⁵⁵ *SRFC Advisory Opinion*, Separate Opinion of Judge Lucky, ¶ 18.

**PART II:
RESPONSE TO FIRST QUESTION**

**CHAPTER 4:
ANTHROPOGENIC GHG EMISSIONS CHANGE THE
PHYSICS AND CHEMISTRY OF THE OCEAN AND
MARINE CRYOSPHERE, LEADING TO SEVERE HARM**

56. The scientific evidence is irrefutable: GHG emissions profoundly harm the ocean and cryosphere—Earth’s ice and snowpack—causing widespread devastation, including existential threats to Small Island States. In particular, average global temperature rise of 1.5°C above pre-industrial levels will have definite and catastrophic effects, including on the marine environment in particular.

57. The scientific evidence underpinning these conclusions represents the agreed, global scientific consensus with respect to the drivers of climate change and its effects. COSIS relies upon the findings of the Intergovernmental Panel on Climate Change (the “IPCC”)—the UN body for assessing the science related to climate change. In particular, COSIS relies on the following key reports from the IPCC’s most recent assessment cycle:

- (a) Synthesis Report (2023)—Summary for Policymakers;
- (b) Working Group II report (2022)—Summary for Policymakers, Chapter 3 (Ocean and Coastal Ecosystems and Their Services), Chapter 15 (Small Islands), and Cross-Chapter Paper 2 (Cities and Settlements by the Sea);
- (c) Working Group I report (2021)—Summary for Policymakers, Chapter 5 (Global Carbon and Other Biogeochemical Cycles and Feedbacks), and Chapter 9 (Ocean, Cryosphere, and Sea Level Change);
- (d) Special Report on the Ocean and Cryosphere in a Changing Climate (2019); and
- (e) Special Report on Global Warming of 1.5°C (2018).⁵⁶

58. In addition, COSIS submits expert reports prepared for these proceedings by two leading scientists, who rely on the IPCC reports as well as peer-reviewed scientific studies of the effects of climate change on the ocean, some of which formed part of the IPCC’s review. These two experts are:

- (a) Sarah Cooley, Director of Climate Science at the Ocean Conservancy and Coordinating Lead Author of Chapter 3 (Ocean and Coastal Ecosystems and Their Services) of IPCC Working Group II’s 2022 report. Dr. Cooley holds a Ph.D. in Marine Science from the University of Georgia and is an expert in oceanography, the global carbon cycle, and ocean acidification.

⁵⁶ Annex 3 contains a detailed listing of the IPCC reports on which COSIS relies in these proceedings.

- (b) Shobha Maharaj, Science Director at Terraformation and Lead Author of Chapter 15 (Small Islands) of IPCC Working Group II’s 2022 report. Dr. Maharaj holds a D.Phil. from the University of Oxford, where her dissertation focused on the impacts of climate change on Small Island States in the Caribbean.⁵⁷

59. This Chapter 4 sets out the indisputable scientific evidence that supports the conclusion that anthropogenic GHG emissions drive climate change (Section I). It then describes the processes by which the ocean absorbs 90 percent of the excess heat in the global climate system (Section II) and one-quarter of the carbon in the atmosphere (Section III), leading to physical and chemical changes to the ocean that cause profound harm. Finally, the Chapter describes the profound harm and existential threats that Small Island States have suffered, are suffering, and will continue to suffer due to climate change (Section IV).

I. Anthropogenic GHG emissions as drivers of climate change

60. The IPCC was established by the UN Environment Programme (“UNEP”) and the World Meteorological Organization (the “WMO”) in 1988.⁵⁸ Today, the IPCC plays a unique role in synthesizing scientific knowledge on climate change and its impacts.⁵⁹ The IPCC relies on hundreds of the worlds’ leading scientists who volunteer their time to conduct regular assessment cycles that “assess the thousands of scientific papers published each year to provide a comprehensive summary of what is known about the drivers of climate change, its impacts and future risks, and how adaptation and mitigation can reduce those risks.”⁶⁰ The IPCC states that “open and transparent review by experts and governments around the world”—which is open to all UN Member States—“is an essential part of the IPCC process.”⁶¹

61. The IPCC’s conclusions are based on “calibrated uncertainty language” used to express scientific confidence in the evidence to support a finding or the likelihood of a finding.⁶² On the basis of the demonstrated science, the IPCC has concluded that human activities are “unequivocally” responsible for the highest atmospheric concentrations of

⁵⁷ Expert Report of Shobha Maharaj, D.Phil. (Oxon.), on Impacts of Climate Change on Small Island States (16 June 2023) (“Maharaj Report”) (Annex 5).

⁵⁸ IPCC, History of the IPCC.

⁵⁹ See Cooley Report, § I.C.

⁶⁰ IPCC, About the IPCC. The hundreds of leading scientists who participated the sixth assessment cycle were divided into three Working Groups. Working Group I examines the physical science underpinning past, present, and future climate change. Working Group II assesses the vulnerability of socioeconomic and natural systems to climate change, negative and positive consequences of climate change, and options for adapting to it. Working Group III focuses on climate change mitigation, assessing methods for reducing GHG emissions, and removing GHGs from the atmosphere. *Id.*

⁶¹ *Id.*

⁶² IPCC, Working Group I, *Technical Summary*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2022), p. 38. The IPCC designs this uncertainty language “to consistently evaluate and communicate uncertainties that arise from incomplete knowledge due to a lack of information or from disagreement about what is known or even knowable.” See also *id.*, p. 41 (graphic representation of the evaluative confidences based on evidence and agreement); Cooley Report, § I.C.1.

GHGs in millions of years, driving warming of the planet at rates never before seen in human history.⁶³ The IPCC’s 2023 Synthesis Report⁶⁴ states plainly:

Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1°C above 1850–1900 in 2011–2020. . . .⁶⁵

Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. Human-caused climate change is already affecting many weather and climate extremes in every region across the globe. This has led to widespread adverse impacts and related losses and damages to nature and people (*high confidence*). Vulnerable communities who have historically contributed the least to current climate change are disproportionately affected (*high confidence*).⁶⁶

62. This Section describes how GHGs trap heat in the atmosphere and cause climate change (Subsection A), the principal types of GHGs (Subsection B), and the remaining budget for GHG emissions to have an assessed likelihood of keeping global temperature rise to within 1.5°C of pre-industrial levels (Subsection C).

A. GHGs’ trapping of heat in the atmosphere

63. All GHGs are “chemical substances”—types of matter made up of identical molecules, which are composed of chemical elements connected by bonds—that take the form of a gas at room temperature.⁶⁷ GHGs are “well mixed” in the Earth’s atmosphere, meaning that, once emitted, they create a nearly homogenous mixture with the other extant gases—primarily nitrogen and oxygen.⁶⁸

⁶³ IPCC, *Longer Report*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), pp. 6–8.

⁶⁴ The IPCC conducts regular assessment cycles, of which there have been six since 1990. The IPCC concluded the sixth cycle in March 2023 with a Synthesis Report drawing key takeaways from the reports from that cycle. IPCC, [About the IPCC](#).

⁶⁵ IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), p. 4.

⁶⁶ *Id.*, p. 5. The IPCC uses two types of calibrated language. *First*, it uses “qualitative expressions of confidence”—“very low,” “low,” “medium,” “high,” and “very high”—“based on the robustness of evidence for a finding.” *Second*, where possible, the IPCC “uses quantitative expressions to describe the likelihood of a finding,” which represent the IPCC’s assessment of how likely a given outcome is to occur based on its “evaluation of underlying evidence and agreement.” Its seven quantitative expressions are “virtually certain” (99 to 100 percent), “very likely” (90 to 100 percent), “likely” (66 to 100 percent), “as likely as not” (33 to 66 percent), “unlikely” (0 to 33 percent), “very unlikely” (0 to 10 percent), or “exceptionally unlikely” (0 to 1 percent). *Id.*, *Technical Summary*, p. 40; *see also id.* p. 41.

⁶⁷ *See Chemical Substance*, INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY, COMPENDIUM OF CHEMICAL TERMINOLOGY (24 February 2014); *see also* Cooley Report, ¶ 21.

⁶⁸ IPCC, Working Group I, *Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 680.

64. GHGs are so called because they absorb solar radiation coming directly from the sun and reflected off the Earth’s surface, trapping heat in the atmosphere.⁶⁹ GHGs absorb and emit certain wavelengths of infrared radiation primarily because of the chemical bond between the three or more different atoms that comprise each of their molecules. Solar energy bends, stretches, and twists GHG molecules, transforming radiative energy to heat energy.⁷⁰ The major components of the atmosphere—nitrogen (N₂), oxygen (O₂), and argon (Ar)—do not have a greenhouse effect because they comprise only one or two atoms. The IPCC has found that, for every 1,000 gigatons of anthropogenic carbon dioxide emissions, “global surface temperature rises by 0.45°C (best estimate, with a *likely* range from 0.27 to 0.63°C).”⁷¹

65. Most GHGs are not inherently harmful and in fact are an important factor in making most of the Earth habitable: without them, Earth’s average temperature would likely be around minus 20°C, as compared with the pre-industrial average of around 14°C.⁷² But severe harm results from the increased presence of GHGs in the atmosphere and the associated rise in global temperatures.⁷³ “Excess GHGs” and “excess heat” refer to the additional quantity of GHGs in the atmosphere and the rise in global temperatures since roughly the year 1850. This is the “start” date relied upon by most scientific models measuring temperature change, as it is the approximate date when “permanent surface observing networks emerged that provide sufficiently accurate and continuous measurements on a near-global scale.”⁷⁴

B. Principal types of GHGs

66. The three key GHGs associated with climate change are (1) carbon dioxide, (2) methane, and (3) nitrous oxide.⁷⁵

1. Carbon dioxide

67. Carbon dioxide (represented by the chemical symbol CO₂) is a molecule made of one carbon atom chemically bonded with two oxygen atoms. Although carbon dioxide constitutes a relatively small proportion of the gases in Earth’s atmosphere—around 0.04 percent as of April 2022—the dramatic increase of its presence has had a powerful greenhouse effect.⁷⁶ The IPCC has found with high confidence that historical cumulative net carbon dioxide emissions from 1850 to 2019 were 2400±240 gigatons, of which 58 percent

⁶⁹ IPCC, Working Group I, *Appendix VII: Glossary*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 2233; Cooley Report, § II.A.

⁷⁰ See Cooley Report, ¶ 21.

⁷¹ IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), pp. 20–21.

⁷² *The Greenhouse Effect*, BRITISH GEOLOGICAL SURVEY; Rebecca Lindsey & Luann Dahlman, *Climate-Change: Global Temperature*, CLIMATE.GOV (1 January 2023); see also IPCC, Working Group I, *Appendix VII: Glossary*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 2232.

⁷³ See Cooley Report, ¶ 22.

⁷⁴ See IPCC, Working Group I, *Chapter 1: Framing, Context and Methods*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 192 (citation omitted).

⁷⁵ *Id.*, *Summary for Policymakers*, p. 4.

⁷⁶ National Oceanic and Atmospheric Administration, *Greenhouse Gases Continued to Increase Rapidly in 2022*, (5 April 2023).

occurred between 1850 and 1989, and about 42 percent occurred between 1990 and 2019.⁷⁷ In 2019, carbon dioxide concentrations in the atmosphere were higher than at any time in at least 2 million years.⁷⁸ During the last measured decade, global average annual emissions of carbon dioxide reached the highest levels in human history, to at least 10 billion metric tons per year.⁷⁹ Once emitted, carbon dioxide will break down into its constituent elements only after 300 to 1,000 years.⁸⁰

68. Human activities emit carbon dioxide in two principal ways: by burning organic material such as fossil fuels and biomass, and through land-use change and land management.⁸¹

69. Burning organic material—naturally occurring carbon-based material—creates a chemical reaction that releases the carbon stored in the material in the form of carbon dioxide.⁸² The largest sources of organic material contributing to GHG emissions are fossil fuels, which are carbon-containing remains of long-dead plants and animals. Humans burn fossil fuels—primarily petroleum, coal, and natural gas—to power internal combustion engines for transportation and shipping by motor vehicles, airplanes, ships, and trains; to generate electricity in power plants or generators; for heating and cooking; or to run certain industrial processes.⁸³ Humans also burn biomass—recently living organic material such as wood, crops, or organic waste—for energy.⁸⁴ Some industrial processes—such as production of cement, iron and steel, and certain chemicals and fertilizers—emit carbon dioxide as a byproduct.⁸⁵ Together, the burning of fossil fuels and biomass accounts for 81 to 91 percent of anthropogenic carbon dioxide emissions worldwide.⁸⁶

70. Different fossil fuels release widely varying amounts of carbon dioxide to achieve the same energy output. For example, to produce 500 megajoules of energy—roughly equivalent to the energy contained in a standard propane tank for a gas grill—burning coal would emit around 50 kilograms of carbon dioxide, gas or diesel around 35 kilograms, propane around

⁷⁷ IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), p. 4.

⁷⁸ *Id.*

⁷⁹ IPCC, Working Group I, *Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 676. In these submissions, one “billion” is one thousand million (1,000,000,000), and one “trillion” is one million million (1,000,000,000,000).

⁸⁰ *Id.*

⁸¹ *Id.*, p. 687; *see also* Cooley Report, § II.A.

⁸² IPCC, Working Group I, *Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 676.

⁸³ *See id.*; Cooley Report, ¶ 29.

⁸⁴ IPCC, Working Group I, *Annex VII: Glossary*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 2219.

⁸⁵ *See id.*, *Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks*, p. 687; International Energy Agency, *Iron and Steel* (September 2022).

⁸⁶ IPCC, Working Group I, *Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 676.

30 kilograms, and natural gas around 25 kilograms.⁸⁷ This means that the release of carbon for the same activity can vary dramatically by the type of fuel used.

71. Burning fossil fuels also emits black carbon, fine particles of pure carbon not fully burned during the combustion process.⁸⁸ Black carbon is visible in the form of dark smoke from gas flares or soot inside a chimney.⁸⁹ Ships with internal combustion engines emit black carbon directly into the air above the ocean; depending on weather conditions, the black carbon can float in the atmosphere for several days or weeks before coming to rest on land, water, snow, ice, or the built environment.⁹⁰ Black carbon contributes to global warming by absorbing sunlight and reducing albedo, the process by which white surfaces such as snow or ice reflect sunlight back out of the atmosphere.⁹¹ Just as a white car is cooler than a black one on a sunny day, the Earth is cooler without black carbon in the air.⁹² The IPCC has concluded with high confidence that, in the Arctic, “darkening of snow through the deposition of black carbon and other light absorbing particles enhances snow melt,” and that sectors that emit large amounts of black carbon are “important contributors to warming over short time horizons up to 20 years.”⁹³ The International Maritime Organization (the “IMO”) has concluded that black carbon from ships increased voyage-based international GHG emissions by seven percent in 2018.⁹⁴

72. Land-use change and land management can emit carbon.⁹⁵ Trees and other vegetation are carbon sinks, meaning they absorb atmospheric carbon—in their case, through photosynthesis. Burning trees and vegetation—such as for logging, agriculture, or land-use management—creates a chemical reaction that releases into the atmosphere in the form of carbon dioxide.⁹⁶ Even after accounting for carbon removal from reforestation or regrowth after human intervention, land-use change and land management accounts for up to nine to 19 percent of global anthropogenic carbon dioxide emissions.⁹⁷

⁸⁷ U.S. Energy Information Administration, [Carbon Dioxide Emissions Coefficients](#) (5 October 2022).

⁸⁸ IPCC, Working Group I, *Appendix VII: Glossary*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 2220; see Cooley Report, ¶ 24.

⁸⁹ See IPCC, Working Group I, *Chapter 6: Short-Lived Climate Forcers*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 847.

⁹⁰ See *id.*, p. 867; *id.*, *Appendix VII: Glossary*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), pp. 2220, 2216.

⁹¹ *Id.*, *Chapter 9: Ocean, Cryosphere and Sea level Change*, pp. 1276–1277; *id.*, *Appendix VII: Glossary*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 2217.

⁹² See *id.*, *Chapter 1: Framing, Context, and Methods*, p. 188; see also *id.*, *Appendix VII: Glossary*, p. 2235.

⁹³ See *id.*, *Chapter 6: Short-Lived Climate Forcers*, p. 817; see also IPCC, Working Group II, *Cross-Chapter Paper 6: Polar Regions*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), pp. 2339, 2347.

⁹⁴ IMO, *Fourth Greenhouse Gas Study* (2020), p. 6.

⁹⁵ IPCC, Working Group I, *Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), pp. 687–689.

⁹⁶ *Id.*, p. 688.

⁹⁷ *Id.*, p. 676.

2. Methane

73. Methane (CH₄) is a molecule comprising one carbon atom bonded to four hydrogen atoms. In 2019, methane concentrations in the atmosphere were up by 156 percent over pre-industrial levels.⁹⁸ During the last measured decade, global average annual anthropogenic emissions of methane reached the highest levels in human history, to between 335 and 383 million metric tons per year.⁹⁹ The IPCC estimates that methane is approximately 80 times more potent than carbon dioxide in its heat-trapping effects, and it takes around 10 years to break down once released into the atmosphere.¹⁰⁰

74. Methane emissions result from a variety of human activities. These include coal mining, oil and gas extraction, biomass burning, treatment of manure for fertilizer, rice cultivation, waste management, and peatland destruction.¹⁰¹

3. Nitrous oxide

75. Nitrous oxide (N₂O) is a molecule made of two nitrogen atoms and one oxygen atom. In 2019, nitrous oxide concentrations in the atmosphere were up by 23 percent over pre-industrial levels, the highest in 800,000 years.¹⁰² During the last measured decade, global average annual anthropogenic emissions of nitrous oxide reached the highest levels in human history, to between 4.2 and 11.4 million metric tons per year.¹⁰³ Nitrous oxide is up to 300 times more potent than carbon dioxide in its heat-trapping effects.¹⁰⁴ Nitrous oxide takes more than 100 years to break down once emitted into the atmosphere.¹⁰⁵

76. The use of synthetic and natural fertilizers, as well as chemical and wastewater processing and combustion of fossil fuels, release nitrous oxide.¹⁰⁶

⁹⁸ *Id.*, p. 676.

⁹⁹ *Id.*

¹⁰⁰ *Id.*, Chapter 7: *The Earth's Energy Budget, Climate Feedbacks and Climate Sensitivity*; see also *id.*, Chapter 5: *Global Carbon and Other Biogeochemical Cycles and Feedbacks*, p. 700.

¹⁰¹ See *id.*, Chapter 5: *Global Carbon and Other Biogeochemical Cycles and Feedbacks*, pp. 676, 700–702.

¹⁰² *Id.*, p. 676.

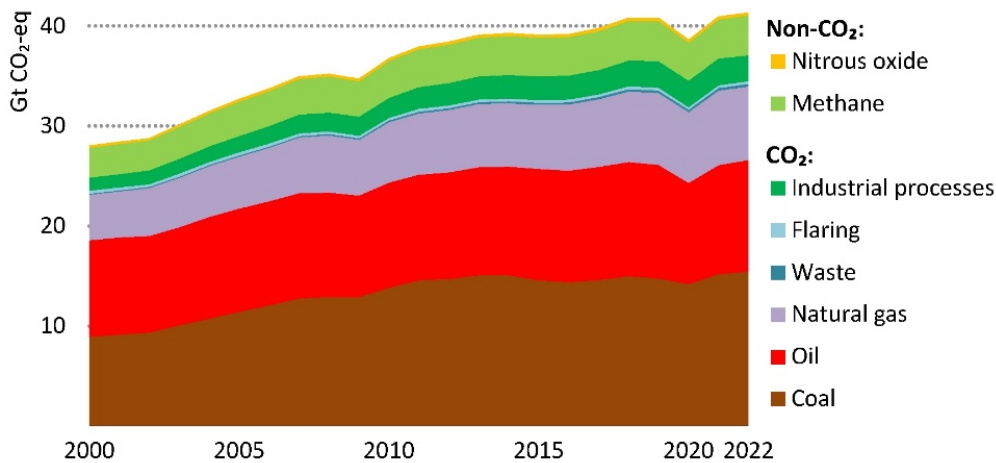
¹⁰³ *Id.*

¹⁰⁴ *Id.*, Chapter 7: *The Earth's Energy Budget, Climate Feedbacks and Climate Sensitivity*, p. 1017.

¹⁰⁵ *Id.*; see also *id.*, Chapter 5: *Global Carbon and Other Biogeochemical Cycles and Feedbacks*, p. 708.

¹⁰⁶ *Id.*, Chapter 5: *Global Carbon and Other Biogeochemical Cycles and Feedbacks*, p. 708.

Global energy-related GHG emissions, 2000-2022¹⁰⁷



C. The Earth’s “carbon budget”

77. The IPCC makes clear that any and all excess GHG emissions will almost certainly contribute to climate change. The IPCC concluded with very high confidence in 2022 that “[r]isks and projected adverse impacts and related losses and damages from climate change escalate with every increment of global warming (*very high confidence*).”¹⁰⁸

78. The IPCC has, with medium to high confidence, identified global average temperature rise of 1.5°C above pre-industrial levels as a threshold over which the risk of catastrophic effects of climate change begins to move from moderate to high.¹⁰⁹ Some “unique and threatened systems” in particular, such as coral reefs, are at “risk from climate change at current temperatures, with increasing numbers of systems at potential risk of severe consequences at global warming of 1.6°C above pre-industrial levels.”¹¹⁰ The IPCC has identified five “Reasons for Concern,” and the risk associated with each increases substantially with average global temperatures of 1.5°C above pre-industrial levels:

- (a) Unique and threatened systems—ecological and human systems that have restricted geographic ranges constrained by climate-related conditions—such as coral reefs, the Arctic and its indigenous people, mountain glaciers, and biodiversity hotspots;
- (b) Extreme weather events, including risks or impacts to human health, livelihoods, assets, and ecosystems from extreme weather events such as heatwaves, heavy rain, drought and associated wildfires, and coastal flooding;

¹⁰⁷ International Energy Agency, CO₂ Emissions in 2022 (March 2023), p. 15.

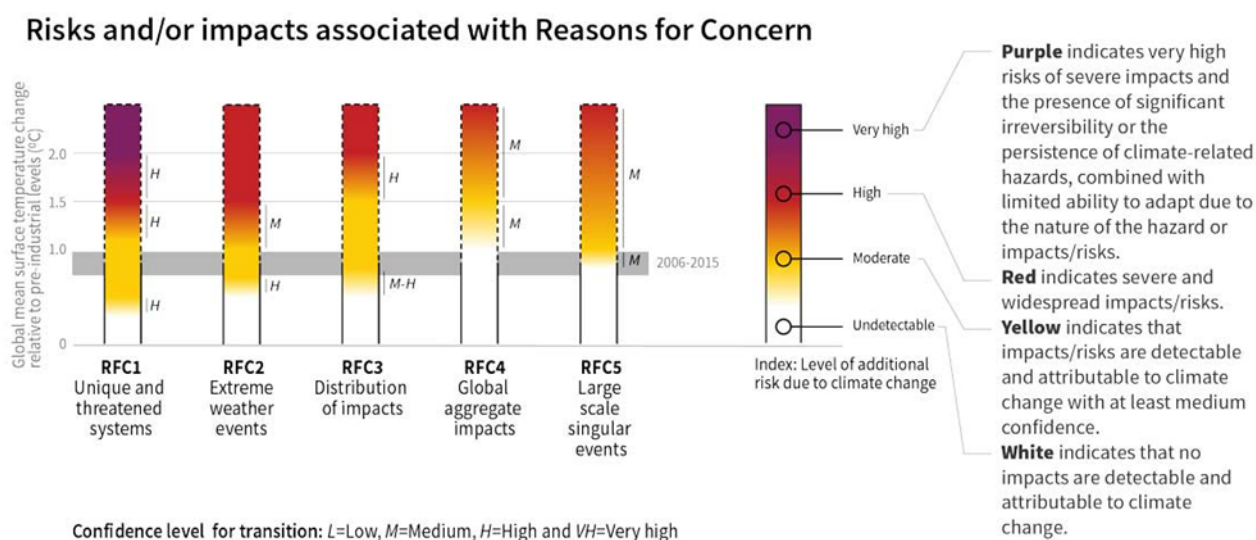
¹⁰⁸ IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), p. 15.

¹⁰⁹ See *id.*, p. 15; IPCC, *Chapter 3: Impacts of 1.5°C Global Warming on Natural and Human Systems*, SPECIAL REPORT: GLOBAL WARMING OF 1.5°C (2018), p. 254, figure 3.21.

¹¹⁰ IPCC, *Chapter 3: Impacts of 1.5°C of Global Warming on Natural and Human Systems*, SPECIAL REPORT: GLOBAL WARMING OF 1.5°C (2018), p. 253; see also Cooley Report, ¶ 64.

- (c) Distribution of impacts, *i.e.*, risks or impacts that disproportionately affect particular groups due to uneven distribution of physical climate change hazards, exposure, or vulnerability;
- (d) Global aggregate impacts, such as global monetary damage, global scale degradation, and loss of ecosystems and biodiversity; and
- (e) Large-scale singular events including relatively large, abrupt, and sometimes irreversible changes in systems that are caused by global warming, such as disintegration of the Greenland and Antarctic ice sheets.¹¹¹

79. The chart below shows the risks or impacts associated with each Reason for Concern at increments of global average temperature rise from 0 to +2°C.¹¹² For each, temperature rise above 1.5°C represents a dramatic increase in the risk, moving from moderate to high. The IPCC has also cautioned with high confidence that the risks and projected adverse impacts for global warming of 1.5°C are greater than they are at present levels and even higher at 2°C.¹¹³



80. The IPCC has concluded that the Earth is close to exhausting the estimated “remaining carbon budget” above which global average temperatures will rise 1.5°C or 2°C above pre-industrial levels. The remaining carbon budget refers to the total net amount of carbon dioxide that human activities can still release into the atmosphere while keeping

¹¹¹ IPCC, *Chapter 3: Impacts of 1.5°C of Global Warming on Natural and Human Systems*, SPECIAL REPORT: GLOBAL WARMING OF 1.5°C (2018), p. 254, figure 3.21 and associated text.

¹¹² *Id.*

¹¹³ IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), p. 15.

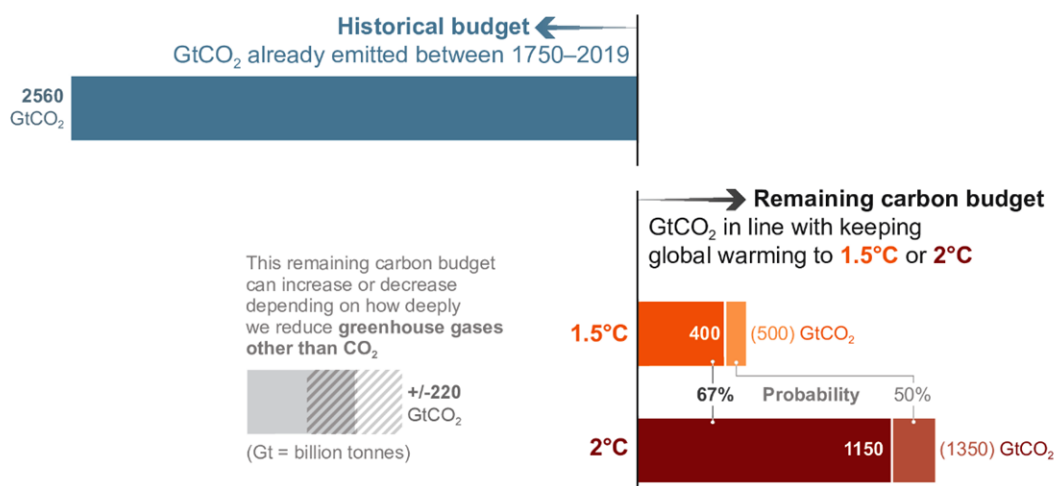
global warming to a specified level above pre-industrial levels, after accounting for the warming effects of other GHGs.¹¹⁴ The IPCC found:

[T]o limit global warming to 1.5°C above pre-industrial levels with either a one-in-two (50%) or two-in-three (67%) chance, the remaining carbon budgets amount to 500 and 400 billion tonnes of CO₂, respectively, from 1 January 2020 onward. Currently, human activities are emitting around 40 billion tonnes of CO₂ into the atmosphere in a single year.¹¹⁵

The chart below reflects the IPCC’s assessment of the remaining carbon budget as of 2022.¹¹⁶

FAQ 5.4: What are Carbon Budgets?

The term carbon budget is used in several ways. Most often the term refers to the total net amount of carbon dioxide (CO₂) that can still be emitted by human activities while limiting global warming to a specified level.



81. The IPCC’s conclusions thus show that, without dramatic and urgent reductions in GHG emissions, the Earth will soon exceed its estimated remaining carbon budget necessary to keep average global temperature rise within the global standard of 1.5°C above pre-industrial levels, with devastating consequences.

II. The ocean and marine cryosphere absorption of excess heat

82. This Section II shows that the ocean and marine cryosphere—sea ice (frozen seawater floating on the sea surface) and ice shelves (ice sheets floating on the ocean but attached to land)—bear the brunt of the excess heat caused by anthropogenic GHG emissions. They absorb the vast majority of that heat (Subsection A), leading to physical and chemical

¹¹⁴ IPCC, Working Group I, *Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 777; see also Cooley Report, ¶ 25.

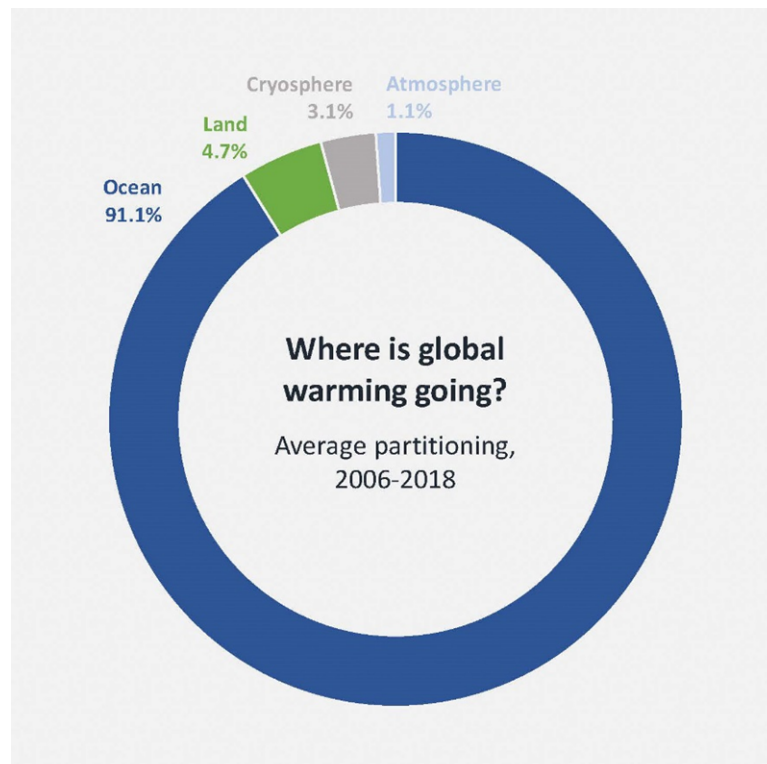
¹¹⁵ IPCC, Working Group I, *Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 777 (citation omitted).

¹¹⁶ *Id.*, p. 778 (figure FAQ 5.4).

changes that cause significant harm, especially to Small Island States (Subsection B). This harm will compound as global warming increases (Subsection C).

A. The ocean and marine cryosphere as the world’s largest heat sinks

83. The ocean and marine cryosphere store more than 90 percent of the excess heat accumulated in the climate system since the 19th century, as Dr. Cooley explains.¹¹⁷ This represents a staggering amount of energy: In 2021, the ocean warmed by 14 zettajoules (14×10^{21}) according to one report, roughly equivalent to seven Hiroshima bombs exploding every second.¹¹⁸ If the ocean were not absorbing this heat, average global temperatures would likely be around 50°C, an increase of over 350 percent from the current average.¹¹⁹ The chart below, which Dr. Cooley prepared from IPCC data, demonstrates how the ocean absorbs 91.1 percent of the excess heat that resides in the climate system.¹²⁰



84. As Dr. Cooley explains, ocean warming occurs because “[s]olar energy landing on the ocean’s surface transfers its energy to molecules of water and other substances in the

¹¹⁷ Cooley Report, figure 6; see IPCC, Working Group II, *Chapter 2: Terrestrial and Freshwater Ecosystems*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 380; IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (2019), p. 9.

¹¹⁸ John Abraham, *We Study Ocean Temperatures. The Earth Just Broke a Heat Increase Record*, THE GUARDIAN (11 January 2022); see also National Centers for Environmental Information, *Global Ocean Heat and Salt Content: Seasonal, Yearly, and Pentadal Fields*.

¹¹⁹ Zoë Schlanger, *If Oceans Stopped Absorbing Heat from Climate Change, Life on Land Would Average 122°F*, QUARTZ (29 November 2017).

¹²⁰ Cooley Report, figure 6.

ocean.”¹²¹ Three main physical factors contribute to the ocean’s extremely high rate of heat absorption. *First*, heat transfers from warmer zones to cooler ones. Because water and ice are on average cooler than air or land, heat trapped in the atmosphere tends to transfer to the ocean and marine cryosphere.¹²² This is particularly true in the polar regions: the IPCC has concluded that, in the past 50 years, “[t]he Arctic has *very likely* warmed more than twice the global rate”¹²³ making it one of the world’s “fastest-warming places.”¹²⁴ *Second*, the ocean covers over 70 percent of Earth’s surface, offering a broad surface area on which that heat transfer can occur.¹²⁵ *Finally*, water has a higher heat capacity—a greater ability to absorb heat energy before its temperature rises—than land-based solids like earth, vegetation, or the built environment.¹²⁶

85. Despite the ocean’s tremendous capacity to store heat, the IPCC has high confidence that, if carbon dioxide emissions continue to increase, ocean carbon sinks will “take up a decreasing proportion of these emissions.”¹²⁷ This is principally because, due to temperature effects on dissolution chemistry, less carbon dioxide will dissolve in seawater and the transport of dissolved carbon dioxide into the deep ocean will slow.¹²⁸ The net result is that some parts of the ocean soon will begin to radiate heat back into the atmosphere, or at least absorb heat at a slower rate, with the devastating effect of accelerating the increase of global temperatures even more.

B. The profound scope of harm to the ocean from excess heat

86. The ocean’s absorption of excess heat leads to five main and interrelated physical and chemical changes, including (1) ocean warming, (2) melting of the marine cryosphere, (3) sea-level rise, (4) changes to ocean and air currents, and (5) ocean stratification and deoxygenation. These physical and chemical changes result in significant and negative effects on marine life and human life and activities.

I. Ocean warming

87. The IPCC has concluded that it is “*virtually certain*” that the upper 700 meters of the ocean globally has warmed since the 1970s and “*extremely likely*” that human influence is the

¹²¹ *Id.*, ¶ 23.

¹²² *See id.*, ¶¶ 20, 23, 26.

¹²³ IPCC, Working Group I, *Chapter 10: Linking Global to Regional Climate Change*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 1379.

¹²⁴ *Id.*, *Chapter 12: Climate Change Information for Regional Impact and for Risk Assessment*, p. 1844.

¹²⁵ *Id.*, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, p. 385.

¹²⁶ *See* Cooley Report, ¶ 64; IPCC, Working Group I, *Chapter 3: Observations: Oceans*, FIFTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2013), pp. 260, 266; U.S. Environmental Protection Agency, *Ocean Heat* (August 2016), p. 1.

¹²⁷ IPCC, Working Group I, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), p. 12.

¹²⁸ *See generally* Megumi Chikamoto et al., *Long-term Slowdown of Ocean Carbon Uptake by Alkalinity Dynamics*, 50 AMERICAN GEOPHYSICAL UNION: GEOPHYSICAL RESEARCH LETTERS (2023); IPCC, Working Group I, *Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), pp. 720–721.

main driver.¹²⁹ At the ocean surface, temperature has, on average, increased by 0.88°C since 1850, with 0.60°C of this warming having occurred since 1980.¹³⁰ Recent data shows that global sea surface hit a new temperature record of 21.1°C in April 2023.¹³¹

88. Ocean warming causes significant harm.¹³² One consequence is that it is impossible for certain marine flora and fauna to live at these elevated temperatures. Sessile marine life—which, by definition, cannot move on their own—such as coral reefs will die in place, disturbing local ecosystems.¹³³ Marine species that are mobile are migrating to cooler waters toward Earth’s poles.¹³⁴ These effects also pose hazards to human health and are particularly devastating to Small Island States given the severe bleaching that surrounding coral reefs are experiencing, especially in the Pacific and Indian Oceans, whose livelihoods are dependent on marine resources.¹³⁵ Palau’s Coral Reef Research Foundation—the world’s most comprehensive network for monitoring ocean temperature—has documented how water temperatures at or above 30°C causes polyps to expel their symbiotic algae, leading to bleaching and death of the coral colony.¹³⁶ After Palau’s first bleaching event in 1998, it experienced subsequent bleaching events in 2010 and again in 2014 to 2016.¹³⁷

89. Loss of marine biodiversity and abundance contributes to food insecurity and malnutrition.¹³⁸ Globally, about 17 percent of humans’ average per capita intake of animal protein in 2017 came from wild and farmed marine and freshwater aquatic animals; for Small Island States, that number jumps to 50 percent or more.¹³⁹ The IPCC has concluded that “[o]cean warming has decreased sustainable yields of some wild fish populations (*high confidence*) by 4.1% between 1930 and 2010,” and that ocean warming and acidification have already affected fish farming.¹⁴⁰ This effect is especially pronounced among Pacific Island States, where the IPCC estimates that a 20 percent decline in fish production from coral reefs by 2050 could threaten food security.¹⁴¹

¹²⁹ IPCC, Working Group I, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 5; see Cooley Report, § III.B.

¹³⁰ IPCC, Working Group I, *Chapter 2: Changing State of the Climate System*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 326, table 2.4; see also Cooley Report, ¶ 31.

¹³¹ NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION; *Daily Sea Surface Temperature*; see *The Ocean Is Hotter Than Ever: What Happens Next?*, NATURE (10 May 2023).

¹³² See Cooley Report, § III.

¹³³ IPCC, Working Group I, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), pp. 418, 427; see also *id.*, *Cross-Chapter Paper 1: Biodiversity Hotspots*, pp. 2143–2148.

¹³⁴ IPCC, Working Group II, *Cross-Chapter 6: Polar Regions*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), pp. 2325, 2333.

¹³⁵ *Id.*, *Chapter 15: Small Islands*, p. 2056.

¹³⁶ Patrick L. Colin, *Ocean Warming and the Reefs of Palau*, 32 OCEANOGRAPHY 126, (2018), pp. 127, 129.

¹³⁷ *Id.*, p. 127.

¹³⁸ See Cooley Report, § VI.C; Maharaj Report, § III.C.7.

¹³⁹ IPCC, Working Group II, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 456.

¹⁴⁰ *Id.*, *Technical Summary*, p. 48.

¹⁴¹ *Id.*, *Chapter 15: Small Islands*, p. 2065.

2. Marine cryosphere

90. The IPCC has concluded that “global warming has led to widespread shrinking of the cryosphere with mass loss from ice sheets and glaciers¹⁴² (*very high confidence*), reductions in snow cover (*high confidence*) and Arctic sea ice extent and thickness (*very high confidence*), and increased permafrost temperature (*very high confidence*).”¹⁴³ Global warming melts Arctic sea ice at a rate of almost 13 percent per decade, and over the past 30 years, the oldest and thickest ice in the Arctic has declined by 95 percent.¹⁴⁴

91. Melting the marine cryosphere directly causes profound harm. It destroys polar habitats, making it impossible to survive for animals like polar bears and penguins that make their habitats on sea ice and ice shelves.¹⁴⁵ Destruction of those habitats also damages traditional sources of food and cultural heritage to Arctic communities, especially those of the Inuit, Saami, Yupik, Nenets, Aleut, or other Arctic peoples.¹⁴⁶

92. Furthermore, loss of marine cryosphere reinforces the adverse effects of climate change, creating a vicious cycle. Reduction of sea ice and ice shelves diminishes the ice-albedo effect, where the whiteness of sea ice reflects light from the sun back out of Earth’s atmosphere, thus cooling the Earth.¹⁴⁷ In addition, melting ice sheets and glaciers exposes permafrost—land frozen for two or more years—underneath those ice features to sunlight and warm air.¹⁴⁸ Permafrost locks in organic material, such as plants or animals that died even millennia ago, as well as the methane and carbon dioxide that that organic material releases through anaerobic decay—that is, decomposition outside the presence of oxygen.¹⁴⁹ Thawing permafrost releases those GHGs in significant quantities, which the IPCC has concluded “accelerat[es] the pace of climate change.”¹⁵⁰

3. Sea-level rise

93. The IPCC is *virtually certain* that absorption of excess heat into the ocean and marine cryosphere causes sea-level rise. The IPCC has found that the global mean sea level

¹⁴² Glaciers are large blocks of frozen water on top of land. *See id.*, *Annex II: Glossary*, p. 2910; Cooley Report, ¶ 34, fn. 74.

¹⁴³ IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (2019), p. 6; *see also* IPCC, Working Group II, *Cross-Chapter Paper 6: Polar Regions*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 2321.

¹⁴⁴ IPCC, Working Group II, *Cross-Chapter Paper 6: Polar Regions*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 2338; *The Arctic Ocean Has Lost 95 Percent of Its Oldest Ice—A Startling Sign of What’s to Come*, WASHINGTON POST (11 December 2018).

¹⁴⁵ IPCC, Working Group II, *Cross-Chapter Paper 6: Polar Regions*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 2321.

¹⁴⁶ *Id.*, p. 2321; *The Inuit Knowledge Vanishing with the Ice*, BBC (11 October 2021); Duane Smith, *Climate Change in the Arctic: An Inuit Reality*, UN CHRONICLE (2007).

¹⁴⁷ Cooley Report, ¶ 40; *see also* IPCC, *Chapter 3: Polar Regions*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE (2019), p. 203.

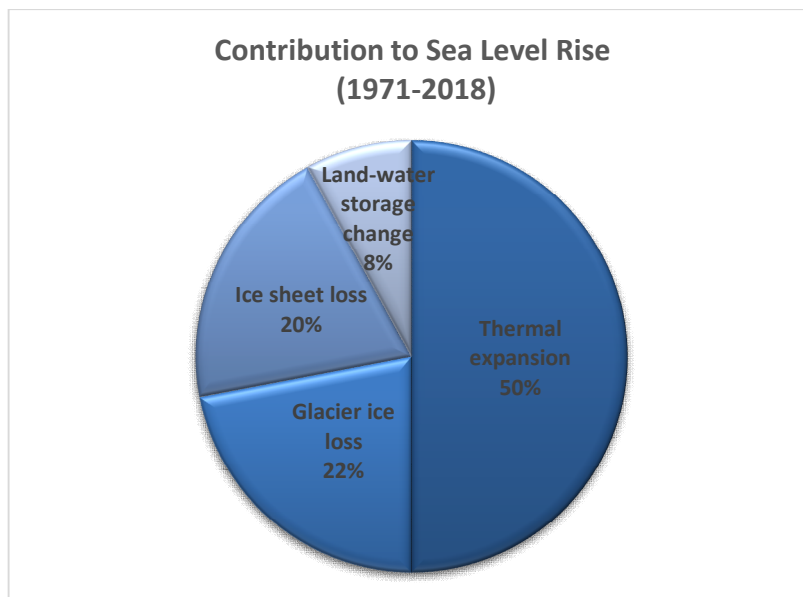
¹⁴⁸ IPCC, Working Group II, *Annex II: Glossary*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 238, 248 (citation omitted).

¹⁴⁹ IPCC, *Chapter 3: Polar Regions*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (2019), p. 206.

¹⁵⁰ *Id.*, p. 248.

increased by approximately 0.20 meters between 1901 and 2018, with projections going up substantially from there.¹⁵¹ The IPCC has called sea-level rise “unavoidable” and concluded with high confidence that, as a result, “risks for coastal ecosystems, people and infrastructure will continue to increase beyond 2100 (*high confidence*).”¹⁵²

94. Three main factors contribute to sea-level rise. *First* is thermal expansion, which accounted for 50 percent of mean sea-level rise from 1971 to 2018. Like most liquids, water expands as it warms. Sea-level rise is therefore in part a direct consequence of the ocean’s absorption of excess heat. Thermal expansion explained 50 percent of sea level rise during 1971–2018. *Second*, melting of ice sheets contributed 20 percent of mean sea-level rise in the same period, and melting of glaciers added 22 percent.¹⁵³ *Finally*, fluctuations in land-water storage—the amount of water that humans store on land or let run into the ocean, such as through dams—contributed 8 percent.¹⁵⁴



95. Sea-level rise causes significant harm and presents an existential threat to Small Island States, including:

- (a) *Destruction and submergence of coastal and island communities and amenities.* Sea-level rise threatens low-lying communities around the world. At current rates of GHG emissions, some Small Island States will be uninhabitable—if not fully submerged—by 2100.¹⁵⁵ Before then, coastal communities and infrastructure will become uninhabitable due to rising tides.

¹⁵¹ IPCC, Working Group I, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), pp. 5, 12–13; see Cooley Report, § III.B.

¹⁵² IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), p. 15.

¹⁵³ IPCC, Working Group I, *Chapter 9: Ocean, Cryosphere and Sea Level Change*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 1318.

¹⁵⁴ See Cooley Report, p. 21, figure 11.

¹⁵⁵ IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 2046; UN General Assembly, Prime Minister of Tuvalu National Statement to the 77th Session (23 September 2022), p. 4; see also Maharaj Report, ¶ 82.

Sea-level rise also shrinks amenities, such as beaches and piers, that promote desirable or useful human enjoyment of the sea and coastline.¹⁵⁶

- (b) *Population displacement.* Sea-level rise could displace millions of people living in coastal and island communities around the world.¹⁵⁷
- (c) *Salinization of aquifers and agricultural lands.* The IPCC found with high confidence that climate-related factors, including sea-level rise and flooding, have led to seawater intrusion into aquifers, soils, estuaries, and deltas around the world. Salinization of these sensitive areas contributes to food insecurity.¹⁵⁸ Furthermore, salinization contributes to the spread of marine-borne pathogens such as *Vibrio cholerae*, which endanger human health.¹⁵⁹
- (d) *Loss of coastal habitats.* Sea-level rise destroys coastal habitats, including mangroves and sandy beaches. These are important ecosystems, especially in island States, for seabirds, turtles, and other coastal animals.¹⁶⁰
- (e) *Loss of cultural heritage.* The IPCC found that “[c]limate-change impacts on ocean and coastal cultural ecosystem services have already disrupted people’s place-based emotional attachments and cultural activities (*limited evidence, high agreement*).”¹⁶¹ Furthermore, “[s]ea level rise and storm-driven coastal erosion endanger coastal archaeological and heritage sites around the world (*very high confidence*).”¹⁶²
- (f) *Decline in fishing and ecotourism.* Sea-level rise threatens economic activity tied to the coasts and coastal infrastructure, such as fishing and ecotourism, that are important industries in climate-affected states. The IPCC has high confidence that climate-change impacts “will continue to denude coastal and marine ecosystem services in many small islands with serious consequences for vulnerable communities.”¹⁶³

¹⁵⁶ See, e.g., IPCC, Working Group II, *Cross-Chapter 4: Mediterranean Region*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 2245 (citations omitted); *id.*, *Chapter 15: Small Islands*, p. 2067; Maharaj Report, § III.C.4; see also Cooley Report § VI.A..

¹⁵⁷ IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 2067; see also Cooley Report § VI.F; Maharaj Report, § III.C.9.

¹⁵⁸ IPCC, Working Group II, *Chapter 4: Water*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 461; see also Cooley Report § VI.D.

¹⁵⁹ IPCC, Working Group II, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), pp. 461–463.

¹⁶⁰ *Id.*, *Chapter 15: Small Islands*, p. 2057; Maharaj Report, § III.C.10.

¹⁶¹ IPCC, Working Group II, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 467; Maharaj Report, § III.C.10.

¹⁶² IPCC, Working Group II, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 467 (citations omitted); see also IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 2069.

¹⁶³ *Id.*, *Chapter 15: Small Islands*, p. 2058; see also *id.*, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, p. 480; Cooley Report, § VI.C.

4. Changes to ocean and air currents

96. Excess heat in the ocean changes ocean and air currents, contributing to extreme weather events.¹⁶⁴ The IPCC has concluded with high confidence that “[m]any ocean currents will change in the 21st century as a response to changes in wind stress associated with anthropogenic warming.”¹⁶⁵

97. An example of this is the Atlantic Meridional Overturning Circulation (“AMOC”), a large system of ocean currents that carry warm water from the tropics into the North Atlantic. The IPCC expects that, as the Atlantic warms over the next 100 years, the AMOC will weaken.¹⁶⁶ It is difficult to predict the precise impact of a weakened or halted AMOC, especially amid other climate stressors, but at a minimum it would likely keep more warm water in the tropics, further contributing to increased rainfall and hurricane activity associated with climate change.¹⁶⁷ The IPCC has already concluded that it is “*likely* that the global proportion of major (Category 3–5) tropical cyclone occurrence has increased over the last four decades” due to climate change.¹⁶⁸ The IPCC has specified at least four other major ocean currents as facing similar risks.¹⁶⁹

5. Ocean stratification and deoxygenation

98. Ocean warming exacerbates ocean stratification, the separation of ocean water by density.¹⁷⁰ The IPCC has concluded that it is “*virtually certain*” that stratification of the upper 200 meters of the ocean globally “has increased since 1970,” and that “[s]tratification (*virtually certain*) . . . will continue to increase in the 21st century.”¹⁷¹ The IPCC has concluded with high confidence that the mean stratification of the upper 200 meters has increased by over two percent since 1971.¹⁷²

99. Ocean stratification poses a serious threat to the entire marine ecosystem. The ocean is naturally stratified between warm and cool water: because warm water is less dense, it tends to float on top of cool water.¹⁷³ Ocean currents do push some cooler water closer to the surface, however—a process called vertical mixing. That vertical mixing is essential to life throughout the ocean because it distributes life-sustaining nutrients and oxygen to the surface.

¹⁶⁴ See Cooley Report, § III.C.

¹⁶⁵ IPCC, Working Group I, *Chapter 9: Ocean, Cryosphere and Sea Level Change*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 1214.

¹⁶⁶ See *id.*

¹⁶⁷ IPCC, *Chapter 6: Extremes, Abrupt Changes and Managing Risks*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE, (2019), p. 591.

¹⁶⁸ IPCC, Working Group I, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 9.

¹⁶⁹ See *id.*, *Chapter 9: Ocean, Cryosphere and Sea Level Change*, pp. 1214–1215.

¹⁷⁰ See Cooley Report, § III.E.

¹⁷¹ IPCC, Working Group I, *Technical Summary*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 74.

¹⁷² *Id.*; see also *id.*, *Regional Fact Sheet—Ocean*; IPCC, *Chapter 9: Oceans and Coastal Ecosystems and Their Services*, pp. 395, 1214, 1225–1227.

¹⁷³ IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (2019), p. 9.

100. Specifically, vertical mixing replenishes nutrients dissolved in the ocean—such as nitrogen, phosphorus, iron, and magnesium—that are the building blocks of marine life. These nutrients are critical in part because phytoplankton, microscopic organisms that float in the sunlit areas of the ocean, consume them during photosynthesis, the process by which phytoplankton convert sunlight into life-sustaining energy. As they photosynthesize, phytoplankton excrete pellets of feces, which sink to lower depths. The fecal pellets are then digested by microbes or other marine life, which releases the nitrogen, phosphorus, iron, and magnesium essential for photosynthesis. Vertical mixing then carries those nutrients up to the surface where phytoplankton can consume them, starting the cycle over again.

101. Ocean stratification interrupts that feces-to-nutrients recycling, disrupting phytoplankton blooms and curtailing the subsequent supply of food sinking to deep-sea organisms. As Dr. Cooley explains, “[s]tratification decreases the vertical exchange of recycled nutrients from the deep ocean back to the upper ocean that help nourish phytoplankton blooms, and it decreases the penetration of dissolved oxygen and carbon dioxide into the deep ocean.”¹⁷⁴ Decreases in phytoplankton are devastating to the marine ecosystem given phytoplankton’s place at the base of the food chain as the principal diet of zooplankton, small fish, and crustaceans.

102. Vertical mixing also replenishes the oxygen at the surface that marine organisms living in warmer water consume.¹⁷⁵ Less vertical mixing reduces the amount of oxygen available below the surface in mid- to deep water.¹⁷⁶ Marine life also requires more oxygen to live at higher temperatures.¹⁷⁷ Less phytoplankton also exacerbates ocean deoxygenation, as phytoplankton release oxygen into surface water as a byproduct of photosynthesis.

103. The IPCC has concluded with medium confidence that the top 1,000 meters of the ocean’s surface have lost oxygen on average, with a very likely range of 0.5 to 3.33 percent.¹⁷⁸ Less oxygen in surface water will limit the number and variety of marine species that can live in those waters.

C. Reduction of harm by limiting GHG emissions to keep average global temperatures from rising above 1.5°C

104. To address the harms linked to climate change discussed above, the IPCC concluded with high confidence that limiting global warming consistent with the global standard of 1.5°C above pre-industrial levels will reduce the risks of harm associated with even greater increases in average global temperature affecting the ocean and marine cryosphere.

¹⁷⁴ Cooley Report, § III.E.

¹⁷⁵ *Id.*, fn. 17; see also IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (2019), pp. 9–10.

¹⁷⁶ IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (2019), pp. 9–10.

¹⁷⁷ James Urton, *Marine Animals Live Where Ocean Is Most “Breathable,” but Ranges Could Shrink with Climate Change*, UNIVERSITY OF WASHINGTON NEWS (16 September 2020).

¹⁷⁸ IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (2019), pp. 9–10.

105. The IPCC has expressed its high confidence that limiting global warming to 1.5°C compared to 2°C will:

reduce increases in ocean temperature as well as associated increases . . . in ocean oxygen levels. . . . Consequently, limiting global warming to 1.5°C is projected to reduce risks to marine biodiversity, fisheries, and ecosystems, and their functions and services to humans, as illustrated by recent changes to Arctic sea ice and warm-water coral reef ecosystems (*high confidence*).¹⁷⁹

The IPCC also concluded with high confidence that the risks to small islands and low-lying coastal areas associated with sea-level rise—including saltwater intrusion, flooding, and damage to infrastructure—are higher at 2°C compared to 1.5°C.¹⁸⁰ In May 2023, scientists from the World Meteorological Organization concluded that there is a 66% likelihood that the annual average global temperature will be more than 1.5°C above pre-industrial levels for at least one year between 2023 and 2027.¹⁸¹

106. Dr. Cooley confirms that, “[a]lthough planetary global average temperatures of even 1.5°C above preindustrial [levels] . . . will raise average ocean temperatures” with harmful effects, warming above that threshold will significantly increase the risk of severe harm to fragile ecosystems.¹⁸² Specifically, warming above 1.5°C will place “warm water corals at very high risk; kelp forests at moderate to high risk; salt marshes, seagrass meadows, sandy beaches, rocky shores, epipelagic systems, and seamount, canyon, and slope deep systems at moderate risk; and estuaries, eastern boundary upwelling systems, at undetectable to moderate risk.”¹⁸³

III. The ocean and marine cryosphere absorption of excess carbon

107. This Section III demonstrates that excess carbon also causes damage to and through the marine ecosystem. It absorbs over one-quarter of excess carbon (Subsection A), leading to physical and chemical changes that cause profound harm, especially to Small Island States (Subsection B). This harm will compound as more carbon dioxide is emitted into the atmosphere (Subsection C).

A. The marine environment’s role in the absorption of anthropogenic carbon dioxide emissions

108. The marine environment has absorbed around one-quarter of the 2400±240 gigatons of excess carbon dioxide that human activities have emitted into the atmosphere.¹⁸⁴ This

¹⁷⁹ IPCC, *Summary for Policymakers*, SPECIAL REPORT: GLOBAL WARMING OF 1.5°C (2018), p. 10.

¹⁸⁰ *Id.*

¹⁸¹ WMO, *Global Annual to Decadal Climate Update* (2023), p. 2.

¹⁸² Cooley Report, § V.F.

¹⁸³ *Id.*, § III.F.

¹⁸⁴ IPCC, Working Group I, *Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 714; IPCC, Working Group III, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: MITIGATION OF CLIMATE CHANGE (2022), p. 10; see also Cooley Report, § IV.

includes marine flora such as plankton and seagrasses that consume carbon dioxide during photosynthesis.¹⁸⁵ But it also includes the ocean itself. This is because the atmosphere and ocean naturally interact at the air-sea interface where air dissolves into the water. As the concentration of carbon dioxide in the atmosphere increases, so will the amount of carbon dioxide that dissolves into the water.

109. As Dr. Cooley explains, when carbon dioxide (CO₂) dissolves in the ocean, it reacts with water (H₂O) to produce carbonic acid (H₂CO₃). When carbonic acid itself dissolves in water, it creates another chemical reaction that makes it lose one positively charged hydrogen atom, also called a hydrogen ion or proton.¹⁸⁶ The result of that disassociation—or separation of the carbonic acid molecule—is a molecule commonly called bicarbonate (HCO₃⁻) plus a hydrogen ion (H⁺). Acidity measures nothing more than the concentration of hydrogen ions in a mixed liquid: pH historically stood for “potential of hydrogen.” The pH scale measures the presence of hydrogen ions on a negative logarithmic scale, meaning that a lower pH indicates higher acidity.¹⁸⁷ The IPCC projects that increased ocean acidification is “virtually certain” even with GHG emission reductions keeping average global temperature rise within 1.5°C due to the anthropogenically emitted GHGs already in the atmosphere.¹⁸⁸

B. The profound scope of harm to the ocean from excess carbon

110. The chemical reaction between carbon dioxide and seawater has undoubtedly made the ocean more acidic.¹⁸⁹ According to the IPCC Special Report on the Ocean and Cryosphere, “[b]y absorbing more CO₂, the ocean has undergone increasing surface acidification (*virtually certain*).”¹⁹⁰ Furthermore, “[s]ince the beginning of the industrial era, oceanic uptake of CO₂ has resulted in acidification of the ocean; the pH of ocean surface water has decreased by 0.1 (*high confidence*), corresponding to a 26% increase in acidity.”¹⁹¹ The IPCC concluded in 2022 that it “is *virtually certain* that the uptake of anthropogenic CO₂ was the main driver of the observed acidification of the global surface open ocean.”¹⁹²

111. The pH balance of the ocean, which for millions of years remained stable, has entered a phase of decrease.¹⁹³ As the IPCC concluded: “The chemical response to increased CO₂ dissolving into the ocean from the atmosphere is known with very high confidence. . . . Further increases in atmospheric CO₂ are virtually certain to further acidify the ocean and

¹⁸⁵ IPCC, Working Group II, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), pp. 400–401.

¹⁸⁶ Cooley Report, ¶ 47.

¹⁸⁷ *See id.*, fn. 105.

¹⁸⁸ IPCC, *Summary for Policy Makers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), pp. 12–13.

¹⁸⁹ *See* Cooley Report, § IV.

¹⁹⁰ IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (2019), p. 9; *see also* IPCC, Working Group I, *Chapter 3: Human Influence on the Climate*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 489; *id.*, *Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks*, pp. 714–722.

¹⁹¹ IPCC, *Summary for Policymakers*, FIFTH ASSESSMENT SYNTHESIS REPORT (2014), p. 4.

¹⁹² IPCC, Working Group I, *Chapter 3: Human Influence on the Climate*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 427; *see also* Cooley Report, ¶ 49.

¹⁹³ IPCC, *Technical Summary*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 76.

change its carbonate chemistry.”¹⁹⁴ There is evidence from the Sargasso Sea in the North Atlantic that, over the past 40 years, the surface ocean carbon dioxide concentrations have increased at a similar rate to the increase of atmospheric carbon dioxide; these data constitute the longest record of ocean carbon dioxide changes in the global ocean.¹⁹⁵

112. The impacts of this ocean acidification are far-reaching and complex.¹⁹⁶ Marine organisms are at risk from progressively lower oxygen levels and higher rates of ocean acidification that are exacerbated by higher ocean temperatures.¹⁹⁷ These risks include major changes to the food web structure in the ocean¹⁹⁸ and “could trigger a chain reaction of impacts through the marine food web by the reduction or even loss of species that are key links in the food web.”¹⁹⁹ In the words of the IPCC: “Ocean acidification affects a variety of biological processes with, for example, lower calcium carbonate saturation states reducing net calcification rates for some shell-forming organisms and higher CO₂ concentrations increasing photosynthesis for some phytoplankton and macroalgal species.”²⁰⁰ The IPCC Special Report on the Ocean and Cryosphere observes with high confidence that “[w]arm-water coral reefs and rocky shores dominated by immobile, calcifying (e.g., shell and skeleton producing) organisms such as corals, barnacles and mussels, are currently impacted by extreme temperatures and ocean acidification.”²⁰¹

113. Ocean acidification has impacts on benthic—or seabed—ecosystems important for food and ecoservices. Benthic communities, such as corals, mollusks, macroalgae, seagrass and microbiota will be impacted directly and indirectly by low pH.²⁰² Scientific evidence shows the various “deleterious impacts of ocean acidification on the productivity and resilience of natural and managed resources, such as coral reefs, fish stocks, and crustaceans.”²⁰³

¹⁹⁴ IPCC, Working Group II, *Chapter 30: The Ocean*, FIFTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2014), pp. 1673–1674.

¹⁹⁵ See Nicholas R. Bates et al., *A Time-Series View of Changing Surface Ocean Chemistry Due to Ocean Uptake of Anthropogenic CO₂ and Ocean Acidification* *Oceanography*, 27 SPECIAL ISSUE ON CHANGING OCEAN CHEMISTRY 126 (March 2014); see also Nicholas R. Bates & Rodney J. Johnson, *Acceleration of Ocean Warming, Salinification, Deoxygenation and Acidification in the Surface Subtropical North Atlantic Ocean*, 1 COMMUNICATIONS EARTH & ENVIRONMENT 33 (2020).

¹⁹⁶ See Moritz Bollmann et al., *How Climate Change Alters Ocean Chemistry*, WORLD OCEAN REVIEW: LIVING WITH THE OCEANS 28 (2010), pp. 35–43; see also Cooley Report, § V.

¹⁹⁷ IPCC, *Summary for Policymakers*, FIFTH ASSESSMENT SYNTHESIS REPORT (2015), p. 13.

¹⁹⁸ IPCC, *Chapter 3: Impacts of 1.5 °C of Global Warming on Natural and Human Systems*, SPECIAL REPORT: GLOBAL WARMING OF 1.5°C (2018), p. 227.

¹⁹⁹ Dan Laffoley et al., *Ocean Acidification: Scientific Understanding and Challenges*, RESEARCH HANDBOOK ON OCEAN ACIDIFICATION LAW AND POLICY 11–22 (David L Vanderzwaag et al. eds, 2021), p. 15.

²⁰⁰ IPCC, Working Group II, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), pp. 395–396.

²⁰¹ IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (2019), p. 13.

²⁰² Secretariat of the Convention on Biological Diversity, *An Updated Synthesis of the Impacts of Ocean Acidification on Marine Biodiversity*, CBD TECHNICAL SERIES, no. 75 (2014), p. 55.

²⁰³ Nilufer Oral, *Ocean Acidification: Falling Between the Legal Cracks of UNCLOS and the UNFCCC?*, 45 *ECOLOGY LAW QUARTERLY* 9 (2018), p. 16 (citing CBD Secretariat, *An Updated Synthesis of the Impacts of Ocean Acidification on Marine Biodiversity*, CBD TECHNICAL SERIES, no. 75 (2014), pp. 7–9).

114. Major impacts will be felt by tropical coral reefs, which perform a vital land building role for coastal and island ecosystems. Tropical coral reef ecosystems are one of the most biodiverse habitats in the ocean, which directly and indirectly support some one third of all marine species.²⁰⁴ The IPCC has concluded that ocean acidification can “weaken coral skeletons, contribute to disease, and slow the recovery of coral communities after mortality events (*low to medium confidence*).”²⁰⁵ It continues: “Mass coral bleaching and mortality are projected to increase because of interactions between rising ocean temperatures, ocean acidification, and destructive waves from intensifying storms.”²⁰⁶

115. In 2018, the IPCC highlighted tropical corals as among the critically important “framework organisms” or “ecosystem engineers” that build structures providing the habitat for large numbers of species.²⁰⁷ The IPCC assessed present-day risks to reef-building tropical corals as “high” with “evidence of strengthening concern” that tropical corals “may be even more vulnerable to climate change” than indicated in assessments conducted in 2014.²⁰⁸ The IPCC suggested that even if warming were to be restrained to 1.5°C above pre-industrial levels, the result would be a “further loss of 70-90% of reef-building corals compared to today, with 99% of corals being lost under warming of 2°C or more above the pre-industrial period.”²⁰⁹

116. These effects will not be restricted to the tropics. Projected ocean acidification and oxygen loss will also affect deep ocean biodiversity and habitats that rely on nutrients from the deep ocean.²¹⁰ Some regions will experience more intense levels of ocean acidification. Projections based on model studies show that, by 2050, the Arctic Ocean will be the first ocean to experience acidification so severe that it will cross a key geochemical threshold, above which unprotected calcium carbonate minerals will dissolve.²¹¹ This will erode the calcium carbonate-based shells of shellfish such as sea snails and inhibit shell building.²¹² Studies show that, by 2100, the entire Arctic Ocean may have crossed that threshold.²¹³

117. Ocean acidification also decreases marine biodiversity and abundance by compounding the effects of ocean deoxygenation. For example, it makes the upper ocean

²⁰⁴ *Id.*, p. 55.

²⁰⁵ IPCC, *Chapter 3: Impacts of 1.5 °C of Global Warming on Natural and Human Systems*, SPECIAL REPORT: GLOBAL WARMING OF 1.5°C (2018), p. 230.

²⁰⁶ *Id.*, p. 235.

²⁰⁷ *Id.*, p. 225.

²⁰⁸ *Id.*, pp. 225–226.

²⁰⁹ *Id.*, p. 230; *see also* Cooley Report, ¶ 64.

²¹⁰ IPCC, *Chapter 5: Changing Ocean, Marine Ecosystems, and Dependent Communities*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (2019), p. 507.

²¹¹ Jens Terhaar et al., *Arctic Ocean Acidification Over the 21st Century Co-Driven by Anthropogenic Carbon Increases and Freshening in the CMIP6 Model Ensemble*, 18(6) BIOGEOSCIENCES 2221 (2021), figure 3.

²¹² *See* Nina Bednarsek et al., *Systematic Review and Meta-Analysis Toward Synthesis of Thresholds of Ocean Acidification Impacts on Calcifying Pteropods and Interactions with Warming*, 6 FRONTIERS IN MARINE SCIENCE (2019); Lisette Mekkes et al., *Effects of Ocean Acidification on Calcification of the Sub-Antarctic Pteropod *Limacina Retroversa**, 8 FRONTIERS IN MARINE SCIENCE (2021).

²¹³ Dan Laffoley et al., *Ocean Acidification: Scientific Understanding and Challenges*, RESEARCH HANDBOOK ON OCEAN ACIDIFICATION LAW AND POLICY 11–22 (David L. Vanderzwaag et al. eds. 2021), p. 16.

inhospitable to zooplankton and other marine life.²¹⁴ The IPCC expects that, between ocean acidification and deoxygenation, the upper ocean’s metabolic index—the rate at which marine flora and fauna produce energy—will decrease globally by 20 percent by 2100.²¹⁵ The IPCC concluded in 2022:

Warming, acidification and deoxygenation are altering ecological communities by increasing the spread of physiologically suboptimal conditions for many marine fish and invertebrates (*medium confidence*). These and other responses have subsequently driven habitat loss (*very high confidence*), population declines (*high confidence*), increased risks of species extirpations and extinctions (*medium confidence*) and rearrangement of marine food webs (*medium to high confidence*, depending on ecosystem).

118. The IPCC also concluded based on laboratory studies that ocean acidification “decreases the fitness, growth or survival of many economically and culturally important larval or juvenile shelled molluscs (*high confidence*) and of several valuable wild-harvest crab species,” and that it “alters larval settlement and metamorphosis of fish in laboratory studies (*high confidence*).”²¹⁶ In other words, ocean acidification inhibits the survival of molluscs and crustaceans, such as oysters, clams, mussels, lobsters, and crabs. This may have significant impacts on the food chain for marine life, as well as the food security of the millions of people that depend upon the ocean for nutrition and livelihoods. For example, studies estimate the possible loss from acidification of some 27 percent of mussel production biomass in Patagonian Waters in southern Chile.²¹⁷ The CBD Secretariat has also concluded that ocean acidification may lead to a substantial reduction in fisheries catch potential.²¹⁸ The limited studies on the economic impact on ocean acidification on coral reefs and lost ecosystem services put the cost near US\$1 trillion by 2100.²¹⁹

119. The IPCC projects that, at the current global rate of emissions, “[c]ontinued carbon uptake by the ocean by 2100 is virtually certain to exacerbate ocean acidification. Open ocean surface pH is projected to decrease by around 0.3 pH units by 2081–2100, relative to 2006–2015 . . . (*virtually certain*).”²²⁰ The IPCC also states with “*high confidence* that ocean

²¹⁴ See Cooley Report, § V.E.

²¹⁵ IPCC, Working Group II, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, SIXTH ASSESSMENT REPORT—CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 436.

²¹⁶ IPCC, Working Group II, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 460.

²¹⁷ Dan Laffoley et al., *Ocean Acidification: Scientific Understanding and Challenges*, RESEARCH HANDBOOK ON OCEAN ACIDIFICATION LAW AND POLICY 11–22 (David L. Vanderzwaag et al. eds. 2021), p. 14.

²¹⁸ Secretariat of the Convention on Biological Diversity, *An Updated Synthesis of the Impacts of Ocean Acidification on Marine Biodiversity*, CBD TECHNICAL SERIES, no. 75 (2014), p. 83.

²¹⁹ *Id.*, p. 84.

²²⁰ IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (2019), p. 19 (emphasis in original); see also Cooley Report, ¶ 50.

acidification will increase for centuries if CO₂ emissions continue, and will strongly affect marine ecosystems.”²²¹

C. Reduction of harm by limiting GHG emissions to keep average global temperatures from rising above 1.5°C

120. As noted above, the IPCC is clear that any emission of GHGs will compound the risks of climate change, including ocean acidification, with risks increasing substantially with a global average temperature increase of 1.5°C or more over pre-industrial levels. For example, the IPCC has high confidence that the

level of ocean acidification due to increasing CO₂ concentrations associated with global warming of 1.5°C is projected to amplify the adverse effects of warming, and even further at 2°C, impacting the growth, development, calcification, survival, and thus abundance of a broad range of species, for example, from algae to fish.²²²

121. Conversely, the IPCC is confident that limiting global warming consistent with the global standard of 1.5°C above pre-industrial levels will reduce the risks of harm caused by ocean acidification. The IPCC has concluded with high confidence that “[l]imiting global warming to 1.5°C compared to 2°C is projected to reduce . . . increases in ocean acidity” and, as a consequence, the “risks to marine biodiversity, fisheries, and ecosystems” associated with ocean acidification.”²²³

IV. Severe and existential threats posed by climate change to Small Island States

122. Despite having contributed negligible amounts to historical GHG emissions, Small Island States bear the brunt of climate change impacts, many of which are already causing them acute, irreparable damage.²²⁴ Small Island States will suffer devastating effects even if global warming remains under 1.5°C above pre-industrial levels, and any progression to higher levels of warming would be catastrophic or fatal to them and others.²²⁵ The IPCC has concluded with *high confidence* that, for small islands, “projected climate and ocean-related changes will significantly affect marine and terrestrial ecosystems and ecosystem services, which will in turn have cascading impacts across both natural and human systems.”²²⁶ Dr. Maharaj further explains that “there is *high confidence* that the vulnerability of these communities may exceed adaptation limits well before 2100—even under low greenhouse gas emission pathways.”²²⁷

²²¹ IPCC, *Summary for Policymakers*, FIFTH ASSESSMENT SYNTHESIS REPORT (2015), p. 16.

²²² IPCC, *Summary for Policymakers*, SPECIAL REPORT: GLOBAL WARMING OF 1.5°C (2018), p. 9.

²²³ *Id.*, p. 8.

²²⁴ See, e.g., Statement of Antigua and Barbuda at COP27; Statement of Niue at COP27; Statement of Palau at COP27; Statement of Saint Lucia at COP27; Statement of Tonga at COP27; Statement of Tuvalu at COP27; Statement of Vanuatu at COP27.

²²⁵ See Maharaj Report, § III.B.

²²⁶ IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 2045.

²²⁷ Maharaj Report, ¶ 82.

123. Although research into the precise modalities and effects of climate change on Small Island States remains limited due to lack of funding, the data that is available confirms they are facing existential threats.²²⁸ Sea-level rise and flooding damage communities, infrastructure, and scarce freshwater resources, and threaten to submerge low-lying islands such as Tuvalu, which has an average elevation of 2 meters.²²⁹ Tropical cyclones and other extreme weather events—such as Hurricane Irma on Antigua and Barbuda in 2017 or Severe Tropical Cyclone Ian on Tonga in 2014—can have similar effects, leading to water and food insecurity, as well as a decline in health outcomes.²³⁰ Small Island States often take years to recover from flooding by extreme weather events due in part to the high cost of debt financing for such projects.²³¹

124. Furthermore, ocean warming, stratification, and acidification destroy marine biodiversity and abundance around islands that depend on the sea for their lives and livelihoods; for example, over 70 percent of Niuean households eat fish caught in local waters every day.²³² Ocean warming is bleaching Palau’s coral reefs, destroying those fragile ecosystems.²³³ Together, these effects also threaten natural and cultural heritage in and around Small Island States, including dozens of UNESCO World Heritage Sites and traditions of vulnerable populations.²³⁴

* * *

125. The science is indisputable: anthropogenic GHGs cause climate change; the ocean absorbs 90 percent of the excess heat caused by GHG emissions, leading to physical and chemical changes that cause profound harm, especially to Small Island States; the marine ecosystem absorbs one-quarter of excess carbon from GHG emissions that, too, changes the ocean’s chemistry and causes profound harm; and the severity of the harm caused by GHG emissions increase substantially with average global temperature rise beyond 1.5°C above pre-industrial levels.

²²⁸ See Maharaj Report, §§ II–III.

²²⁹ See UN General Assembly, Prime Minister of Tuvalu National Statement, 77th Session (23 September 2022), p. 4; Maharaj Report, § III.C.4.

²³⁰ See Maharaj Report, §§ III.5–7.

²³¹ See, e.g., World Health Organization, Health & Climate Change: Antigua and Barbuda Country Profile 2020; Third National Communication of Tonga to the UNFCCC (December 2019), pp. 1, 80; Maharaj Report, § III.D.

²³² See Niue, *Second National Communication*, UNFCCC (2014), p. 64; Maharaj Report, § III.C.5.

²³³ See ¶ 88 above (citing Patrick L. Colin, Ocean Warming and the Reefs of Palau, 32 OCEANOGRAPHY 126 (2018), p. 127).

²³⁴ Maharaj Report, § III.C.10.

**CHAPTER 5:
THE DEFINITION OF THE POLLUTION OF THE
MARINE ENVIRONMENT UNDER UNCLOS**

126. The Convention defines “pollution of the marine environment” in Article 1(1)(4) 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, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality of use of sea water and reduction of amenities.

At every juncture, the language is inclusive: “directly *or* indirectly”; “substances *or* energy”; “results *or is likely* to result”; “*such* deleterious effects *as*,” followed by a non-exhaustive list of possible deleterious effects. In the words of one leading commentator, Article 1(1)(4) thus has an “open texture nature” that allows it to “cover[] new sources of marine pollution” based on real-world events “in the present or future.”²³⁵ Others have commented that the definition is “essentially a scientific one.”²³⁶

127. Anthropogenic GHG emissions—chiefly carbon dioxide, methane, and nitrous oxide—introduced into the atmosphere by human activities—easily meet the definition of “pollution of the marine environment” under the Convention. That is because GHG emissions directly and indirectly introduce both energy (in the form of heat) and a substance (in the form of carbon) into the marine environment.²³⁷

128. Such introduction results or is likely to result in physical and chemical changes to the marine environment that produce deleterious effects. These encompass: *harm to living resources and marine life*, such as the destruction of ocean, coastal, and polar habitats and ecosystems, as well as a significant decline in marine biodiversity and abundance; *hazards to human health*, such as food insecurity and malnutrition, submergence and destruction of coastal communities, changing and increasing extreme weather events (including cyclones, droughts, flooding, and heatwaves), population displacement, salinization of agricultural lands, seawater intrusion into freshwater aquifers, and increased geographic spread of marine-borne pathogens; *hindrance to marine activities, including fishing and other legitimate uses of the sea*, such as decline in fish abundance and diversity, unsustainable migration of fish to cooler water, and decline in fishing and ecotourism; and *reduction of amenities*, such as loss of beach front, submergence and destruction of coastal and reef ecosystems, and loss of cultural heritage.

²³⁵ Yoshifumi Tanaka, *Article 1: Use of Terms and Scope*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Pröhl ed. 2017), p. 23.

²³⁶ See Judge Jin-Hyun Paik, *Disputes Involving Scientific and Technical Matters and the International Tribunal for the Law of the Sea*, NEW KNOWLEDGE AND CHANGING CIRCUMSTANCES IN THE LAW OF THE SEA (Tomas Heidar ed. 2020), p. 16; see also Judge David Anderson, *Scientific Evidence in Cases Under Part XV of the LOSC*, LAW, SCIENCE AND OCEAN MANAGEMENT (Myron H. Nordquist et al. eds. 2007), p. 508 (noting that Article 1(1)(4) has a “strongly scientific flavour”).

²³⁷ See § 4.III above; Cooley Report, § IV.

129. Section I of this Chapter 5 demonstrates how the definition of “pollution in the marine environment” in Article 1(1)(4) is met by virtue of the mechanisms by which anthropogenic GHG emissions constitute the introduction by humans of energy (in the form of heat) and of a substance (carbon) both directly and indirectly into the marine environment. Section II then addresses how these mechanisms result or likely result in the deleterious effects contemplated by that Article by virtue of the widely accepted scientific conclusions of the IPCC.

I. Anthropogenic GHG emissions introduce energy (heat) and a substance (carbon) into the marine environment as defined in Article 1(1)(4)

130. Anthropogenic GHG emissions introduce energy (heat) and a substance (carbon) into the ocean, the marine cryosphere, and the air-sea interface, which are all part of the “marine environment.”

131. This Section I demonstrates that the “marine environment” comprises the entire marine ecosystem (Subsection A); anthropogenic emissions of GHGs constitute both a “direct” and “indirect” action mechanism by which human activities introduce energy and substances into the marine environment (Subsection B); anthropogenic GHG emissions indirectly introduce energy in the form of excess heat into the marine environment (Subsection C); and anthropogenic GHG emissions both directly and indirectly introduce a substance in the form of carbon into the marine environment (Subsection D).

A. The meaning of “marine environment”

132. The definition in Article 1(1)(4) pertains to the “marine environment,” which is not expressly defined in UNCLOS. The “marine environment” encompasses the entire marine ecosystem, including its living and non-living resources.²³⁸

133. The ordinary meaning of “marine” in relevant part is “of, relating to, or characteristic of the sea” or “existing, originating, or found in the sea; produced by the sea; inhabiting or growing in the sea.”²³⁹ The “environment” in relevant part is defined as “the physical surroundings or conditions in which a person or other organism lives, develops, etc., or in which a thing exists; the external conditions in general affecting the life, existence, or properties of an organism or object.”²⁴⁰

134. The ordinary meaning of “marine environment,” therefore, establishes that its definition under the Convention is inclusive, comprising the entire marine ecosystem of marine organisms and their physical environment. It thus includes, at a minimum, the ocean (including internal waters, such as estuaries); the marine cryosphere, including ice shelves (floating glaciers) and sea ice (frozen seawater); the seabed; coastlines; the air-sea interface; and living and non-living resources. Such aspects of the marine ecosystem are clearly “characteristic of the sea” and exist in its “physical surroundings or conditions.”

²³⁸ Cooley Report, § V.

²³⁹ OXFORD ENGLISH DICTIONARY, “marine.”

²⁴⁰ OXFORD ENGLISH DICTIONARY, “environment.”

135. The context for Article 1(1)(4) is Part XII, in which the phrase “marine environment” appears 63 times, and is used in a broad sense.²⁴¹ That Part requires States Parties to prevent, reduce, and control pollution of the marine environment occurring through discharge of pollutants into the “sea,” “from or through the atmosphere,” and in “ice-covered areas,” among other obligations.²⁴² Elsewhere in Part XII, the Convention refers to the atmosphere as “air space” superjacent to the water.²⁴³ The atmosphere is thus part of the “marine environment,” “at least to the extent that there is a direct link between the atmosphere in superjacent airspace and the natural qualities of the subjacent ocean space.”²⁴⁴

136. This inclusive reading is consistent with the only specification of “marine environment” in Article 1(1)(4) itself to include estuaries—internal waters that generally fall outside the Convention’s scope. Articles 194(5) and 211(1) further clarify that the marine environment includes “coastlines,” “rare or fragile ecosystems,” and “the habitat of depleted, threatened or endangered species or other forms of marine life.”

137. The Convention’s object and purpose is supportive: specifically, the States Parties’ express acknowledgement in the Preamble that “the problems of ocean space are closely interrelated and need to be considered as a whole.”²⁴⁵ For States Parties’ obligations in Part XII to have any practical effect toward achieving the Convention’s core mandate for the “protection and preservation of the marine environment,” the features to which these obligations refer must be part of the “marine environment.”²⁴⁶

138. There is no need to have recourse to supplementary means in interpreting “marine environment” in Article 1(1)(4) as the ordinary meaning, context, and object and purpose of the provision establish a clear, unambiguous, and reasonable reading. But if recourse were to be had, the Convention’s preparatory work confirms that it is inclusive. That preparatory work shows a deliberate decision to leave “marine environment” undefined. At the Sea-Bed Committee, the Malta Working Group recommended that “marine environment” be defined as “the surface of the sea, the air space above, the water column and the sea-bed beyond the high tide mark including the biosystems therein or dependent thereon.”²⁴⁷ The reference to areas “beyond the high tide mark” indicates an early intention to include even terrestrial ecosystems that rely on the oceans within the “marine environment.” The Kenyan delegation similarly proposed that the marine environment be defined as “the area comprising the air

²⁴¹ See UNCLOS, Part XII; see also *Article 1: Use of Terms and Scope*, UNITED NATIONS ON THE LAW OF THE SEA (Myron H. Nordquist et al. eds. 2013) (the “VIRGINIA COMMENTARY”), vol. 1, p. 42 (noting that the meaning of marine environment “can be deduced from Part XII” given the relationship between Article 1(1)(4) and States Parties’ obligations to prevent, reduce, and control pollution of the “marine environment”).

²⁴² See UNCLOS, Articles 194(3)(a)–(b), 234.

²⁴³ See UNCLOS, Articles 2(2), 34(1), 49(2), 56(1)(a), 78(1), 135, 155(2), 212, 222.

²⁴⁴ *Article 194: Measures to Prevent, Reduce, and Control Pollution of the Marine Environment*, VIRGINIA COMMENTARY, vol. IV, p. 67 (“[T]he atmosphere itself can be regarded as a component of the marine environment, at least to the extent that there is a direct link between the atmosphere in superjacent airspace and the natural qualities of the subjacent ocean space.”); see also *id.*, p. 42 (“[T]he term “marine environment” will include the atmosphere where relevant.”).

²⁴⁵ See UNCLOS, Preamble.

²⁴⁶ See *id.*; *id.*, Article 192.

²⁴⁷ Third Conference, Sea-Bed Committee, *Malta: Draft Articles on the Preservation of the Marine Environment*, UN Doc. A/AC.138/SC.III/L.33 (1972).

space above the sea, the surface and the subsoil beyond the high tide mark including the living and non-living resources therein.”²⁴⁸ Ultimately, these proposals were not accepted and “marine environment” remained undefined.

139. Nevertheless, the Maltese and Kenyan conceptions of the “marine environment” largely reflect the contemporary understanding and interpretation. This conclusion is supported by the observations of the Chairman of the Third Committee during the negotiations, who noted that it was understood by the delegations present that the term extended to include “marine life.”²⁴⁹ The Virginia Commentary confirms that the drafters of the Convention left the definition of “marine environment” open to fulfill the Convention’s object and purpose: the “absence” of any specific definition was intentional as it “allows the Convention an element of flexibility in accommodating the continuously-expanding human knowledge and human activities relating to the marine environment, including its protection and preservation.”²⁵⁰

140. The jurisprudence of the Tribunal and of Annex VII tribunals confirms this reading. The arbitral tribunal in *Chagos Marine Protection Area* held that Article 194 “extends to measures focused primarily on conservation and the preservation of ecosystems.”²⁵¹ In *Southern Bluefin Tuna*, the Tribunal found that “living resources of the sea” are part of the “marine environment” that States Parties must protect and preserve.²⁵² ITLOS similarly held in *SRFC* that “living resources and marine life are part of the marine environment.”²⁵³ The *South China Sea* tribunal found that “marine environment” encompasses “a dynamic complex of plant, animal and micro-organism communities,” as well as “their non-living environment.”²⁵⁴ And in *Arctic Sunrise*, the Tribunal recognized risk to the ice-covered Arctic region as capable of constituting pollution of the marine environment.²⁵⁵

141. Scholars agree that UNCLOS “goes beyond the anthropocentric understanding of the environment; its scope is comprehensive and includes the entire marine ecosystem”; the obligation “refers to the all-encompassing living and non-living marine nature, its ecosystems and components.”²⁵⁶ The absence of spatial restriction is also confirmed in commentary. Professor Yoshifumi Tanaka notes that, because Article 192’s obligation to protect and

²⁴⁸ Third Conference, *Kenya: Draft Articles for the Preservation and the Protection of the Marine Environment*, UN Doc. A/CONF.62/C.3/L.2 (1974), Preamble ¶ (c).

²⁴⁹ Third Conference, *Reports of the Committees and Negotiating Groups on Negotiations at the Resumed Seventh Session Contained in a Single Document both for the Purposes of Record and for the Convenience of Delegations*, UN Doc. A/CONF.62/RCNG/1 (1978), Proposal on Article 1(4), p. 97.

²⁵⁰ *Article 1: Use of Terms and Scope*, VIRGINIA COMMENTARY, vol. 1, p. 42.

²⁵¹ *Chagos Marine Protected Area (Mauritius v. United Kingdom)*, PCA Case No. 2011-03, Award (18 March 2015) (“*Chagos Award*”), ¶ 538.

²⁵² *Southern Bluefin Tuna (New Zealand v. Japan; Australia v. Japan)* (Case Nos. 3 & 4), Order (Provisional Measures), 1999 ITLOS REP. 280 (27 August) (“*Southern Bluefin Tuna Order*”), ¶ 70.

²⁵³ *SRFC Advisory Opinion*, ¶ 216.

²⁵⁴ *South China Sea (Philippines v. China)*, PCA Case No. 2013-19, Award on the Merits (12 July 2016) (“*South China Sea Award*”), ¶ 945.

²⁵⁵ See “*Arctic Sunrise*” (*The Netherlands v. Russia*), Case No. 22, Order (Provisional Measures), 2013 ITLOS REP. 230 (22 November), ¶¶ 82, 87, 105.

²⁵⁶ Detlef Czybulka, *Article 192: General Obligation*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Prölß ed. 2017), p. 1287.

preserve the marine environment “contains no qualification,” it “follows that the general obligation embodied in Article 192 covers the ocean as a whole, including the high seas.”²⁵⁷

142. Thus, the ordinary meaning of “marine environment” in its context and in light of its object and purpose—as confirmed by the Convention’s preparatory work, related jurisprudence, and commentary—encompasses the entire marine ecosystem under and beyond national jurisdiction, including the ocean, the marine cryosphere, coastlines, the air-sea interface, and the habitats and ecosystems of marine life.

B. Anthropogenic GHG emissions and “pollution of the marine environment”

143. Article 1(1)(4)’s reference to “introduction”—“directly or indirectly, of substances or energy into the marine environment”—places no limit on the types of actions that introduce “energy” or “substances” into the marine environment, except that it must be done “by man.” Likewise, the ordinary meaning of “introduce”—to “put or place in from without, to insert”—captures a wide range of such actions.²⁵⁸ The specification that the “introduction” may be “direct” or “indirect” confirms that this element of the definition encompasses introduction actions regardless of whether the introduction is immediate or involves more than one step.

144. According to its ordinary meaning, “direct” introduction occurs when human activities introduce “substances” or “energy” into the marine environment “without intermediation or intervening agency.”²⁵⁹ The ordinary meaning of “indirect,” by contrast, refers to a mechanism “not immediately resulting from an action or cause,”²⁶⁰ and, accordingly, indirect introduction occurs when human activities introduce “substances” or “energy” into the marine environment, not as the activities’ “immediate[] result[],” but instead through an intermediate step. Importantly, the open-textured nature of the definition in Article 1(1)(4), including its reference to “indirect” sources, does not mean that any kind of introduction of substance or energy into the marine environment, no matter how indirect and no matter how remote, constitutes a breach of UNCLOS. Rather, as explained in Subsection II.C below, the definition in Article 1(1)(4) requires that such mechanisms result or likely result in “deleterious effects,” such that *de minimis* introductions do not qualify, and as explained in Chapter 7, the occurrence of pollution of the marine environment does not *per se* constitute a breach of UNCLOS.

145. The context for Article 1(1)(4) in Part XII makes clear that the human activities leading to the introduction can originate from any source. Article 194(3)(a) specifies that the “measures taken pursuant to this Part [XII] shall deal with *all sources of pollution* of the marine environment,”²⁶¹ and explicitly including “land-based sources.”²⁶² The breadth of the provision led a leading commentary to note that its text “means that neither the place of origin nor the ‘source’ changes the obligation of States to prevent, reduce and control marine pollution” because “[t]he provision encompasses all sources of pollution and shall not leave

²⁵⁷ Yoshifumi Tanaka, *THE INTERNATIONAL LAW OF THE SEA* (4th ed. 2023).

²⁵⁸ See, e.g., OXFORD ENGLISH DICTIONARY, “introduce.”

²⁵⁹ OXFORD ENGLISH DICTIONARY, “direct.”

²⁶⁰ OXFORD ENGLISH DICTIONARY, “indirect.”

²⁶¹ See UNCLOS, Article 194(3) (emphasis added).

²⁶² See *id.*; see also *id.*, Articles 207(1), 213.

gaps.”²⁶³ In addition, Article 211 requires States Parties to “adopt laws and regulations for the prevention, reduction and control of pollution of the marine environment from vessels flying their flag or of their registry.”

146. To the extent there is any ambiguity, recourse to the circumstances of the Convention’s conclusion pursuant to Article 32 of the 1969 Vienna Convention on the Law of Treaties (the “VCLT”) confirms that Article 1(1)(4) was intended to capture a broad range of mechanisms of “introduction.” That text originated in 1969 with the first meeting of the Joint Group of Experts on the Scientific Aspects of Marine Pollution (“GESAMP”), a group of UN technical experts.²⁶⁴ Later that year, the Intergovernmental Oceanographic Commission (the “IOC”)—a body of the UN Educational, Scientific, and Cultural Organization (“UNESCO”) with a mandate to “promote international cooperation and to coordinate programmes in research, services and capacity-building” related to the marine environment—broadened the definition to guide its technical program of oceanic research.²⁶⁵ The 1972 UN Conference on the Human Environment and the Convention’s drafters later adopted essentially the same definition of “pollution of the marine environment.”²⁶⁶

147. In describing the definition, the IOC explained:

Noxious materials can be transported by physical and biological processes over vast distances from the site of their injection into the environment.

Many pollutants reach the oceans from many sources: rivers and coasts, particularly urban and industrial effluents; the atmosphere; ships and equipment operating in the marine environment²⁶⁷

²⁶³ Detlef Czybulka, *Article 194: Measures to Prevent, Reduce, and Control Pollution of the Marine Environment*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Pröbß ed. 2017), pp. 1303–1304.

²⁶⁴ GESAMP, *Report of the First Session*, UN Doc. GESAMP I/11 (17 July 1969), ¶ 12 (defining “marine pollution” as “[i]ntroduction by man of substances into the marine environment resulting in such deleterious effects as harm to living resources, hazards to human health, hindrance to marine activities including fishing, impairment of quality for use of sea water and reduction of amenities”).

²⁶⁵ See UNESCO, *Statutes of the IOC*, UN Doc. SC-2000/WS/57 (1999), Article 2(1); UNESCO, IOC, *Comprehensive Outline of the Scope of the Long-Term and Expanded Programme of Oceanic Exploration and Research*, UN Doc. A/7750 (Annex) (13 September 1969), pp. 5, 24–25 (defining “marine pollution” as “[i]ntroduction by man, directly or indirectly, of substances or energy into the marine environment (including estuaries) resulting in such deleterious effects as harm to living resources, hazard to human health, hindrance to marine activities including fishing, impairing of quality for use of sea water and reduction of amenities”).

²⁶⁶ See United Nations, *Report of the Conference on the Human Environment*, UN Doc. A/CONF.48/14/Rev.1 (Annex III), p. 73; Third Conference, *Results of Consideration of Proposals and Amendments Relating to the Preservation of the Marine Environment*, UN Doc. A/CONF.62/C.3/L.15 (22 August 1974), p. 260, note 12; see also *Article 1: Use of Terms and Scope*, VIRGINIA COMMENTARY, vol. 1, ¶¶ 1.4, 1.22.

²⁶⁷ UNESCO, IOC, *Comprehensive Outline of the Scope of the Long-Term and Expanded Programme of Oceanic Exploration and Research*, SC.70/XVI.7/A (2–13 September 1969), p. 16.

The IOC's explanation thus acknowledges the scientific reality that pollutants can enter the marine environment through various pathways, including the atmosphere, and that the entry point may be far away from the emission point.

148. In *Pulp Mills*, the ICJ considered the question of such direct or indirect introduction in the context of the 1975 Statute of the River Uruguay between Argentina and Uruguay, which comparably defined “pollution” as the “direct or indirect introduction by man into the aquatic environment of substances or energy which have harmful effects.”²⁶⁸ With respect to Argentina's claim that a paper plant's carbon emissions constituted “pollution” under the Statute,²⁶⁹ the ICJ held:

As regards air pollution, the Court is of the view that if *emissions from the plant's stacks* have deposited into the aquatic environment substances with harmful effects, such *indirect pollution of the river* would fall under the provisions of the 1975 Statute.²⁷⁰

149. In *MOX Plant*, the Tribunal considered Ireland's request for the indication of provisional measures in connection with a dispute with respect to the United Kingdom's authorization to open a new mixed oxide fuel (or MOX) plant. Ireland alleged that operation of the plant would contribute to the pollution of the Irish Sea through releases of radioactive materials and wastes, “whether directly into the marine environment *or indirectly via the atmospheric route*.”²⁷¹ Although the Tribunal rejected Ireland's main request, it implicitly recognized the plausibility of a claim of “indirect” pollution of the marine environment via atmospheric release when it ordered the parties to enter into consultations in order to “exchange further information with regard to possible consequences for the Irish Sea arising out of the commissioning of the MOX plant,” on the basis that “the duty to cooperate is a fundamental principle in the prevention of pollution of the marine environment under Part XII of the Convention and general international law.”²⁷² In his Separate Opinion, Judge David Anderson expressly recognized the possibility of indirect introduction through the atmosphere, as he noted that normal cleaning work at the plant “is expected to result in the introduction of some very small amounts of liquid and gaseous substances and energy into the marine environment of the Irish Sea” in part “via the atmosphere, to which article 212 applies.”²⁷³

150. As detailed below, anthropogenic GHG emissions meet the definition in Article 1(1)(4) because they constitute both a “direct” and “indirect” action mechanism by which human activities introduce energy or substances into the marine environment.

²⁶⁸ See Statute of the River Uruguay, 1295 UNTS 340 (19 November 1975), Article 40.

²⁶⁹ *Pulp Mills on the River Uruguay (Argentina v. Uruguay)*, Judgment, 2010 ICJ REP. 14 (20 April) (“*Pulp Mills Judgment*”), ¶ 220.

²⁷⁰ *Id.*, ¶ 264 (emphases added).

²⁷¹ *MOX Plant (Ireland v. United Kingdom)*, Case No. 10, Request for Provisional Measures and Statement of Case Submitted on Behalf of Ireland (9 November 2001), ¶ 112 (emphasis added).

²⁷² *MOX Plant (Ireland v. United Kingdom)*, Case No. 10, Order (Provisional Measures), 2001 ITLOS REP. 95 (3 December) (“*MOX Plant Order*”), ¶¶ 82, 84, 89.

²⁷³ *MOX Plant Order*, Separate Opinion of Judge Anderson, p. 127.

C. Indirect introduction of energy in the form of excess heat into the marine environment

151. Anthropogenic GHG emissions indirectly introduce energy in the form of heat into the marine environment. As explained in Chapter 4, humans engage in various activities that emit GHGs—primarily carbon dioxide, methane, and nitrous oxide—that trap heat in the atmosphere.²⁷⁴ Heat is a form of “energy.” The ordinary meaning of “energy” includes heat: “power or force derived from the exploitation of physical and chemical resources,” including “light and heat.”²⁷⁵ This accords with the scientific definition of “heat”: indeed, the IPCC refers to “heat” and “energy” interchangeably.²⁷⁶

152. The ocean absorbs heat from the atmosphere through a process of thermal transfer from hotter air to cooler water, making them Earth’s largest heat sinks.²⁷⁷ Thus, anthropogenic GHG emissions indirectly introduce energy in the form of heat into the ocean, the marine cryosphere, and the air-sea interface “from or through the atmosphere.”²⁷⁸ The main drivers of such emissions include: running internal combustion engines for industry or transportation by land, sea, or air; burning fossil fuels for heat or electricity; manufacturing agricultural products; and disposing of organic waste.²⁷⁹

153. As noted in Section 4.II.A above, the IPCC has concluded that the ocean and marine cryosphere have absorbed more than 90 percent of the excess heat accumulated in the climate system since 1850. They have been constantly absorbing excess heat since at least the 20th century, with most heat transfer occurring since 1970.²⁸⁰

D. Direct and indirect introduction of excess carbon into the marine environment

154. Anthropogenic GHG emissions directly and indirectly introduce carbon, a substance, into the marine environment, changing its physics and chemistry.

155. Carbon meets the ordinary meaning of “substance”: “any particular kind of matter with uniform properties” or “a kind of matter of a definite chemical composition, as a compound or element.”²⁸¹ It is also a substance in that term’s scientific meaning: carbon dioxide is a “chemical substance” comprising one carbon and two oxygen atoms.²⁸² Black carbon, particles of pure carbon, is also a “substance.”

²⁷⁴ See § 4.II.B above; Cooley Report, § II.D.

²⁷⁵ OXFORD ENGLISH DICTIONARY, “energy.”

²⁷⁶ See, e.g., IPCC, Working Group I, *Chapter 2: Changing State of the Climate System*, SIXTH ASSESSMENT REPORT (2021), p. 380.

²⁷⁷ See § 4.I.A above; Cooley Report § II.

²⁷⁸ See § 4.II above.

²⁷⁹ See § 4.I above.

²⁸⁰ IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (2019), p. 9 (“It is virtually certain that the ocean has warmed unabated since 1970 and has taken up more than 90% of the excess heat in the climate system (*high confidence*). Since 1993, the rate of ocean warming has more than doubled (*likely*).”).

²⁸¹ OXFORD ENGLISH DICTIONARY, “substance.”

²⁸² See § 4.I.B.1

156. GESAMP has consistently concluded that air-sea exchange of pollutants, including carbon dioxide, constitutes pollution of the marine environment.²⁸³ The UN Environment Programme has reached the same conclusion with respect to black carbon.²⁸⁴ These scientific conclusions are consistent with *Pulp Mills* in which, as described above, the ICJ noted that emissions from smokestacks, including carbon, could constitute a “substance” for purposes of the 1975 Statute.²⁸⁵

157. As explained in Chapter 4, human activities emit carbon dioxide by burning organic material such as fossil fuels and biomass, through industrial processes, and through land-use change and land management. Humans also emit black carbon—fine particles of carbon not fully burned, such as soot—when they burn fossil fuels.²⁸⁶ Those substances then pass “from or through the atmosphere” into the marine environment, including the ocean and air-sea interface in the case of carbon dioxide, and the ocean and marine cryosphere in the case of black carbon.²⁸⁷ Indeed, the marine environment has absorbed about one-quarter of the 2400±240 gigatons of carbon dioxide that human activities have emitted into the atmosphere.²⁸⁸

II. Anthropogenic GHG emissions result or are likely to result in deleterious effects as defined in Article 1(1)(4)

158. The introduction of excess heat and carbon into the marine environment by virtue of GHG emissions results or is likely to result in “deleterious effects” under Article 1(1)(4).

159. This Part II demonstrates that: “deleterious effects” as understood in Article 1(1)(4) encompass a non-exhaustive and wide range of present and future harm (Section A); excess heat introduced into the marine environment by virtue of anthropogenic GHG emissions results or is likely to result in such deleterious effects (Section B); and excess carbon introduced in the marine environment by virtue of anthropogenic GHG emissions results or is likely to result in deleterious effects (Section C).

A. Scope of actual or “likely” “deleterious effects”

160. Article 1(1)(4) covers a wide range of actual or likely deleterious effects. The ordinary meaning of “effect” in relevant part is “[t]hat which results from the action or properties of something or someone; results in general; the quality of producing a result, efficacy.”²⁸⁹ Article 1(1)(4) modifies “effect” by the term “deleterious,” the ordinary meaning of which in relevant part is “[c]ausing physical harm or damage to a person or thing;

²⁸³ GESAMP, *Pollutant Modification of Atmospheric and Oceanic Processes and Climate: Some Aspects of the Problem*, REPORTS AND STUDIES NO. 36 (1989); GESAMP, *Interchange of Pollutants between the Atmosphere and the Oceans (part II)*, REPORTS AND STUDIES NO. 23 (1985); GESAMP, *Interchange of Pollutants between the Atmosphere and the Oceans*, REPORTS AND STUDIES NO. 13 (1980). The definition in Article 1(1)(4) is broader than the one that GESAMP uses in that it permits “likely” results.

²⁸⁴ UNEP & WMO, *Integrated Assessment of Black Carbon and Tropospheric Ozone*, CLIMATE & CLEAN AIR COALITION (2011).

²⁸⁵ See § I.B, ¶ 148 (citing *Pulp Mills Judgment*, ¶ 264).

²⁸⁶ See Cooley Report, § II.B, ¶ 24.

²⁸⁷ See § 4.III.A; Cooley Report, § II.B, ¶ 24.

²⁸⁸ See §§ 4.III.A.

²⁸⁹ OXFORD ENGLISH DICTIONARY, “effect.”

detrimental to life or health; harmful; noxious.”²⁹⁰ Reflecting that ordinary meaning, Article 1(1)(4) includes an extensive but non-exhaustive list of deleterious effects: *harm* to living resources and marine life; *hazards* to human health; *hindrance* to marine activities, including fishing and other legitimate uses of the sea; *impairment* of quality of use of sea water; and *reduction* of amenities. By specifying that an effect must be “deleterious” to meet that element of the definition, Article 1(1)(4) makes clear that the introduction of substances or energy into the marine environment is not in itself sufficient; a certain threshold of harm sufficient to qualify as actual or likely “deleterious effect” must be met. International courts and tribunals have made findings of “deleterious effects” by reference to the enumerated examples in the non-exhaustive list contained in Article 1(1)(4).²⁹¹

161. To meet this element of Article 1(1)(4), these effects need only be “likely,” the ordinary meaning of which is “probable [or] having a high chance of occurring.”²⁹² This expressly captures both effects that have already actually occurred and future effects that are likely to occur. The *South China Sea* tribunal, for example, found that the use of dynamite and cyanide for fishing purposes constitutes pollution of the marine environment, in part because they “threaten[]” the fragile ecosystem of coral reefs and the habitats of endangered species.²⁹³

162. In the context of its findings related to climate change, the IPCC defines “likely” as a finding of having a 66 to 100 percent probability of occurrence.²⁹⁴ As a general matter and *a fortiori*, “likely” as understood in Article 1(1)(4) must also include the IPCC’s confidence bands of “virtually certain” (99 to 100 percent) and “very likely” (90 to 100 percent) as applied to its findings.²⁹⁵

163. The inclusion of “likely” within Article 1(1)(4) indicates that assessments of whether a particular introduction of energy or substances into the marine environment may result in deleterious effects should err on the side of inclusivity and precaution. This reflects the well-established standard reflected in the 1992 Rio Declaration on Environment and Development that, “where there are threats of serious or irreversible damage,” the “lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”²⁹⁶ In *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area*, the Seabed Disputes Chamber opined that this standard applies under the Convention “in situations where scientific

²⁹⁰ OXFORD ENGLISH DICTIONARY, “deleterious.”

²⁹¹ See, e.g., *South China Sea Award*, ¶ 970 (holding that shattering coral and injuring non-target species while fishing can constitute “harm [to] living resources and marine life”).

²⁹² OXFORD ENGLISH DICTIONARY, “likely.”

²⁹³ *South China Sea Award*, ¶ 970.

²⁹⁴ See § 4.I, fn. 65.

²⁹⁵ See § 4.I, fn. 65.

²⁹⁶ UN Conference on Environment and Development, *Rio Declaration on Environment and Development*, UN Doc. A/CONF.151/26 (Vol. I) (Annex I) (“Rio Declaration”), Principle 15; see also UNFCCC, Article 3(3).

evidence concerning the scope and potential negative impact of the activity in question is insufficient but where there are plausible indications of potential risks.”²⁹⁷

164. The Chamber further noted in that 2011 opinion that incorporation of this precautionary approach into “a growing number of international treaties and other instruments . . . has initiated a trend towards making this approach part of customary international law.”²⁹⁸ That trend is even stronger a decade later as more treaties have incorporated the precautionary approach.²⁹⁹

B. Actual or likely deleterious effects of excess heat

165. As detailed in Chapter 4 and as noted above, GHG emissions introduce enormous amounts of excess heat (that is, heat above pre-industrial levels) into the marine environment, leading to profound physical and chemical changes to the ocean and marine cryosphere. These include thermal expansion of seawater, loss of sea ice and ice shelves, sea-level rise, ocean stratification and deoxygenation, and shifts in ocean and air currents.³⁰⁰ Those physical and chemical changes result or are likely to result in the deleterious effects enumerated in Article 1(1)(4). These deleterious effects include:

- (a) *Harm to living resources and marine life*, such as decline in marine biodiversity and abundance, including loss of coral reefs due to heat stress, ocean stratification, and ocean deoxygenation; and destruction of ocean, coastal, and polar habitats due to sea-level rise and the melting marine cryosphere,³⁰¹
- (b) *Hazards to human health*, such as:
 - (i) Food insecurity and malnutrition arising out of the decline in seafood as an essential source of animal protein, especially among coastal and island communities,³⁰²

²⁹⁷ *Area Advisory Opinion*, ¶ 131; *see also Pulp Mills Judgment*, ¶ 164 (finding that “a precautionary approach may be relevant in the interpretation and application” of the environmental provisions of the Statute of the River Uruguay).

²⁹⁸ *Area Advisory Opinion*, ¶ 135.

²⁹⁹ *See* Draft 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, (March 2023) (“BBNJ Agreement”) (forthcoming adoption in June 2023); Investment Protocol to the AfCFTA, 2023, Article 34; EU–UK Trade and Cooperation Agreement (30 December 2020), Article GRP.1; UK–Moldova Trade and Cooperation Agreement (24 December 2020), Article 339; UK–Kenya Economic Partnership Agreement (8 December 2020), Article 54; UK–Ukraine Trade Agreement (8 October 2020), Article 278; EU–Vietnam Free Trade Agreement (1 August 2020), Article 13.11; ECOWAS Supplementary Act on Investments (19 January 2019), Article 12; Nigeria–Morocco Bilateral Investment Treaty (3 December 2016), Article 14; Convention on the Determination of the Minimal Conditions for Access and Exploitation of Marine Resources within the Maritime Areas under Jurisdiction of the Member States of the Sub-Regional Fisheries Commission (16 September 2012), Article 2.

³⁰⁰ *See* § 4.II.B.

³⁰¹ *See* §§ 4.II.B, III.B above; Cooley Report, §§ III.E, V.D.

³⁰² *See* §§ 4.II.B, III.B, IV; Cooley Report, § VI.C.

- (ii) Submergence and destruction of coastal communities and infrastructure due to flooding and sea-level rise;³⁰³
- (iii) Changing weather patterns of heat and precipitation caused by changing ocean currents, such as weakened Atlantic Meridional Overturning Circulation;³⁰⁴
- (iv) Extreme weather events, including cyclones, droughts, flooding, and heatwaves;³⁰⁵
- (v) Population displacement due to sea-level rise, declining economic development, or lack of access to water and food;³⁰⁶
- (vi) Salinization of agricultural lands;³⁰⁷
- (vii) Seawater intrusion into freshwater aquifers;³⁰⁸ and
- (viii) Increased geographic spread of marine-borne pathogens;³⁰⁹
- (c) *Hindrance to marine activities, including fishing and other legitimate uses of the sea*, such as decline in fish abundance and diversity, migration of fish to cooler water and decline in fishing and ecotourism;³¹⁰ and
- (d) *Reduction of amenities*—features, facilities, or services that promote desirable or useful human enjoyment of the sea and coastline—such as beach loss due to flooding and sea-level rise, submergence and destruction of coastal and reef ecosystems, and loss of cultural heritage.³¹¹

C. Actual or likely deleterious effects of excess carbon

166. Also as detailed in Chapter 4, GHG emissions introduce enormous amounts of excess carbon (that is, carbon above pre-industrial levels) into the marine environment, leading to profound physical and chemical changes to the ocean and marine cryosphere. Specifically, atmospheric carbon dioxide reacts with seawater to cause ocean acidification. The ocean has been constantly absorbing excess carbon dioxide throughout at least the 20th century, with more than one-quarter of carbon emissions ending up in the marine environment.³¹² Extreme

³⁰³ See § 4.II.B.3 above; Cooley Report, § VI.A.

³⁰⁴ See § 4.II.B.4 above.

³⁰⁵ See *id.*; Cooley Report, § III.C.

³⁰⁶ See § 4.II.B.3 above; Cooley Report, § VI.F.

³⁰⁷ See § 4.II.B.3 above; Cooley Report, § VI.D.

³⁰⁸ See § 4.II.B.3 above.

³⁰⁹ See *id.*; Cooley Report, § VI.D.

³¹⁰ See §§ 4.II.B–III.B above; Cooley Report, §§ V.C–D.

³¹¹ See §§ 4.II, 4.IV above; Cooley Report, § VI.A.

³¹² IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (2019), p. 9 (“The ocean has taken up between 20–30% (*very likely*) of total anthropogenic CO₂ emissions since the 1980s causing further ocean acidification.”).

levels of ocean acidification are reducing the ocean’s ability to act as a carbon sink, leaving more carbon dioxide in the atmosphere and running the risk that the ocean may become a net carbon emitter. Black carbon also reduces the ice-albedo effect. Carbon emissions thus exacerbate the changes caused by excess heat.³¹³

167. Those physical and chemical changes result or are likely to result in the deleterious effects enumerated in Article 1(1)(4). These deleterious effects include:

- (a) *Harm to living resources and marine life*: decline in marine biodiversity and abundance—including coral reefs, shellfish, and crustaceans—due to the inability of certain species to survive in acidic environments;³¹⁴
- (b) *Hazards to human health*: food insecurity and malnutrition arising out of the decline in seafood as an essential source of animal protein, especially among coastal and island communities that depend on impacted marine life;³¹⁵
- (c) *Hindrance to marine activities, including fishing and other legitimate uses of the sea*: decline in abundance and diversity of fish, shellfish, and crustaceans, and decline in fishing and ecotourism, especially around coral reefs;³¹⁶ and
- (d) Exacerbation of deleterious effects of excess heat absorption.³¹⁷

* * *

168. In short, anthropogenic GHG emissions thus meet the definition of “pollution of the marine environment” in Article 1(1)(4) of the Convention because they introduce staggering amounts of excess heat and carbon—a form of energy and a substance, respectively—into the marine environment that result or are likely to result in an array of deleterious effects. The table below illustrates the relationship between the introduction of heat and carbon into the marine environment and those deleterious effects.

169. As the living constitution of the ocean, and as set out in the following three Chapters, UNCLOS Part XII requires that States respect both substantive and procedural obligations to prevent, reduce, and control the pollution of the marine environment from all sources related to climate change.

³¹³ See § 4.I above.

³¹⁴ See § 4.III.B (describing the impact of ocean acidification on marine life); Cooley Report, §§ IV, V.D (describing respectively the phenomena of ocean acidification and its effects, and biodiversity changes).

³¹⁵ See § 4.III.B (describing a reduction of fisheries and marine food chains due to ocean acidification); Cooley Report, § VI.C (describing livelihood changes, including to fisheries and harvests).

³¹⁶ See § 4.III.B (describing the impact of ocean acidification on marine life); Cooley Report, § IV (describing effects of ocean acidification), § VI.C (describing livelihood changes, such as declining fishing and ecotourism).

³¹⁷ Cooley Report, § III (describing abiotic outcomes from heat absorption).

Relationship of ocean inputs from anthropogenic climate change to their physical and chemical effects, as well as the outcome for human communities³¹⁸

Substance or Energy	Physical and Chemical Effects	Deleterious Effects
Heat absorbed by ocean and sea ice	<ul style="list-style-type: none"> • Ocean warming • Sea-level rise • Changing weather • Loss of sea ice • Changing ocean stratification • Ocean deoxygenation 	<p><u>Harm to living resources and marine life</u></p> <ul style="list-style-type: none"> • Increase in low-oxygen events • Increased stress on individual marine organisms and populations • Decline in marine biodiversity, especially in low latitudes • Disruption of seasonal relationships and processes, including reproduction and growth • Destruction of ocean, coastal, and polar habitats, including coral reefs, aquatic vegetation, and deep-sea systems • Transformation of ecosystems to new stable states with different species and benefits to people • Irreversibility of many climate impacts and ecosystem transformations over centuries <p><u>Hazards to human health</u></p> <ul style="list-style-type: none"> • Submergence and destruction of coastal communities and infrastructure • Increase in extreme weather events, including cyclones, droughts, flooding, and heatwaves • Decreased food security and marine livelihoods • Salinization of freshwater aquifers and coastal agricultural land • Increased geographic spread of marine-borne pathogens • Increased population displacement • Increase in compound risks to coastal and island communities <p><u>Hindrance to marine activities, including fishing and other legitimate uses of the sea</u></p> <ul style="list-style-type: none"> • Decline in fish abundance and diversity • Migration of fish to cooler water • Disruption of seasonal processes • Decline in fishing and ecotourism <p><u>Impairment of quality of use of sea water</u></p> <ul style="list-style-type: none"> • Reduction of natural mixing that supports ecosystems • Acidification of seawater • Deoxygenation of seawater <p><u>Reduction of amenities</u></p> <ul style="list-style-type: none"> • Submergence and destruction of coastal communities, property, and infrastructure • Loss of cultural heritage • Destruction of coastal and unique marine ecosystems

³¹⁸ Cooley Report, §§III-VII.

Substance or Energy	Physical and Chemical Effects	Deleterious Effects
Carbon absorbed by ocean	<ul style="list-style-type: none"> • Ocean acidification 	<p><u>Harm to living resources and marine life</u></p> <ul style="list-style-type: none"> • Loss of ecologically optimal conditions for organisms • Disruption of ecosystem relationships and loss or shifts of biodiversity • Increased threat of ecological tipping points and irreversible changes in marine life <p><u>Hindrance to marine activities, including fishing and other legitimate uses of the sea</u></p> <ul style="list-style-type: none"> • Decline in fish abundance and diversity • Poleward movement of fishery stocks <p><u>Hazards to human health</u></p> <ul style="list-style-type: none"> • Loss of food from the sea • Exposure to aquatic pathogens • Harm to mental health

CHAPTER 6: OBLIGATIONS TO PREVENT, REDUCE, AND CONTROL POLLUTION OF THE MARINE ENVIRONMENT

170. UNCLOS as a whole and its relevance as the “constitutional law of the sea” has been addressed above.³¹⁹ As set out in Chapter 4, it is scientifically proven that anthropogenic activities emitting GHGs cause climate change, and that those emissions profoundly harm the oceans and the marine environment. It has also already been established in Chapter 5 that anthropogenic GHG emissions constitute the introduction by humans of energy and carbon both directly and indirectly into the marine environment, therefore falling squarely within the definition of “pollution of the marine environment” found in Article 1(1)(4).

171. Part XII is divided into 11 sections. This Chapter 6 will address more specifically: the general provisions found in Section 1; international rules and national legislation to prevent, reduce, and control pollution of the marine environment found in Section 5; and enforcement provisions found in Section 6.

172. Article 192 is the first provision found in Part XII and establishes the general obligation of States to protect and preserve the marine environment.³²⁰ In accordance with that obligation of protection and preservation, Article 193 indicates that States have the sovereign right to exploit their natural resources, so long as they do so in accordance with their duty to protect and preserve the marine environment.

173. Going beyond the general obligation of Article 192, the present Chapter 6 addresses the obligations that States Parties committed to fulfill under Part XII of the Convention to prevent, reduce, and control pollution of the marine environment that is resulting, or likely to result, from the causes and consequences of climate change.

174. Article 194 contains the core obligations in this regard. It is composed of five paragraphs.³²¹ Section I of this Chapter addresses the core obligation in Article 194(1) of UNCLOS to take “all measures . . . necessary to prevent, reduce and control pollution.” In addition to their obligation to take measures to prevent, reduce, and control pollution of the marine environment, States also have the separate obligation set out in Article 194(2) of UNCLOS “to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution.” Section II draws out this specific obligation. The all-encompassing necessary measures set out in Article 194(1) of UNCLOS include, but are not limited to, measures that concern specifically the different sources of pollution that are

³¹⁹ See § 3.III above.

³²⁰ See § 8.I below.

³²¹ This Chapter does not discuss Article 194(3)–(5) in detail. Those paragraphs contain specific measures that are dealt with in other chapters of the present written statement. Paragraph 4, for its part, indicates that while taking measures to prevent, reduce and control pollution of the marine environment, States should not interfere, unjustifiably, with the activities carried out by other States as they exercise their rights and duties in accordance with UNCLOS. In *Alleged Violations of Sovereign Rights and Maritime Spaces in the Caribbean Sea (Nicaragua v. Colombia)*, Colombia argued that it had the right and duty to protect and preserve the marine environment of the southwestern Caribbean Sea, and that its actions did not impede on Nicaragua’s ability to exercise its sovereign rights. Judgment, slip opinion (21 April 2022), ¶¶ 54–55. Even though UNCLOS was not applicable between the Parties in this case, the Court confirmed that in exercising their sovereign rights, States shall have due regard to each of their respective rights and duties. *Id.*, ¶¶ 60, 63.

affecting or are likely to adversely affect the marine environment. Three sources of pollution are especially relevant, namely pollution from land-based sources (Article 207), pollution from vessels (Article 211), and pollution from or through the atmosphere (Article 212). Section III sets out the specific measures relating to each of these sources.

I. Obligation under Article 194(1)

175. This Section will address the core obligation in Article 194(1) (Subsection A) and the standard of implementation of this core obligation (Subsection B). The best practicable means available and States' respective capabilities will be considered as informing this standard.

A. The core obligation in Article 194(1)

176. Article 194(1) of UNCLOS sets out the general obligation for States to take all measures necessary to prevent, reduce, and control pollution of the marine environment, whatever the source of the pollution. Article 194(1) reads:

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

177. According to some commentators, Article 194 “establishes the framework for the development and adoption of national legislative measures to prevent, reduce and control pollution of the marine environment.”³²² However, it suffices to read the text of the Convention to acknowledge that the obligation set out in Article 194(1) is more precise. It establishes the legal obligation to adopt and implement *all* national and collective (international) measures that are necessary for preventing, reducing, and controlling pollution of the marine environment. As detailed below, the obligation is an obligation for States to adopt a certain conduct.³²³ But, it does also mean that States Parties have a positive obligation of result, which is to adopt and implement “all measures . . . necessary” in order to prevent, reduce, and control this pollution. More detail about the interpretation of this obligation is set out in the following six points.

178. *First*, Article 194(1) sets up a legal obligation. The use of the expression “shall take” leaves no doubt that the provision is binding.

179. *Second*, the term “measures” should be understood broadly. A wide range and variety of measures can be covered by this term as it is used in Article 194(1). Measures may vary in nature and include both normative and substantive ones, such as the adoption of laws, regulations, and public policies of all kinds at the national, regional, or global levels. Measures of a procedural nature can also be taken. For example, the duty to conduct an environmental impact assessment before undertaking a project would consist of a procedural

³²² *Article 207: Pollution from Land-Based Sources*, VIRGINIA COMMENTARY, vol. IV, pp. 127–128.

³²³ See § I.B below.

measure.³²⁴ Measures of a procedural nature expressly considered necessary under UNCLOS can be found in Articles 204 to 206 of UNCLOS.

180. *Third*, according to their ordinary meaning, the terms “all measures” “necessary to prevent, reduce and control pollution of the marine environment” refer to what is needed to achieve meaningful prevention, reduction, and control. The expression “all measures” thus reflects the non-exhaustive and open-ended nature of Article 194(1). It follows that the necessity of a particular measure results from an objective assessment of what is practically needed to achieve this aim, which is to be determined in the light of the specific circumstances of a situation.³²⁵

181. Indeed, this provision regarding “all measures” “necessary” calls for an objective assessment. Article 194(1) is phrased in direct terms. It provides that all necessary measures must be taken to prevent, reduce, and control marine pollution. Under UNCLOS, States do not enjoy discretion in determining whether measures should be taken; to the extent that they are necessary, correspond to practicable means, and are within a State’s capabilities, they must be taken. It is to be noted that the use of the term “as appropriate” in Article 194(1) refers to whether the measures should be taken individually or jointly but does not leave discretion to States in determining whether measures should, in fact, be taken.

182. *Fourth*, the aim of the measures to be adopted is to prevent, reduce, and control pollution of the marine environment. It follows that the precise content of the measures that have to be taken by States Parties depends on the proper interpretation of the obligation to “prevent, reduce and control” pollution of the marine environment. It is therefore necessary to define what is understood by each term: “prevent,” “reduce,” and “control.”

183. *Fifth*, the obligation to “prevent,” on the one hand, and the obligation to “reduce and control,” on the other, appear to refer to different kinds of action. These concepts are not co-extensive. To “prevent” means to preclude something from happening; to “reduce and control” refers to the management required to mitigate a certain situation or its effects. It follows that preventing pollution is a different endeavor from reducing and controlling pollution. But of course, the two endeavors can be articulated as a progression over time, or as a sequence.³²⁶ When facing a particular form of pollution, or risk of pollution, it might be warranted, in light of the practicable possibilities and available capabilities, to, first, reduce and control the pollution, or its risk, and then, when it becomes practicably possible, to prevent it in full.

³²⁴ See Jutta Brunnée, *Procedure and Substance in International Environmental Law*, 405 COLLECTED COURSES OF THE HAGUE ACAD. INT’L L. (2020), pp. 131–135.

³²⁵ On the objective assessment that must be conducted to determine whether a measure is necessary, see *Oil Platforms (Iran v. United States)*, Judgment, 2003 ICJ REP. 161 (6 November), ¶ 43, and *Certain Iranian Assets (Iran v. United States)*, Judgment, slip opinion (30 March 2023), ¶¶ 106–108.

³²⁶ See *Pulp Mills Judgment*, ¶ 205 (indicating that the obligation to conduct an environmental impact assessment is a continuous one); see also *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua)* and *Construction of a Road in Costa Rica along the San Juan River (Nicaragua v. Costa Rica)*, Judgment, 2015 ICJ REP. 665 (16 December) (“*Certain Activities and Construction of a Road Judgment*”), ¶ 161; Jorge E. Viñuales, *Due Diligence in International Environmental Law: A Fine-Grained Cartography*, DUE DILIGENCE IN THE INTERNATIONAL LEGAL ORDER (Heike Krieger et al. eds. 2020), p. 113.

184. *Sixth*, it follows that the specific obligation in a given situation to take all necessary measures to prevent, reduce, and control pollution of the marine environment necessarily derives from the context, or, in other words, must be understood in light of the nature of the pollution that must be prevented, reduced and controlled, and of the capacity of each State Party to abide by this obligation.

185. In this regard, the pollution of the marine environment under discussion and its causes are scientifically proven.³²⁷ It is also certain that this pollution creates disastrous harm to States, peoples, and the entire ecosystem.³²⁸ It should therefore be prevented. But at the same time, it is obvious that it is impossible for States Parties to fully succeed in preventing this pollution in the short term. Moreover, the text of Article 194(1) specifies that the obligation varies both in time, in that States Parties must use, for complying with it, “the best practicable means at their disposal,” which is an evolutive notion and according to the “capabilities” of each State. These concepts of “best practicable means” and States’ respective “capabilities” will be detailed in subsection B.

186. The obligation under Article 194(1), in this context, is for States Parties to initiate a process in adopting “all measures . . . necessary” with a view to prevent completely the pollution or risk of pollution of the marine environment that is the object of this request for an advisory opinion, when practicably possible, and in the meantime, reduce and control it as much as possible for each State in using the best practicable means.

B. The standard of implementation of the core obligation

187. In accordance with Article 194(1), States must take all measures necessary to prevent, reduce, and control pollution of the marine environment “using for this purpose the best practicable means at their disposal and in accordance with their capabilities.” It follows that upon assessment that measures are “necessary”—which has been detailed above in Subsection A—a State must take such measures, and the content of the appropriate measures will be informed by the means available and the State’s own capabilities. These two notions, as used in this context, are complementary. The “best practicable means at their disposal” (*“les moyens les mieux adaptés dont ils disposent”*) refers to a category of “means.”

188. The term “means,” in this context, refers to scientific and technical methods or tools that must be “used” to implement all necessary measures to prevent, reduce and control pollution of the marine environment. Thus, the term “means” refers to the concrete actions a State must carry out for implementing “all measures . . . necessary.”

189. The “means” States have to use must be the “best practicable . . . at their disposal” (*“les mieux adaptés dont ils disposent”*). This qualification clarifies that between different means at their disposal, States must use “the best practicable” ones. It follows that a State cannot pretend that it fulfils its obligation when, although it does take “all measures . . . necessary,” it does not implement these measures in using “the best practicable means at [its] disposal,” but rather uses means that are not the most efficient to prevent, reduce and control pollution of the marine environment.

³²⁷ See §§ 4.II.B–III.B above; Cooley Report, §§ II–V.

³²⁸ See §§ 4.II.B–III.B and IV; Cooley Report, §§ II–VI.

190. A further clarification regarding the obligation to mobilize the “best practicable means” at a State’s disposal is that this must be “in accordance with [its] capabilities” (“*en fonction de [ses] capacités*”). This qualification does not suggest that States can decide discretionarily what are their “capabilities.” It simply means that what a State cannot possibly do is not required from it.

191. Thus, the best practicable means available and a State’s capabilities need to be considered to determine with precision how measures must be taken by a State to fulfil its obligation under Article 194(1). These notions expressly enshrined in the provision characterize the standard of implementation of the necessary measures that must be taken. As detailed in Chapter 7, they are informed by a standard of due diligence, in that the best practicable means and a State’s capabilities are factors to be expressly taken into account to determine the level of diligence required of this State to prevent, reduce, and control pollution of the marine environment.

192. In the case at hand, two factors specifically listed in Article 194(1) characterize the standard of performance that is expected of States and that may evolve over time, namely the “best practicable means at [States’] disposal” and States’ “capabilities.” The expression “best practicable means at [States’] disposal” combines objectively and subjectively determined elements. The best practicable means should be understood as the technological and scientific practices that qualify the technical scope of Article 194(1). These technological solutions can be objectively determined at a point in time, as they are subject to change.³²⁹

193. The expressions “best available techniques” or “best environmental practices” are used in other instruments and refer to similar—while not equivalent—concepts.³³⁰ In addition, the expression “best practicable means” as used in Article 194(1) is qualified by a subjective element, in that the said “means” must be at the “disposal” of States. Even though the means may be technically available in the world, a State needs to have the necessary competence to use and implement them.³³¹ As such, there is a clear link between the means available to States and these States’ “capabilities.”

194. It follows that each State’s capabilities and level of development may influence the nature of the applicable obligation imposed on this State to take all necessary measures to prevent, reduce, and control pollution of the marine environment.³³² The obligation to act can be qualified as “reflexive,” in that the intensity of the effort a State has to make is determined by its actual technical and scientific capacity to entertain this effort. Aside from a State’s economic development, other subjective factors may also inform the content of an obligation: for example, a State’s capacity to influence the actions of certain actors.³³³

³²⁹ International Law Association, Study Group on Due Diligence in International Law, Second Report (2016), p. 21.

³³⁰ See, e.g., OSPAR Convention, Appendix I.

³³¹ Detlef Czybulka, *Article 194: Measures to Prevent, Reduce, and Control Pollution of the Marine Environment*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Pröelß ed. 2017), p. 1304.

³³² International Law Association, Study Group on Due Diligence in International Law, Second Report (2016), pp. 3, 16.

³³³ See *Application of the Convention on the Prevention and Punishment of the Crime of Genocide (Bosnia and Herzegovina v. Serbia and Montenegro)*, Judgment, 2007 ICJ REP. 43 (26 February), ¶ 430.

195. Therefore, the obligation to take all measures necessary to protect, prevent, and reduce pollution of the marine environment under Article 194(1) is subject to an expressly stated standard of performance.

196. The obligation is also informed by the body of treaties relevant to the protection of the environment and to climate change.

197. As will be detailed below in Section III, States have the obligation to “adopt laws and regulations to prevent, reduce and control pollution of the marine environment” from all sources.³³⁴ UNCLOS also refers to the establishment of global and regional rules, standards, and recommended practices by international organizations or diplomatic conferences to prevent, reduce, and control pollution of the marine environment from land-based sources, vessels, and from or through the atmosphere.³³⁵ Additionally, with regard to the same sources of pollution, UNCLOS provides that States are obliged to adopt laws and regulations and take other measures necessary to implement those international rules and standards when established.³³⁶

198. It derives from these texts that the precise content of these obligations for each State is substantiated, in part, by the “global and regional rules, standards and recommended practices and procedures” established notably by international organizations and diplomatic conferences. Some treaties have, in fact, established for their Contracting Parties standards and recommended practices aimed at preventing, reducing, and controlling pollution of the marine environment.

199. For example, Article 3 of the Convention for the Protection of the Marine Environment of the North-East Atlantic (the “OSPAR Convention”), which concerns more specifically pollution from land-based sources, provides:

The Contracting Parties shall take, individually and jointly, all possible steps to prevent and eliminate pollution from land-based sources in accordance with the provisions of the Convention, in particular as provided for in Annex I.

200. Annex I, Article 2(1) of that Convention adds:

Point source discharges to the maritime area, and releases into water or air which reach and may affect the maritime area, shall be strictly subject to authorisation or regulation by the competent authorities of the Contracting Parties. Such authorisation or regulation shall, in particular, implement relevant decisions of the Commission which bind the relevant Contracting Party.

201. As is evident, under the OSPAR Convention, Contracting Parties must not only take mitigation measures, but must do all they can to “prevent and eliminate” pollution; that entails precluding new pollution and eliminating existing pollution. This example illustrates

³³⁴ UNCLOS, Article 207(1); *see id.*, Articles 211(2), (4)–(5), 212(1).

³³⁵ *See id.*, Articles 207(4), 211(1), 212(3).

³³⁶ *See id.*, Articles 213, 217, 218, 220, 222.

that regional rules regarding pollution of the marine environment as set out by environmental treaties can be more stringent than mere mitigation.

202. Other conventions are relevant to inform on what is required from their Contracting Parties to protect the marine environment. For example, Article 4(1) of the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (the “Barcelona Convention”) sets out that:

The Contracting Parties shall individually or jointly take all appropriate measures in accordance with the provisions of this Convention and those Protocols in force to which they are party to prevent, abate, combat and to the fullest possible extent eliminate pollution of the Mediterranean Sea Area and to protect and enhance the marine environment in that Area so as to contribute towards its sustainable development.³³⁷

203. Here too, the obligation is not merely one of mitigation, as it requires States to take measures to “prevent, abate [and] combat” pollution of the Mediterranean Sea.

II. Obligation under Article 194(2)

204. While Section I is dedicated to interpreting the obligation under Article 194(1) to take all measures that are necessary to prevent, reduce, and control pollution of the marine environment from any source of pollution, in the light of the best practicable means available and in accordance with States’ capabilities, this section turns to the second obligation under Article 194(2), which reads:

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

205. Article 194(2) provides for a way to comply with the obligation to prevent, reduce, and control pollution of the marine environment under Article 194(1). In other words, the obligation under Article 194(2) sets out one of the modalities to respect the general obligation under Article 194(1) to adopt “all measures . . . necessary.”

206. Even though Article 194(2) is a treaty provision that was conventionally agreed, it also reflects a more general rule or principle that is undoubtedly relevant with respect to environmental damages generated by global warming. It is indeed conceptually rooted in the principle *sic utere tuo ut alienum non laedas* or *sic utere tuo* (use property so as not to harm another), which has been adopted as a general rule of public international law in *Corfu Channel*. In this judgment, the ICJ held that there exists a general obligation for every State not to allow its territory to be used to harm the rights of other States.³³⁸ The rule was already

³³⁷ See also Barcelona Convention, Articles 5–8.

³³⁸ *Corfu Channel (United Kingdom v. Albania)*, Judgment, 1949 ICJ REP. 4 (9 April), p. 22.

applied in the *Trail Smelter* award, which remained for a long time “the most widely quoted arbitral authority in the area of international pollution.”³³⁹ It establishes that,

under the principles of international law, . . . no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.³⁴⁰

207. Inspired by these precedents as well as by the growing concern manifested by the international community regarding the crucial necessity to protect and preserve the environment, as expressed in the Stockholm³⁴¹ and Rio Declarations,³⁴² the ICJ held that States must ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of their jurisdiction,³⁴³ and:

A State is thus obliged to use all the means at its disposal in order to avoid activities which take place in its territory, or in any area under its jurisdiction, causing significant damage to the environment of another State. This Court has established that this obligation “is now part of the corpus of international law relating to the environment.”³⁴⁴

208. The relevance of this principle with respect to climate change was expressly recognized in the preamble to the UNFCCC:

Recalling also that States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction

³³⁹ Kenneth B. Hoffman, *State Responsibility in International Law and Transboundary Pollution Injuries*, 25 INT’L & COMP. L. Q. 509 (1976), p. 512.

³⁴⁰ *Trail Smelter (United States / Canada)*, Award, III RIAA 1905 (11 March 1941), p. 1965.

³⁴¹ Stockholm Declaration on the Human Environment, UN Conference on the Human Environment, Stockholm (June 1972), UN Doc. A /CONF.48/14/Rev.1 (“Stockholm Declaration”), Principle 21 (“States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.”).

³⁴² Rio Declaration, Principle 2 (“States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.”).

³⁴³ *Nuclear Weapons* Advisory Opinion, ¶ 29 (“The existence of the general obligation of States to ensure that activities within their jurisdiction and control respect the environment of other States or of areas beyond national control is now part of the corpus of international law relating to the environment.”).

³⁴⁴ *Pulp Mills Judgment*, ¶ 101; see also Jutta Brunnée, *Procedure and Substance in International Environmental Law*, 405 COLLECTED COURSES OF THE HAGUE ACAD. INT’L L. (2020), pp. 124–129.

or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.³⁴⁵

209. While it relies on the principle mentioned above, UNCLOS, as treaty law, provides for it in the form of Article 194(2). The interpretation of this provision requires a primary focus on its terms, read in context, in the light of the object and purpose of UNCLOS. This Section provides an interpretation of different parts of the obligation found in Article 194(2). An interpretation of the terms “take all measures necessary to ensure” will first be provided (Subsection A), followed by the expression “that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States and their environment” (Subsection B), and finally by the last part of the obligation which indicates “that pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with this Convention” (Subsection C).

A. “States shall take all measures necessary to ensure”

210. The important terms defining the nature of the obligation enshrined in Article 194(2) is the expression “shall take all measures necessary to ensure.”

211. Four points can be made in this regard.

212. *First*, ITLOS has had the occasion to provide an interpretation of these terms in *Area*. It mentioned Article 194(2) as an illustration that:

The expression “to ensure” is often used in international legal instruments to refer to obligations in respect of which, while it is not considered reasonable to make a State liable for each and every violation committed by persons under its jurisdiction, it is equally not considered satisfactory to rely on mere application of the principle that the conduct of private persons or entities is not attributable to the State under international law.³⁴⁶

213. However, it is submitted that the interpretation of a primary obligation through the lenses of secondary obligations pertaining to State responsibility (or liability) is an unconventional method of treaty interpretation. It was surely warranted in *Area* because one of the very questions put to ITLOS directly concerned the “liability” and “responsibilities” of States Parties.

214. *Second*, ITLOS primarily conducted its treaty interpretation by referring to UNCLOS provisions other than Article 194(2), namely Articles 139(1) and 4(4) of Annex III.

215. It is indeed with specific reference to Article 139, not Article 194(2), that ITLOS concluded that the obligation under these provisions was “an obligation to deploy adequate means, to exercise best possible efforts, to do the utmost, to obtain this result” and should be qualified as “an obligation of ‘due diligence.’”³⁴⁷ To support its reasoning, ITLOS relied on

³⁴⁵ UNFCCC, Preamble.

³⁴⁶ *Area* Advisory Opinion, ¶ 112.

³⁴⁷ *Id.*, ¶ 110.

the French and Spanish versions of Article 139. The expression “States Parties shall have the responsibility to ensure that activities” found in the English version of Article 139 reads in French as “[i]l incombe aux Etats Parties de veiller à ce que les activités” and in Spanish as “[l]os Estados Partes estarán obligados a velar por que las actividades.” In the Tribunal’s view, the nature of the obligation as one of due diligence “appears even more clearly” in the light of these versions of the text.³⁴⁸

216. But a comparison between Articles 139 and 194(2) illustrates their differences.

217. Article 139 reads, in English:

States Parties shall have the responsibility to ensure that activities in the Area, whether carried out by States Parties, or state enterprises or natural or juridical persons which possess the nationality of States Parties or are effectively controlled by them or their nationals, shall be carried out in conformity with this Part.

218. The nature of this obligation is informed by the formula “shall have the responsibility to ensure” or, in the French version “[i]l incombe aux Etats Parties de veiller à,” and in the Spanish version “[l]os Estados Partes estarán obligados a velar.” This wording clearly attributes to States Parties certain “responsibilities.” It is their task to “ensure that” (“*veiller à*” or “*velar*”) anyone under their authority, jurisdiction or control respects certain rules contained in UNCLOS. As the title of Article 139 stipulates, States have “[r]esponsibility to ensure compliance.”

219. Article 194(2), by contrast, is not about States’ “[r]esponsibility to ensure compliance” by others with established UNCLOS rules. Rather, it is an explicit and broad obligation on States to adopt “*all measures necessary* to ensure” (emphasis added) that certain events will not occur, namely damage by pollution to other States and their environment, and that pollution arising from incidents or activities under their jurisdiction or control will not spread beyond the areas where they exercise sovereign rights.

220. This contrast is further emphasized by assessing the French and Spanish versions of Article 194(2) which do not use language similar to the one found in Article 139, as they do not use the expressions “*veiller à*” in French or “*velar*” in Spanish.³⁴⁹ In French, the first part of Article 194(2) reads:

Les États prennent toutes les mesures nécessaires pour que les activités relevant de leur juridiction ou de leur contrôle le soient de manière à ne pas causer de préjudice par pollution.

221. Similarly, the Spanish text of Article 194(2) reads:

Los Estados tomarán todas las medidas necesarias para garantizar que las actividades bajo su jurisdicción o control se

³⁴⁸ *Id.*, ¶ 114.

³⁴⁹ The texts of the Convention in Arabic, Chinese, English, French, Russian and Spanish “are equally authentic.” UNCLOS, Article 320.

realicen de forma tal que no causen perjuicios por contaminación.

222. The important differences between Articles 139 and 194(2) just highlighted necessarily characterize the obligation in Article 194(2) as more demanding of States. In this sense, if Article 139 is an obligation of due diligence, the obligation enshrined in Article 194(2) goes beyond acting merely with due diligence and encompasses an obligation of result.

223. Additionally, it might be queried whether the obligation enshrined in Article 194(2) is truly an obligation of due diligence, understood as an obligation of conduct rather than an obligation of result, as ITLOS held in *Area*.³⁵⁰ The notion of “conduct” as it appears in this article does not refer to the States Parties’ obligation, but to the way in which activities under the States’ jurisdiction or control should be carried out. The obligation of conduct is therefore applicable to persons conducting activities, rather than States Parties. For their part, States Parties have, under Article 194(2), a “direct” obligation, which is to adopt “all measures necessary” to achieve a certain defined result.³⁵¹

224. *Third*, turning to the interpretation of Article 194(2), some of its terms have already been defined in Section I. The expression “all measures” should be understood as broad and as covering all kinds of measures. The expression “activities under their jurisdiction or control” is also clear; the areas concerned comprise the State’s territory and its territorial sea, but also its continental shelf and exclusive economic zone (“EEZ”), over which the coastal State may exercise jurisdictional rights.³⁵² As such, the provision recognizes States’ sovereignty, but also their responsibilities in areas under their jurisdiction or control.

225. The terms “to ensure that activities under their jurisdiction or control are . . . conducted” in a certain manner call for special attention. In its ordinary meaning, “to ensure” denotes a stringent obligation, one that requires definitive action as opposed to one that entails best efforts. “To ensure” is to secure a certain result.

226. *Fourth*, there is a marked difference between Article 194(2) and Article 194(1). Indeed, the obligation under Article 194(2) is not triggered by “the best practicable means” at the disposal of States “and in accordance with their capabilities.” These specificities do not appear in Article 194(2). This suggests that “all measures necessary” to ensure the result sought are to be envisaged solely in reference to their objective necessity.

B. “[E]nsure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States and their environment”

227. The meaning of these terms can be construed as follows.

³⁵⁰ See *Area* Advisory Opinion, ¶ 110.

³⁵¹ *Id.*, ¶¶ 121–140.

³⁵² See *Article 194: Measures to Prevent, Reduce and Control Pollution of the Marine Environment*, VIRGINIA COMMENTARY, p. 65.

228. The term “pollution” has the same meaning as “pollution of the marine environment” as found in Article 1(1)(4).³⁵³

229. The term “activities” under the jurisdiction or control of States includes all activities carried out on the States’ territory and, more broadly, where they exercise control. This includes the land territory, the territorial sea, the continental shelf, and the aerial domain where States exercise jurisdiction or control. The term “activities” is unqualified. That includes all kinds of activities, whether hazardous or not, whether lawful or unlawful, and regardless of who carries them out. It includes all activities that generate emissions of GHGs.

230. The “activities” as such are not the focus of the obligation. Rather, the focus of the obligation is the way activities are “conducted.” They must be conducted in such a manner as not to cause damage by pollution to other States and their environment. The obligation of States Parties is to adopt “all measures necessary” to ensure such “conduct.”

231. The expression “damage by pollution to other States and their environment” suggests that what must be avoided is not mere “pollution,” but “damage by pollution.” The type of environmental damage at stake is not specified in the Convention. This is to be contrasted with many treaties that include an obligation to prevent environmental damage, which do condition this obligation to a certain degree of severity of the harm that could be caused. Reference to “significant” damage is made in, for example, Article 7 of the Convention on the Law of the Non-Navigational Uses of International Watercourses, Articles 1(2) and 2 of the Vienna Convention for Protection of the Ozone Layer, Articles 1(1) and 3 of the UNFCCC, and Article 3(2)(b) of the Protocol on Environmental Protection to the Antarctic Treaty. Moreover, significant adverse effects on biological diversity are required under Article 14(1)(a) of the CBD.

232. The international case law confirms that the obligation of prevention arises when there is a risk of “significant damage.”³⁵⁴ This notion of “significant” harm has also been codified by the International Law Commission (the “ILC”) in the context of the Articles on Prevention of Transboundary Harm from Hazardous Activities.³⁵⁵ According to the ILC:

“significant” is something more than “detectable” but need not be at the level of “serious” or “substantial.” The harm must lead to a real detrimental effect on matters such as, for example, human health, industry, property, environment or agriculture in other States. Such detrimental effects must be susceptible of being measured by factual and objective standards.³⁵⁶

³⁵³ Cf. Chapter 5.

³⁵⁴ *Pulp Mills Judgment*, ¶ 101; *Certain Activities and Construction of a Road Judgment*, ¶ 153; see *Indus Waters Kishenganga (Pakistan v. India)*, PCA Case No. 2011-01, Partial Award (18 February 2013), ¶ 451, and Final Award (20 December 2013), ¶ 112.

³⁵⁵ ILC, Articles on Prevention of Transboundary Harm from Hazardous Activities, UN Doc. A/RES/62/68 (Annex) (6 December 2007), Article 1.

³⁵⁶ ILC, Commentaries on the Articles on Prevention of Transboundary Harm from Hazardous Activities, UN Doc. A/56/10 (2001), Article 2, ¶ 4.

233. While the ILC's Articles on Prevention of Transboundary Harm from Hazardous Activities apply to harm caused in the territory of another State, and therefore do not apply as such to environmental harm beyond national jurisdiction, the ILC's reasoning easily applies to this broader context.³⁵⁷ It is submitted that "damage by pollution" as mentioned in Article 194(2), although unqualified, must be understood as referring to a "significant" damage, meaning a damage based on a "real detrimental effect" subject to a concrete measure assessed by factual and objective standards.

C. "[E]nsure . . . that pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with this Convention"

234. Since the subject matter of the present advisory opinion proceedings is related to the pollution of the marine environment arising from global warming and its anthropogenic causes, the mention of "pollution arising from incidents" is not relevant: the emission of GHGs is not the outcome of "incidents," but of regular activities. What follows will therefore disregard the notion of "pollution arising from incidents."

235. The obligation is to adopt all measures necessary to ensure that polluting activities in areas under States' jurisdiction or control do not extend beyond the limits of the EEZ of a coastal State, or its territorial sea if it has not claimed an EEZ.

236. There are four points to register.

237. *First*, the "activities under their jurisdiction or control" can take place anywhere where States exercise jurisdiction or control, as already explained above.

238. *Second*, the term "beyond," in context, means "outside of," without suggesting a necessary contiguity between areas where a State exercises jurisdiction and control, and areas in which the pollution spreads. A pollution extending up to the territorial sea of another State, after crossing the high seas or the aerial space above it, is therefore covered by the provision.

239. *Third*, since, under the Convention the notion of "sovereign rights" refers to rights exercised by the coastal State in its EEZ and continental shelf, one can ask whether the obligation applies to States which have no EEZ and continental shelf. Considering that for these States there are no areas where they exercise sovereign rights, "beyond" those inexistent areas might appear unclear. However, the context informs that even States which have no coast are concerned by this obligation to the extent that they are States Parties to UNCLOS. Indeed, the Convention clearly addresses all sources of pollution, including "land-based" and "atmospheric" sources. Thus, to the extent that a land-locked State can have under its jurisdiction or control an activity contributing to a source of pollution, it is bound by the obligation under Article 194(2). For such a State, the obligation not to let pollution spread beyond certain maritime areas covers the entire surface of the sea, since none of the areas of the sea are areas where it can exercise sovereign rights.

240. *Fourth*, States' obligation to ensure that pollution does not "spread" beyond certain areas suggests an obligation to adopt "all measures necessary to ensure" that pollution

³⁵⁷ See fn. 442 below.

generated in areas where they exercise their jurisdiction or control does not spread. This obligation has been understood by Professor James Crawford, acting as arbitrator in the *MOX Plant* arbitration, as “an absolute obligation”—meaning that States should adopt measures to ensure that there is no spread of pollution at all.³⁵⁸ By contrast, and in apparent contradiction, with respect to toxic, harmful, or noxious substances, Article 194(3)(a) provides only for an obligation to adopt measures designed “to minimize to the fullest possible extent” their release in the marine environment.

241. However, there is no contradiction here. Among “all measures” that States must take under Article 194(2), there are in any event the measures mentioned in Article 194(3)(a), which addresses pollution not directly as it spreads into an area, once created in another area, but which addresses the nature of pollution, acknowledging that because of such nature, there is an obvious risk that this pollution will be spreading.

242. It is submitted that the obligation to take “all measures necessary” to ensure that no pollution arising out of activities under the jurisdiction or control of a State spread beyond certain areas include, but is not limited to, measures intended to minimize the risk that “localized” pollution spread, by limiting the source of the initial pollution itself, when the nature of the pollution is such that it is highly likely that it will spread. It is also submitted that the pollution of the marine environment arising from GHG emissions is certainly of such a nature.

243. Thus, under Article 194(2), States Parties have the obligation to adopt all measures necessary to ensure that GHG emissions do not generate the spread of pollution of the marine environment of other States or of the high sea, the only way being to minimize “to the fullest possible extent” such emissions.

III. Measures to be taken in light of the specific sources of pollution

244. In the context of the present request for an advisory opinion, the relevant sources of pollution are mainly pollution from land-based sources and from or through the atmosphere. These sources of pollution “appear to cover all airborne and land-based sources of marine pollution comprehensively, including those currently generating CO₂ emissions and other GHGs.”³⁵⁹ Nonetheless, it is also relevant to consider pollution from vessels.³⁶⁰

245. Additional obligations related to those three sources of pollution are set out in Sections 5 and 6 of Part XII.³⁶¹ Articles 207, 211, and 212 in particular complement and supplement the general obligation set out in Article 194. As such, they provide details on the

³⁵⁸ *MOX Plant*, PCA Case No. 2002-01, Transcript of Oral Proceedings, Day 8 (21 June 2003), p. 63, lines 34–35.

³⁵⁹ See Alan Boyle, *Protecting the Marine Environment from Climate Change: The LOSC Part XII Regime*, in *THE LAW OF THE SEA AND CLIMATE CHANGE: SOLUTIONS AND CONSTRAINTS* (Elise Johansen et al. eds. 2021), pp. 81–103.

³⁶⁰ See § 4.I above.

³⁶¹ See UNCLOS, Articles 207, 211, 212, 213, 217, 218, 220, 222. UNCLOS also deals with “pollution from seabed activities subject to national jurisdiction.” See *id.*, Articles 208, 214.

relationship to be established between international rules, standards and practices, and national laws and regulations.³⁶²

246. Section 6 of Part XII concerns enforcement of the obligations to adopt certain necessary measures, namely laws and regulations, and provides for specific obligations for States, which apply to one or more sources of pollution. Enforcement, in the context of Articles 213, 217, and 222 is understood as “enforcement by national authorities applying their national laws and regulations.”³⁶³

247. Provisions in Section 6 must be understood as “an essential complement to article 194” in that they give it “practical effect.”³⁶⁴ Obligations that are found in Section 6 are not mere policy indications. These provisions reflect the balance between international rules and national laws and regulations. As such, enforcement provisions provide an appropriate equilibrium between States’ discretion and sovereignty, and the need to prevent, reduce and control pollution of the marine environment. Indeed, “[e]ven if national laws and regulations grant some measure of discretion to the national authorities in the matter of law enforcement, article 213 [as well as articles 217 and 222] limits that discretion in the circumstances contemplated by that article, as a matter of international obligation.”³⁶⁵

A. Pollution from land-based sources

248. The OSPAR Convention defines land-based sources as “point and diffuse sources on land from which substances or energy reach the maritime area by water, through the air, or directly from the coast.”³⁶⁶ Article 207(1) sets out the specific obligation for States to adopt laws and regulations to prevent, reduce, and control pollution of the marine environment in relation to land-based sources:

States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment from land-based sources, including rivers, estuaries, pipelines and outfall structures, taking into account internationally agreed rules, standards and recommended practices and procedures.

249. This provision instructs States to “tak[e] into account” internationally agreed rules, standards, and recommended practices and procedures.

250. The Article makes it clear that “all” necessary measures cannot be reduced to laws and regulations adopted under Article 207(1) only, if they are not sufficient to cover what is “necessary.” Indeed, Article 207(2) specifies that, in addition to laws and regulations, States have the obligation to take other measures that appear necessary.

³⁶² *Article 207: Pollution from land-based sources*, VIRGINIA COMMENTARY, vol. IV, p. 127–128; *id.*, *Article 211: Pollution from Vessels*, pp. 180–181; *id.*, *Article 212: Pollution From or Through the Atmosphere*, pp. 208–209.

³⁶³ *Id.*, *Article 213: Enforcement With Respect to Pollution From Land-Based Sources*, pp. 215–216.

³⁶⁴ *Id.*; see also *id.*, *Article 217: Enforcement by Flag States*, p. 255 (providing more specificity regarding pollution from vessels).

³⁶⁵ *Id.*, *Article 213: Enforcement With Respect to Pollution From Land-Based Sources*, pp. 219–220.

³⁶⁶ OSPAR Convention, Article 1(e).

251. Additionally, under Article 207(3), States have the obligation to “endeavour to harmonize their policies in this connection at the appropriate regional level.”

252. Moreover, States have the obligation under Article 207(4) to “establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control pollution of the marine environment”:

States, acting especially through competent international organizations or diplomatic conference, shall endeavour to establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control pollution of the marine environment from land-based sources, taking into account characteristic regional features, the economic capacity of developing States and their need for economic development. Such rules, standards and recommended practices and procedures shall be re-examined from time to time as necessary.³⁶⁷

253. An interesting provision appears in Section 6 of Part XII. Article 213 provides that:

States shall enforce their laws and regulations adopted in accordance with article 207 and shall adopt laws and regulations and take other measures necessary to implement applicable international rules and standards established through competent international organizations or diplomatic conference to prevent, reduce and control pollution of the marine environment from land-based sources.³⁶⁸

254. The difference of wording between Article 213 and Article 207 must be discussed. Article 207(1) refers to “internationally agreed rules, standards and recommended practices and procedures” that must be “taken into account,” while Article 213 refers to an obligation to implement “applicable” rules and standards.

255. It is submitted that, in limiting its scope to certain rules and standards only, namely those established by duly recognized and competent international organizations and diplomatic conference, Article 213 restricts its scope to very specific rules and standards:

³⁶⁷ See *Article 207: Pollution from Land-Based Sources*, VIRGINIA COMMENTARY, vol. IV, pp. 133–134 (noting that “land-based pollution is particularly susceptible to regional and local regulations” and that “[t]he combination of competent international organization and diplomatic conference allows the necessary flexibility in the machinery (which may be global or regional) through which States can establish widely acceptable and harmonized rules”). This idea of “re-examination,” which was introduced at the Fourth Session in 1976, “may imply an obligation of periodic review” and therefore illustrates the relevance of a continuous reevaluation of the applicability of rules, standards and recommended practices and procedures. See *id.*, p. 131.

³⁶⁸ In early versions of this provision, the text was drafted as a “right of enforcement” but was later modified during the Fourth Session in 1976 to reflect “a duty to enforce measures to prevent pollution of the marine environment from land-based sources.” It also expanded the obligation of States under Article 207, as they are also required to “adopt laws and regulations and take other measures necessary to implement applicable rules and standards.” See *Article 213: Enforcement with Respect to Pollution From Land-Based Sources*, VIRGINIA COMMENTARY, vol. IV, pp. 217–219. Through the use of the term “their,” this provision, and others in Section 6 of Part XII, refer to national measures. *Id.*, p. 220.

those emanating from and acknowledged by States or their governmental organizations. In this context, “applicable” arguably means “relevant,” “appropriate,” “material.” Thus, “applicable international rules and standards established through competent international organizations or diplomatic conference to prevent, reduce and control pollution of the marine environment from land-based sources” includes international rules and standards established through competent international organizations or diplomatic conference and that are appropriate, relevant or, in other words, “applicable” to prevent, reduce, and control pollution of the marine environment.

256. Under this understanding, Article 213 directly requires that States Parties give effect in their domestic legal systems to “applicable” (relevant) rules or standards established through competent international organizations or diplomatic conference to prevent, reduce, and control marine pollution.

B. Pollution from vessels

257. Pollution from vessels must be understood as pollution coming mainly from the shipping and maritime trade, which has been addressed in international instruments, such as in the International Convention for the Prevention of Pollution from Ships (the “MARPOL Convention”).³⁶⁹

258. Article 211 concerns more specifically obligations in relation to pollution from vessels by setting out the specific obligation for States to adopt laws and regulations to prevent, reduce and control pollution of the marine environment in relation to vessels:

2. *States shall adopt laws and regulations for the prevention, reduction and control of pollution of the marine environment from vessels flying their flag or of their registry. Such laws and regulations shall at least have the same effect as that of generally accepted international rules and standards established through the competent international organization or general diplomatic conference. . . .*³⁷⁰

4. Coastal States *may*, in the exercise of their sovereignty within their territorial sea, *adopt laws and regulations for the prevention, reduction and control of marine pollution from*

³⁶⁹ See also *Article 211: Pollution From Vessels*, VIRGINIA COMMENTARY, vol. IV, pp. 181–182.

³⁷⁰ Emphasis added. This paragraph, applicable to all flag States, “expresses the level of harmonization between the national laws and regulations, and the ‘generally accepted’ international rules and standards, required in the matter of vessel-source pollution.” *Article 211: Pollution from Vessels*, VIRGINIA COMMENTARY, vol. IV, p. 203. Overall, Article 211 may be said to represent a compromise between the interests of coastal States and those of States with “large merchant marines,” for which the “focal point of the compromise regarding the protection and preservation of the marine environment is found in recognition of a single international organization which is competent to establish the international rules and standards for the prevention, reduction and control of pollution of the marine environment, namely, in principle, the International Maritime Organization.” See *id.*, p. 200. Despite the focus on a single organization—the IMO—other regional organizations could also provide assistance to implement international rules and standards, elaborate regional rules, share information or promote cooperation. See *id.*, pp. 201–202.

foreign vessels, including vessels exercising the right of innocent passage.³⁷¹

5. Coastal States, for the purpose of enforcement as provided for in section 6, *may* in respect of their exclusive economic zones *adopt laws and regulations* for the prevention, reduction and control of pollution from vessels conforming to and giving effect to generally accepted international rules and standards established through the competent international organization or general diplomatic conference.³⁷²

259. As opposed to Article 207(1) concerning pollution from land-based sources, following Article 211(2), States Parties must not only “take into account” generally accepted rules and standards, but must ensure that the laws and regulations they adopt “shall at least have the same effect as that of generally accepted international rules and standards established through the competent international organization or general diplomatic conference.” This is a more stringent obligation. States Parties must ensure that the laws and regulations they adopt are at least equivalent to the other generally accepted rules and standards.

260. Articles 211(4) and 211(5) arguably leave more discretion to States Parties as they “may” adopt laws and regulations to prevent, reduce and control pollution from foreign vessels and to prevent, reduce, and control pollution in respect of their exclusive economic zones for the purpose of enforcement under Section 6 of Part XII.

261. Moreover, States have the obligation under Article 211(1) to “establish international rules and standards to prevent, reduce and control pollution of the marine environment”:

States, acting through the competent international organization or general diplomatic conference, shall establish international rules and standards to prevent, reduce and control pollution of the marine environment from vessels and promote the adoption, in the same manner, wherever appropriate, of routeing systems designed to minimize the threat of accidents which might cause pollution of the marine environment, including the coastline, and pollution damage to the related interests of coastal States. Such rules and standards shall, in the same manner, be re-examined from time to time as necessary.³⁷³

262. Finally, under Section 6 of Part XII, States Parties, depending on whether they are flag States, port States, or coastal States, must abide by a series of specific enforcement

³⁷¹ Emphasis added. During negotiations leading to the adoption of UNCLOS, the fact that previous conventions did not sufficiently protect coastal States was raised and remedied by the adoption of Article 211. *See id.*, pp. 182–184.

³⁷² Emphasis added. *See id.*, p. 204.

³⁷³ This version of the provision was adopted to ensure that a State’s jurisdiction would not be confined to its territorial waters. *See id.*, pp. 187–198. Addressed to all States and referring to all vessels, Article 211(1) also “emphasizes the preeminence of international rules and standards for the control of vessel-source pollution.” *Id.*, ¶ 211.15(c). Article 211(1) must be read with Article 211(6). *See id.*, ¶ 211.15(j).

obligations.³⁷⁴ Notably, Article 217(1) provides that flag States have the obligation to adopt other laws and regulations to ensure implementation:

States shall ensure compliance by vessels flying their flag or of their registry with applicable international rules and standards, established through the competent international organization or general diplomatic conference, and with their laws and regulations adopted in accordance with this Convention for the prevention, reduction and control of pollution of the marine environment from vessels and shall accordingly adopt laws and regulations and take other measures necessary for their implementation. Flag States shall provide for the effective enforcement of such rules, standards, laws and regulations, irrespective of where a violation occurs.³⁷⁵

263. Here, too, the difference of wording between Article 211(2) and Article 217(1) must be discussed. Article 211(2) refers to “generally accepted international rules and standards established through the competent international organization or general diplomatic conference,” while Article 217(1) refers to “applicable” rules and standards.

264. Following the reasoning set out under Section A above regarding obligations in relation to pollution from land-based sources, “applicable” arguably also means here in relation to pollution from vessels “relevant,” “appropriate,” “material.” Thus, “applicable international rules and standards, established through the competent international organization or general diplomatic conference, and with their laws and regulations adopted in accordance with this Convention for the prevention, reduction, and control of pollution of the marine environment from vessels” includes international rules and standards established through the competent international organization or general diplomatic conference, and that are appropriate, relevant, or in other words “applicable” to prevent, reduce and control pollution of the marine environment.

265. Under this understanding, Article 217 directly requires that States Parties give effect in their domestic legal systems to “applicable” (relevant) rules or standards established through the competent international organization or general diplomatic conference.

³⁷⁴ See UNCLOS, Articles 217, 218, 220.

³⁷⁵ Globally, Article 217 can be understood as “part of the response to the long-standing criticisms of the regime of exclusive flag-State jurisdiction.” *Article 217: Enforcement by Flag States*, VIRGINIA COMMENTARY, vol. IV, pp. 242–243. Moreover, it reflects the general consensus on the appropriateness of imposing an enforcement obligation on flag States, regardless of the location of the violation. *Id.*, pp. 243–245.

C. Pollution from or through the atmosphere

266. Pollution from or through the atmosphere is of a global nature.³⁷⁶ As mentioned in Article 212, that form of pollution can be produced by vessels or aircrafts and thereafter has an adverse impact on the atmosphere and its further contact with the ocean.³⁷⁷

267. Article 212 concerns more specifically obligations in relation to pollution from or through the atmosphere. Article 212(1) sets out the specific obligation for States to adopt laws and regulations to prevent, reduce and control pollution of the marine environment in relation to the atmosphere:

*States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment from or through the atmosphere, applicable to the air space under their sovereignty and to vessels flying their flag or vessels or aircraft of their registry, taking into account internationally agreed rules, standards and recommended practices and procedures and the safety of air navigation.*³⁷⁸

268. Here as well, this provision instructs States to “take into account” internationally agreed rules, standards, and recommended practices and procedures, and, additionally, the safety of air navigation.

269. As mentioned above, the Convention makes it clear that “all” necessary measures cannot be reduced to laws and regulations only if they are not sufficient to cover what is “necessary.” Article 212(2) specifies that, in addition to laws and regulations, States have in any event the obligation to take other measures that appear necessary.

270. Moreover, States have the obligation under Article 212(3) to “establish global and regional rules, standards, and recommended practices and procedures to prevent, reduce and control pollution of the marine environment”:

States, acting especially through competent international organizations or diplomatic conference, shall endeavour to establish global and regional rules, standards and recommended

³⁷⁶ The causes of pollution from or through the atmosphere are varied. See § 4.I.A above; see also Frank Wacht, *Article 212: Pollution From or Through the Atmosphere*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Pröhl ed. 2017), p. 1444 (“It is mainly caused by emissions from vessels and aircraft, incineration at sea, discharges from the air as well as atmospheric pollution from land-based activities, leading to the introduction of toxic, harmful or noxious substances into the marine environment.”); UNCLOS, Article 194(3).

³⁷⁷ See §§ 4.II.B, 4.III.B above.

³⁷⁸ UNCLOS, Article 212(1) (emphasis added). Based on the formulation adopted in this paragraph, the provision is applicable “whether the pollution is land-based or not.” *Article 212: Pollution from or Through the Atmosphere*, VIRGINIA COMMENTARY, vol. IV, pp. 211–212). The suggestion to expressly include pollution from aircrafts was not made until the 1972 session of the Sea-Bed Committee. See *id.*, p. 209.

practices and procedures to prevent, reduce and control such pollution.³⁷⁹

271. Finally, under Section 6 of Part XII, Article 222 provides that States Parties have the obligation to adopt other laws and regulations to ensure implementation:

States shall enforce, within the air space under their sovereignty or with regard to vessels flying their flag or vessels or aircraft of their registry, their laws and regulations adopted in accordance with article 212, paragraph 1, and with other provisions of this Convention and shall adopt laws and regulations and take other measures necessary to implement applicable international rules and standards established through competent international organizations or diplomatic conference to prevent, reduce and control pollution of the marine environment from or through the atmosphere, in conformity with all relevant international rules and standards concerning the safety of air navigation.³⁸⁰

272. Following the reasoning set out under Subsections A and B above with regard to obligations in relation to pollution from land-based sources and from vessels, “applicable” arguably also means here in relation to pollution from or through the atmosphere “relevant,” “appropriate,” “material.” Thus, “applicable international rules and standards established through competent international organizations or diplomatic conference to prevent, reduce and control pollution of the marine environment from or through the atmosphere” includes international rules and standards established through competent international organizations or diplomatic conference, and that are appropriate, relevant, or in other words “applicable” to prevent, reduce, and control pollution of the marine environment.

273. Under this understanding, Article 222 directly requires that States Parties give effect in their domestic legal systems to “applicable” (relevant) rules or standards established through competent international organizations or diplomatic conference to prevent, reduce, and control marine pollution.

³⁷⁹ UNCLOS, Article 212(3). Even though Article 212 does not concern pollution of the atmosphere itself, it is worth noting that if the rules mentioned in paragraph 3 are contained in a special convention or agreement, “article 237 provides an opening for linking this provision with other aspects of environmental control of the atmosphere.” *Article 212: Pollution from or Through the Atmosphere*, VIRGINIA COMMENTARY, vol. IV, pp. 212–213.

³⁸⁰ UNCLOS, Article 222. Here too, early versions of the provision related to a “right to enforce laws and regulations”, which was subsequently transformed into a duty to do so (*Article 222: Enforcement With Respect to Pollution From or Through the Atmosphere*, VIRGINIA COMMENTARY, pp. 317–318. It must also be noted that this “article may to some extent overlap article 213 on enforcement with regard to pollution of the marine environment from land-based sources – since in fact most of the pollution in the atmosphere derives from sources on land—but it does not give rise to particular problems of interpretation.” *Id.*, p. 319. Finally, it is worth specifying that Article 222 does not set up one specific international organization as competent to deal with enforcement questions.

**CHAPTER 7:
THE CONVENTION OBLIGES STATES PARTIES TO EXERCISE DUE
DILIGENCE TO PREVENT, REDUCE, AND CONTROL ANTHROPOGENIC GHG
EMISSIONS CONSTITUTING POLLUTION OF THE MARINE ENVIRONMENT**

274. As set forth in Chapter 6, Part XII of UNCLOS obliges States Parties to take measures to prevent, reduce, and control anthropogenic GHG emissions, and to ensure that GHGs emitted from areas within their jurisdiction or control do not spread beyond that zone and affect “the environment of other States or areas beyond [their] national control.”³⁸¹ At the core of Part XII is the obligation of States Parties under Article 194(1) to prevent, reduce, and control pollution of the marine environment by adopting “*all measures . . . that are necessary*” to achieve that goal. That obligation, together with the one under Article 192 to protect and preserve the marine environment, entails an obligation of due diligence. This obligation is supplemented by a range of other substantive and procedural obligations in Part XII, all of which are aimed at the overarching objective of protecting and preserving the marine environment.

275. This Chapter 7 sets out the general scope and nature of States Parties’ obligation to use due diligence to prevent, reduce, and control anthropogenic GHG emissions (Section I); the other specific obligations that Part XII imposes on States Parties in respect of anthropogenic GHG emissions within and outside their jurisdiction and control (Section II); and States Parties’ obligation to fulfill their due diligence obligation in light of current scientific knowledge and international standards related to anthropogenic GHG emissions (Section III).

I. Due diligence and Part XII

276. Before elaborating on the content of the obligations under Part XII, it is necessary to make some general observations as to the nature of the due diligence obligations which frame the legal regime under Part XII. The due diligence obligations that frame the legal regime under Part XII have five primary features.

277. *First*, as to definition, due diligence as a legal concept is situated at the interface of primary rules of conduct and secondary rules of state responsibility.³⁸² It has been described by legal commentators not as a free-standing obligation but rather as *ancillary* or *complementary* to more specific primary rules, as a *modality* attached to a duty of care, or a *qualifier* of behavior.³⁸³ On the *level of primary rules*, including in regimes like UNCLOS that set out positive obligations that are often indeterminately phrased, due diligence consolidates the parameters of what is “due,” thereby helping to operationalize and stabilize these obligations.³⁸⁴ Such obligations have both procedural and substantive aspects, and it

³⁸¹ *Nuclear Weapons* Advisory Opinion, ¶ 29.

³⁸² See International Law Association, Study Group on Due Diligence in International Law, Second Report (2016), pp. 20, 22–23.

³⁸³ Leonhard Kreuzer et al., *Due Diligence in the International Legal Order: Dissecting the Leitmotif of Current Accountability Debates*, DUE DILIGENCE IN THE INTERNATIONAL LEGAL ORDER (2020), p. 2.

³⁸⁴ *Id.*, p. 3; Richard Alan Barnes, *The Continuing Vitality of UNCLOS*, LAW OF THE SEA: UNCLOS AS A LIVING TREATY (2016), p. 480 (“[E]stablishing positive obligations of conduct that are to be assessed in the light of a *general regulatory position* that *extends* beyond immediate treaty obligations”) (emphasis added).

stands to reason that a State may violate its substantive obligation to, for example, prevent harm, by failing to take the procedural steps required to address that harm.³⁸⁵

278. *Second*, the obligation imposed is one of conduct. As the Seabed Disputes Chamber explained in *Area* in relation to Article 139 of UNCLOS, due diligence is “an obligation to deploy adequate means, to exercise best possible efforts, to do the utmost, to obtain this result.”³⁸⁶ At the same time, however, due diligence requires a level of care from States. The jurisprudence of international courts and tribunals explain that the obligation to act with due diligence requires 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.”³⁸⁷ In the analogous context of the Articles on Prevention of Transboundary Harm from Hazardous Activities, the ILC has characterized the principle of prevention in Article 3 as an obligation of due diligence:

States are under an obligation to take unilateral measures to prevent significant transboundary harm or at any event to minimize the risk thereof arising out of activities within the scope of article 1. Such measures include, first, *formulating policies* designed to prevent significant transboundary harm or to minimize the risk thereof and, secondly, *implementing those policies*. Such policies are expressed in legislation and administrative regulations and implemented *through various enforcement mechanisms*.³⁸⁸

279. The emphasis on implementation and enforcement action in the exercise of due diligence means that the adoption of national rules and regulations alone is not enough. Failure to exercise care in the enforcement and control of such measures gives rise to a presumption that due diligence has not been exercised.

280. *Third*, due diligence is a *continuous* duty.³⁸⁹ It may be satisfied by particular actions at particular times, but the duty itself is continuous. For example, the ICJ stressed in *Pulp Mills* that throughout the lifetime of a project its effects on the environment must be continuously monitored.³⁹⁰

³⁸⁵ Jutta Brunnée, *Procedure and Substance in International Environmental Law*, 405 COLLECTED COURSES OF THE HAGUE ACAD. INT’L L. (2020), pp. 124–129, 140–141.

³⁸⁶ *Area* Advisory Opinion, ¶ 110; *see also Pulp Mills* Judgment, ¶ 187.

³⁸⁷ *Pulp Mills* Judgment, ¶ 197 (emphasis added); *Area* Advisory Opinion, ¶¶ 115, 239; *SRFC* Advisory Opinion, ¶ 131; *South China Sea* Award, ¶ 944.

³⁸⁸ ILC, Commentaries on the Articles on Prevention of Transboundary Harm from Hazardous Activities, UN DOC. A/56/10 (2001), Article 3, ¶ 10 (emphasis added).

³⁸⁹ Jorge E. Viñuales, *Due Diligence in International Environmental Law*, DUE DILIGENCE IN THE INTERNATIONAL LEGAL ORDER (2020), p. 113; *see also Trail Smelter (United States / Canada)*, Award, III RIAA 1905 (11 March 1941), p. 1963 (finding that subsequent measures could have cured initial negligence).

³⁹⁰ *Pulp Mills* Judgment, ¶ 205; *Certain Activities and Construction of a Road* Judgment, ¶ 161.

281. *Fourth*, due diligence obligations do not have a fixed content but rather are context-dependent and change over time. As the Seabed Disputes Chamber observed in *Area*:

“due diligence” is a variable concept. It may change over time as measures considered sufficiently diligent at a certain moment may become not diligent enough in light, for instance, of new scientific or technological knowledge. It may also change in relation to the risks involved in the activity.³⁹¹

282. The choice of specific measures in the exercise of due diligence in principle falls within the discretion of the state. That does not mean, however, that this discretionary space is unlimited or unconstrained. As the International Law Association’s Study Group on Due Diligence has observed:

“Reasonableness” is a golden thread in determining which measures States should take to act in a duly diligent manner. Indeed, one might describe a due diligence obligation as an obligation for the State to take *all measures it could reasonably be expected to take*.³⁹²

283. Specific obligations can be identified that inform the minimum core content of due diligence. This is also the approach taken by the Seabed Disputes Chamber in interpreting the due diligence obligation of sponsoring states in the Area. The Seabed Disputes Chamber identified a number of “direct obligations” under the Convention and related instruments with which states have to comply *independently* of their obligation of due diligence, but “compliance with these obligations can also be seen as a *relevant factor in meeting the due diligence obligation*.”³⁹³

284. In addition, the level of due diligence that is expected from a State is influenced by both the level of risk and foreseeability of the harm, as well as the State’s capability. In relation to the former, the level of due diligence exercised should be in exact proportion to the risks,³⁹⁴ and the more control a State possesses over certain activities, the more stringent the standard will be.³⁹⁵ As the Seabed Disputes Chamber observed in *Area*: “the standard of due diligence has to be more severe for the riskier activities.”³⁹⁶ The Chamber also made the link between “situations where scientific evidence concerning the scope and potential

³⁹¹ *Area* Advisory Opinion, ¶ 117; see also ILC, Commentaries on the Articles on Prevention of Transboundary Harm from Hazardous Activities, UN DOC. A/56/10 (2001), Article 3, ¶ 11.

³⁹² International Law Association, Study Group on Due Diligence in International Law, Second Report (2016), p. 8.

³⁹³ *Area* Advisory Opinion, ¶ 123 (emphasis added).

³⁹⁴ *Alabama Claims (United States v. Great Britain)*, Award (14 September 1872), XXIX RIAA 125, 129; *Sambiaggio (Italy v. Venezuela)*, Decision (1 January 1903), X UNRIAA 499, 512 (requiring care proportional to the degree of foreseeable risk); see also ILC, Commentaries on the Articles on Prevention of Transboundary Harm from Hazardous Activities, UN DOC. A/56/10 (2001), Article 3, ¶¶ 11, 18.

³⁹⁵ Leonhard Kreuzer et al., *Due Diligence in the International Legal Order: Dissecting the Leitmotif of Current Accountability Debates*, DUE DILIGENCE IN THE INTERNATIONAL LEGAL ORDER (2020), p. 6; Jorge E. Viñuales, *Due Diligence in International Environmental Law*, DUE DILIGENCE IN THE INTERNATIONAL LEGAL ORDER (2020), pp. 112–113.

³⁹⁶ *Area* Advisory Opinion, ¶ 117.

negative impact of the activity in question is insufficient but where there are *plausible indications of potential risks*” and the precautionary approach.³⁹⁷ In the context of climate change, it may be noted that the available science and climate models provide good insight and predictability of both current and future impacts under current emission trajectories and of the severity of the risks posed thereby.³⁹⁸ On the point of “control,” States can generally be considered capable of controlling the risk (*i.e.*, regulating and enforcing GHG emission reduction measures at the source) within their jurisdiction.

285. As to capability, a State’s capabilities to regulate particular conduct or take measures is generally considered a relevant factor in determining the level of due diligence required, so as to avoid an unreasonable burden on the state.³⁹⁹ Due diligence requires “nothing more nor less than the reasonable measures of prevention which a well-administered government could be expected to exercise under similar circumstances.”⁴⁰⁰ At the same time, due diligence is generally understood to entail an international minimum standard.⁴⁰¹ The ILC, for example, points to the economic level of States as one of the factors to be taken into account in determining whether a State has complied with its obligation of due diligence, yet this cannot be used to dispense a State from its obligations under said articles.⁴⁰² Because due diligence entails an international minimum standard, States cannot rely on (lower) domestic standards to inform their level of due diligence.⁴⁰³ If differentiated standards are applied, it is clear that a certain minimum standard of due diligence is applicable to all States at all times. Commentators suggest due diligence requirements may be more lenient for economically less advanced states in relation to obligations to use new and costly technologies for example,⁴⁰⁴ but not in instances where States have received financial or technical assistance.⁴⁰⁵

286. *Finally*, the content of the due diligence obligation is informed by the other provisions of Part XII as well as external norms. The *South China Sea* tribunal read the general obligation in Article 192 “against the background of other applicable international law” and considered that it is “given particular shape in the context of fragile ecosystems by

³⁹⁷ *Area Advisory Opinion*, ¶ 131 (emphasis added) (finding that disregarding those risks “would amount to a failure to comply with the precautionary approach”).

³⁹⁸ *See, e.g.*, IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: MITIGATION OF CLIMATE CHANGE (2022); *see generally* Chapter 4.

³⁹⁹ Jorge E. Viñuales, *Due Diligence in International Environmental Law*, DUE DILIGENCE IN THE INTERNATIONAL LEGAL ORDER (2020), pp. 125–126; Richard Mackenzie-Gray Scott, *Due Diligence as a Secondary Rule of General International Law*, 34 LEIDEN J. INT’L L. 343 (2021), p. 362

⁴⁰⁰ Alwyn V. Freeman, *Responsibility of States for Unlawful Acts of their Armed Forces*, 88 COLLECTED COURSES HAGUE ACAD. INT’L L. (1955-II), pp. 277–278.

⁴⁰¹ Leonhard Kreuzer et al., *Due Diligence in the International Legal Order: Dissecting the Leitmotif of Current Accountability Debates*, DUE DILIGENCE IN THE INTERNATIONAL LEGAL ORDER (2020), p. 5 (collecting cases).

⁴⁰² ILC, Commentaries on the Articles on Prevention of Transboundary Harm from Hazardous Activities, UN DOC. A/56/10 (2001), Article 3, ¶ 13.

⁴⁰³ Leonhard Kreuzer et al., *Due Diligence in the International Legal Order: Dissecting the Leitmotif of Current Accountability Debates*, DUE DILIGENCE IN THE INTERNATIONAL LEGAL ORDER (2020), p. 6.

⁴⁰⁴ Nele Matz-Lück & Erik van Doorn, *Due Diligence Obligations and the Protection of the Marine Environment*, L’OBSERVATEUR DES NATIONS UNIES (2017), p. 194.

⁴⁰⁵ Detlef Czybulka, *Article 202: General Obligation*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Prölß ed. 2017), p. 1348.

Article 194(5).”⁴⁰⁶ The tribunal referred to the “general corpus of international law relating to the environment, which informs the content of the general obligation in Article 192.”⁴⁰⁷ In particular, the tribunal cited with approval the ICJ’s conclusion in *Nuclear Weapons* that States are required to “ensure that activities within their jurisdiction and control respect the environment of other States or of areas beyond national control,”⁴⁰⁸ and the arbitral tribunal in *Indus Waters Kishenganga Arbitration*, which held that States have a positive “‘duty to prevent, or at least mitigate’ significant harm to the environment when pursuing large-scale construction activities.”⁴⁰⁹

287. The choice of specific measures is thus legally circumscribed based on further detailed provisions of Part XII itself, and other relevant international rules and standards that are part of the corpus of international law relating to the environment. As the latter corpus of rules and standards evolves over time, the standard of due diligence may rise with developments in the law, as well as developments in science and technology.⁴¹⁰ Furthermore, the standard of due diligence may be informed by more specific standards contained in soft-law instruments when these articulate how a State should give effect to general obligations of conduct, and provided that international support for these non-binding standards is sufficiently widespread and representative.⁴¹¹

II. Direct obligations under Part XII, including Article 194

288. The subsections below address the normative content of States Parties’ due diligence and direct obligations under Part XII to prevent, reduce, and control anthropogenic GHG emissions arising from activities within their jurisdiction (Subsection A) and globally in cooperation with other States (Subsection B).

A. Identification of obligations on States Parties to take specific steps

1. States must, at a minimum, adopt legislative and regulatory measures aimed at reducing GHG emissions

289. Article 194(1) lays down the core obligation under Part XII: that “States shall take . . . all measures . . . that are necessary to prevent, reduce and control pollution of the marine environment from any source.” As detailed in Chapter 6, the requirement to adopt “*all measures*” is broad in scope, and as informed by the obligation of due diligence discussed

⁴⁰⁶ *South China Sea Award*, ¶ 959.

⁴⁰⁷ *Id.*, ¶ 941.

⁴⁰⁸ *Nuclear Weapons Advisory Opinion*, ¶ 29.

⁴⁰⁹ *Indus Waters Kishenganga (Pakistan v. India)*, PCA Case No. 2011-01, Award (20 December 2013), ¶ 112 (quoting *Iron Rhine Railway (Belgium v. Netherlands)*, PCA Case No. 2003-02, Award (24 May 2005), ¶ 59).

⁴¹⁰ Nele Matz-Lück & Erik van Doorn, *Due Diligence Obligations and the Protection of the Marine Environment*, L’OBSERVATEUR DES NATIONS UNIES (2017), p. 191; Makane Mbengue, *The South China Sea Arbitration: Innovations in Marine Environmental Fact-Finding and Due Diligence Obligations*, 110 AM. J. INT’L L. 285 (2016), p. 286.

⁴¹¹ Nele Matz-Lück & Erik van Doorn, *Due Diligence Obligations and the Protection of the Marine Environment*, L’OBSERVATEUR DES NATIONS UNIES (2017), p. 195; Alan Boyle & Catherine Redgwell, *INTERNATIONAL LAW AND THE ENVIRONMENT* (2021), pp. 165–166 *see also* Alan Boyle, *Protecting the Marine Environment from Climate Change: The LOSC Part XII Regime*, *THE LAW OF THE SEA AND CLIMATE CHANGE: SOLUTIONS AND CONSTRAINTS* (2020).

above, encompasses the variety of modalities through which States Parties may reasonably and appropriately choose to achieve the legal objective of controlling GHG emissions and associated pollution of the marine environment. As to the requirement that the measures be “*necessary*,” the ICJ recently reiterated in assessing a treaty-based defense that a given contested measure was “necessary to protect [the respondent’s] essential security interests,” “[e]ven accepting that [a State] enjoys a certain margin of discretion.”⁴¹² The question “whether the measures taken were necessary is not purely a question for the subjective judgment of the party . . . and may thus be assessed by the Court.”⁴¹³ Thus, States have a general—though not unbounded—discretion when deciding on the specific policy tools to be employed, and may consider the full range of permissible preventative and remedial measures including policies, legislation, regulations, and adjudication.

290. As it relates to the measures to be adopted within a State’s jurisdiction and control, Part XII mandates that States “adopt *laws and regulations* to prevent, reduce and control pollution of the marine environment.”⁴¹⁴ The obligation requires, at a minimum, that States Parties enact legally binding rules and directives, consistent with their individual legal and constitutional arrangements, to prevent, reduce, and control GHG emissions within their jurisdiction and associated marine pollution. Importantly, and consistent with their due diligence obligation, the obligation encompasses three main requirements.

291. *First*, in fulfilling their due diligence obligation under Article 194 and generally under Part XII, such legally binding rules and directives must incorporate all necessary measures to prevent, reduce, and control anthropogenic GHG emissions constituting pollution of the marine environment in light of current scientific knowledge (Subsection III.A below) and international rules and standards (Subsection III.B below). As detailed therein, that knowledge and those standards coalesce around a target of limiting temperature increase to 1.5°C above pre-industrial levels and taking urgent measures with respect to GHG emissions to address the devastating harm of climate change. This is consistent with the reference to “damage by pollution” in Article 194(2), which, as noted, although unqualified, must be understood as referring to a “significant” damage, meaning a damage based on a “real detrimental effect” subject to a concrete measure assessed by factual and objective standards.⁴¹⁵

292. *Second*, such rules or directives enacted must be enforceable, whether before judicial authorities, administrative agencies, quasi-judicial, or similar bodies.⁴¹⁶ As such, the mere promulgation of policy guidelines and nonmandatory political directives and targets with respect to GHGs would fall short of compliance with Part XII.

293. *Finally*, while the enactment of legislative and regulatory measures is a core obligation under Part XII, it is but a minimum mandatory requirement. Part XII makes clear that States must also “take other measures as may be necessary to prevent, reduce and

⁴¹² *Certain Iranian Assets (Iran v. United States)*, Judgment, slip opinion (30 March 2023), ¶ 106 (citations and internal quotation marks omitted).

⁴¹³ *Id.*, ¶ 108.

⁴¹⁴ See UNCLOS, Articles 207(1), 208(1), 211(2), 211(4), 211(5), 212(1).

⁴¹⁵ See § 6.II.B above.

⁴¹⁶ UNCLOS, Articles 213, 214, 215, 216, 220, 222; see also § 7.II.A.6 below.

control . . . pollution.”⁴¹⁷ These additional measures include the various stipulations set out in Part XII with respect to States’ engagement with international organizations and in other international fora (e.g., the duty to provide technical assistance to developing States), which are addressed in further detail in Section II.B.3 below. Other measures States may adopt pursuant to their Part XII obligations include budgetary measures, public information measures, and measures aimed at encouraging and incentivizing corporate and other nongovernmental entities to take concrete steps to reduce pollution from GHGs. In this regard, it should be noted that budgetary measures are particularly important to the fulfilment of the obligations under Part XII,⁴¹⁸ not least because financial resources are indispensable for reducing GHG emissions, addressing climate change, promoting adaptation to the climate change impacts that are already occurring, and building the resilience of the marine environment.⁴¹⁹

2. *The legislative and policy measures adopted with respect to GHG emissions must address all sources of marine pollution within the State’s jurisdiction and control*

294. As outlined in Chapter 6, the legislative and regulatory measures enacted by States to “prevent, reduce and control pollution of the marine environment” from GHGs must constitute a comprehensive framework. This is clear from the text of Article 194(1), which mandates that States adopt “*all measures . . . necessary to prevent, reduce and control pollution . . . from any source.*” Part XII also specifies that legislative and policy measures must address GHG pollution from all land-based sources;⁴²⁰ sources which emit pollutants from or through the atmosphere;⁴²¹ and sources on the surface and subsurface levels of the ocean.⁴²² In so doing, Part XII imposes obligations that encompass the major sources of anthropogenic GHG emissions within the jurisdiction and control of States Parties. It also covers regulation of the most significant sources of GHG emission, such as power generation, industrial production, transportation, and agricultural activities.⁴²³

295. Compliance with the due diligence standard in Article 194(1) must also be measured in light of the other substantive requirements in Part XII, such as in Article 196. That provision stipulates that States Parties “take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the use of technologies under their jurisdiction or control . . . which may cause significant and harmful changes” to the marine environment. There is no designated list of technologies to be regulated pursuant to Article 196. However, technologies that emit substantial amounts of GHG certainly “cause significant and harmful changes” to the marine environment within the meaning of

⁴¹⁷ UNCLOS, Articles 207(2), 208(2), 210(2), 212(2).

⁴¹⁸ ILC, Commentaries on the Articles on Prevention of Transboundary Harm from Hazardous Activities, UN DOC. A/56/10 (2001), Article 3, ¶ 14 (“An efficient implementation of the duty of prevention may well require upgrading the input of technology in the activity as well as the allocation of adequate financial and manpower resources with necessary training for the management and monitoring of the activity.”).

⁴¹⁹ IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), pp. 9, 11.

⁴²⁰ UNCLOS, Article 207(1).

⁴²¹ *Id.*

⁴²² *Id.*, Articles 208(1), 209(1), 210(1), 211(1).

⁴²³ IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), p. 4.

Article 196. Such technologies, by virtue of the GHGs they release and the heat they introduce into the ocean, adversely impact the marine environment, including through the absorption of excess carbon which makes it more acidic, leading to profound harm, especially to Small Island States.⁴²⁴ It is an objective question of science whether particular technologies cause “pollution of the marine environment” through GHGs and “may cause significant and harmful changes” to the marine environment. States Parties must exercise the appropriate level of due diligence, in light of the best available scientific information, to take the necessary measures to prevent, reduce, and control pollution from the use of technologies that are carbon intensive or otherwise contribute to marine pollution.

3. *Legislative and policy measures adopted must regulate the GHG activities of both State and non-State actors*

296. States Parties must engage with non-State actors to achieve the Convention’s objective of eliminating marine pollution. It is not adequate or “satisfactory to rely on mere application of the principle that the conduct of private persons or entities is not attributable to the State under international law.”⁴²⁵ Therefore, the stipulation in Article 194(1) that States take “*all measures . . . necessary* to prevent, reduce and control pollution of the marine environment from any source” must be read as implying an obligation on States to regulate the activities of non-State actors within their jurisdiction. The same applies to the obligation in Article 194(2) to “ensure that activities . . . are so conducted as not to cause damage by pollution.”

297. International courts and tribunals have confirmed that due diligence obligations entail a legal duty to effectively regulate the conduct of non-State actors within the State’s jurisdiction and control. As the ICJ noted in *Pulp Mills*, the duty to act with due diligence as applied in the environmental context is

an obligation which entails not only the adoption of appropriate rules and measures, but also . . . the exercise of administrative control applicable to . . . *private operators*, such as the monitoring of activities undertaken by such operators.⁴²⁶

298. The obligation under Article 194(1) to take appropriate steps to ensure that non-State actors do not cause “pollution of the marine environment from any source”⁴²⁷ requires that States, among other actions, adopt and enforce an appropriate mix of laws, regulations, and policies that encourage or oblige non-State actors to reduce GHG emissions, and adopt measures to prevent adverse impacts on the marine environment resulting from emissions. This may include mandating that companies exercise due diligence, conduct environmental and climate impact assessments, or disclose GHG emissions and climate change impacts.⁴²⁸

⁴²⁴ See §§4.II, III; *see also* Cooley Report, §V.

⁴²⁵ *Area Advisory Opinion*, ¶ 112.

⁴²⁶ *Pulp Mills Judgment*, ¶ 197 (emphasis added).

⁴²⁷ UNCLOS, Article 194(1).

⁴²⁸ *See, e.g.*, UN High-Level Expert Group on the Net Zero Emissions Commitments of Non-State Entities, *Integrity Matters: Net Zero Commitments by Businesses, Financial Institutions, Cities and Regions* (8 November 2022), pp. 12–13 (recommending disclosure of net zero business plans, setting public emissions reductions targets, due diligence obligations to assess climate-related impacts along the supply chain and devise net-zero plans through the supply chain, and public disclosure of GHG emissions data).

States may also seek to discharge their due diligence obligations by adopting measures to encourage businesses to prioritize low-carbon and zero-carbon investments, or through contractual or licensing provisions constraining the relevant activities of non-State actors.⁴²⁹

299. This obligation does not make States *per se* internationally responsible for marine pollution caused by private actors. As the Seabed Disputes Chamber explained in *Area*, the due diligence obligations imposed under Part XII create an “obligation[] which States Parties must fulfil by exercising their power over entities of their nationality and under their control.”⁴³⁰ Accordingly, a State will bear international responsibility insofar as there is a “failure to meet its obligation to ensure” compliance by relevant non-State actors.⁴³¹

4. *Legislative and policy measures adopted must also regulate harm in areas beyond national control caused by GHG emissions originating from within the State’s jurisdiction and control*

300. Part XII enshrines the fundamental principle that States must refrain from causing environmental harm arising from hazardous activities under their jurisdiction or control.⁴³² Specifically, Article 194(2) provides that “States shall take all measures necessary to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States,” and must ensure that “pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with this Convention.”⁴³³ This provision imposes a due diligence obligation on States with respect to the prevention of significant environmental harm to areas beyond their jurisdiction,⁴³⁴ and obliges States Parties to take appropriate measures to prevent significant transboundary harm or adverse environmental impacts beyond national borders arising out of activities within their jurisdiction and control. Reference can be made again to the analogous context of the ILC’s work with respect to transboundary harm,⁴³⁵ which suggests that such implementing measures include “formulating policies designed to prevent significant transboundary harm or to minimize the

⁴²⁹ See, e.g., IPCC, *Chapter 2: Mitigation Pathways Compatible with 1.5 C in the Context of Sustainable Development*, SPECIAL REPORT ON THE IMPACTS OF GLOBAL WARMING OF 1.5°C ABOVE PRE-INDUSTRIAL LEVELS, pp. 153–154 (noting the importance of aligning investments with mitigation pathways); UN High-Level Expert Group on the Net Zero Emissions Commitments of Non-State Entities, *Integrity Matters: Net Zero Commitments by Businesses, Financial Institutions, Cities and Regions* (8 November 2022), pp. 12–13 (recommending that financial institutions divest from fossil fuels and other activities that contribute to climate change, including deforestation, and that governments adopt regulations constraining activities of high-impact corporate emitters).

⁴³⁰ *Area Advisory Opinion*, ¶ 108.

⁴³¹ *Area Advisory Opinion*, ¶ 109.

⁴³² See § 6.II.B below.

⁴³³ UNCLOS, Article 194(2); see also *Nuclear Weapons Advisory Opinion*, ¶ 29; Rio Declaration, Principle 2; Stockholm Declaration, Principle 21.

⁴³⁴ *Pulp Mills Judgment*, ¶ 101.

⁴³⁵ The ILC defines “transboundary harm” as “harm caused in the territory of or in other places under the jurisdiction or control of a State other than the State of origin, whether or not the States concerned share a common border.” ILC, Articles on Prevention of Transboundary Harm from Hazardous Activities, UN Doc. A/RES/62/68 (Annex) (6 December 2007), Article 2(c). UNCLOS is broader and refers to “pollution . . . beyond the areas where [States] exercise sovereign rights in accordance with this Convention,” which includes not only “transboundary” pollution as defined, but also pollution in areas beyond national control. UNCLOS, Article 194(2).

risk thereof and . . . implementing those policies” through “legislation and administrative regulations . . . implemented through various enforcement mechanisms.”⁴³⁶ The overriding requirement is, however, that the preventative and mitigative measures adopted represent the State’s “best practical means at their disposal” for preventing extra-territorial marine pollution caused by GHG emissions from within its jurisdiction.⁴³⁷

301. A more exacting obligation of due diligence is incumbent on industrialized and developed States in this context. It is well established that “the degree of care expected of a State with a well-developed economy and human and material resources . . . is different from States which are not so well placed.”⁴³⁸ Given that the standard of due diligence applicable to States must be “appropriate and proportional to the degree of risk of transboundary harm” from their activities, it is both logical and just that industrialized and developed States should bear a more exacting obligation with respect to the prevention of transboundary and extra-territorial harm from GHG emissions.⁴³⁹ Industrialized and developed States play an outsized role in generating GHG emissions and associated damage to the marine environment. For example, GHG emissions from the 49 least developed countries collectively accounted for just 0.54 percent of global GHG emissions in 2003.⁴⁴⁰ Such emissions are *de minimis* because they contribute only a small portion of global GHG emissions. In contrast, in 2009 alone, industrialized and developed States in the Group of 20 collectively accounted for 80 percent of global GHG emissions.⁴⁴¹ As the International Law Association has rightly noted, the most advanced States must take the lead in addressing GHGs “by adopting more stringent mitigation commitments” and addressing their adverse effects.⁴⁴²

5. *States Parties are obliged to discharge other procedural obligations at the international level with respect to the prevention of pollution of the marine environment*

302. UNCLOS also requires that States Parties discharge a number of procedural obligations that are no less robust than the substantive obligations which States are required to observe. As the ICJ emphasized in *Pulp Mills*, “the two categories of obligations . . . complement one another perfectly.”⁴⁴³ The established procedures “enable the parties to fulfil their substantive obligations,”⁴⁴⁴ and serve as “an essential indicator of whether, in a concrete case, substantive obligations were or were not breached.”⁴⁴⁵ In this way, procedural obligations are an important element of due diligence and contribute significantly to the nature of the substantive environmental obligations under UNCLOS. Procedural obligations

⁴³⁶ *Id.*, Article 3, ¶ 10.

⁴³⁷ UNCLOS, Article 194(1) (“best practical means at their disposal”).

⁴³⁸ ILC, Commentaries on the Articles on Prevention of Transboundary Harm from Hazardous Activities, UN Doc. A/56/10 (2001), Article 3, ¶ 17.

⁴³⁹ *Id.*, Article 3, ¶ 11.

⁴⁴⁰ UN Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries, and Small Island Developing States, *The Impact of Climate Change on the Development Prospects of the Least Developed Countries and Small Island Developed States* (2009), pp. 6, 12.

⁴⁴¹ IMF, *Mitigation Policies for the Paris Agreement: An Assessment for G20 Countries* (2018), p. 4.

⁴⁴² International Law Association, *Draft Legal Principles Related to Climate Change* (2014), Article 5(3)(a).

⁴⁴³ *Pulp Mills Judgment*, ¶ 77.

⁴⁴⁴ *Id.*, ¶ 78.

⁴⁴⁵ *Id.*, Joint Dissenting Opinion of Judges Al-Khasawneh and Simma, ¶ 26.

are not, however, subsumed within substantive treaty obligations. States are required to “answer for [breaches of] those obligations separately, according to their specific content.”⁴⁴⁶

303. The due diligence obligation imposed by Article 194(2)—and as expressly reflected in Articles 204 to 206—require that States Parties conduct environmental impact assessments with respect to activities likely to cause transboundary and other extraterritorial environmental harm from GHGs. Article 206 in particular provides:

When States have reasonable grounds for believing that planned activities under their jurisdiction or control may cause substantial pollution of or significant and harmful changes to the marine environment, they shall, as far as practicable, assess the potential effects of such activities on the marine environment and shall communicate reports of the results of such assessments in the manner provided in article 205 [on publication of reports].⁴⁴⁷

304. Article 205 provides that States “shall publish reports” of the results of studies regarding “risks or effects of pollution of the marine environment,” or provide such reports “at appropriate intervals to the competent international organizations, which should make them available to all States.”

305. This obligation stems not only from the terms of the Convention, but also from general obligations under customary international law. As the ICJ observed in *Pulp Mills*:

[A] practice, which in recent years has gained so much acceptance among States that it may now be considered a requirement under general international law, is to undertake an environmental impact assessment where there is a risk that the proposed industrial activity may have a significant adverse impact in a transboundary context, in particular, on a shared resource.⁴⁴⁸

306. The requirement is also reflected in Principle 17 of the Rio Declaration, which provides for assessment of the risk of activities that are likely to have a significant adverse impact on the environment,⁴⁴⁹ as well as in Article 7 of the Articles on Prevention of Transboundary Harm from Hazardous Activities.⁴⁵⁰

307. That a State may not be fully able to trace the chain of causation linking specific GHG emission to damage in a particular injured State does not diminish the necessity or utility of conducting an environmental impact assessment. Environmental assessments may be adapted for the specific requirements of evaluating the possible transboundary and extra-

⁴⁴⁶ *Id.*, Judgment, ¶ 79.

⁴⁴⁷ UNCLOS, Article 206.

⁴⁴⁸ *Pulp Mills* Judgment, ¶ 204.

⁴⁴⁹ Rio Declaration, Principle 17.

⁴⁵⁰ ILC, Articles on Prevention of Transboundary Harm from Hazardous Activities, UN Doc. A/RES/62/68 (Annex) (6 December 2007), Article 7.

territorial harmful impact of GHG activity.⁴⁵¹ Such assessments are important for enabling “the State to determine the extent and the nature of risk involved in an activity and consequently the type of preventative measures it should take.”⁴⁵² As the ICJ observed in *Pulp Mills*, “the duty of vigilance and prevention . . . would not be considered to have been exercised, if a party planning works liable to [significantly] affect . . . the quality of [the marine environment] . . . did not undertake an environmental impact assessment on the potential effects of such works.”⁴⁵³

308. Part XII imposes additional specific procedural obligations on States Parties. Most notably, Article 198 stipulates that, when “a State becomes aware of cases in which the marine environment is in imminent danger of being damaged or has been damaged by pollution,” it must immediately notify other States it deems likely to be affected by such damage, as well as the competent international organizations. Article 199 further provides that States must jointly develop and promote contingency plans for responding to pollution incidents in the marine environment.

6. *Legislative and regulatory measures with respect to marine pollution from GHG emissions must be enforced under domestic law*

309. States are obliged to “enforce the . . . laws and regulations”⁴⁵⁴ adopted in accordance with Part XII, including laws and regulations with respect to the prevention, reduction, and control of marine pollution from land-based sources;⁴⁵⁵ the surface and subsurface levels of the ocean;⁴⁵⁶ and from and through the atmosphere.⁴⁵⁷

310. Enforcement here refers to the range of procedures and actions that a State may employ to ensure that entities and individuals failing to comply with environmental laws or regulations implementing multilateral environmental agreements can be brought into compliance or sanctioned through civil, administrative, or criminal action. Quite apart from regulatory enforcement, international law also requires that States ensure that an effective legal remedy is available under their legal systems for damage to those who have suffered from marine environmental damage caused by GHG emissions.⁴⁵⁸ Consistent with this principle, Article 235(2) of UNCLOS requires that States Parties “ensure that recourse is available in accordance with their legal systems for prompt and adequate compensation or other relief in respect of damage caused by pollution of the marine environment by natural or juridical persons under their jurisdiction.”

⁴⁵¹ Neither UNCLOS nor general rules of international law set down mandatory requirements with respect to “the scope and content of an environmental impact assessment.” See *Pulp Mills Judgment* ¶ 205; *Area Advisory Opinion*, ¶ 149.

⁴⁵² ILC, Commentaries on the Articles on Prevention of Transboundary Harm from Hazardous Activities, UN Doc. A/56/10 (2001), Article 7, ¶ 1.

⁴⁵³ *Pulp Mills Judgment*, ¶ 204.

⁴⁵⁴ UNCLOS, Articles 213, 214, 215, 216(1), 217, 218, 220, 222.

⁴⁵⁵ *Id.*, Article 207(1).

⁴⁵⁶ *Id.*, Articles 208, 209, 210, 211, and 219.

⁴⁵⁷ *Id.*, Article 207(1).

⁴⁵⁸ See, e.g., *id.*, Articles 235(2) and 235(3); Convention for the Protection of the Mediterranean Sea Against Pollution, Article 12; 1969 International Convention on Civil Liability for Oil Pollution Damage.

311. Under UNCLOS, each State Party is free to design the enforcement measures that are most appropriate in the context of its own legal system and related social, cultural, and economic circumstances. However, the Tribunal has explained in *SRFC*, that:

While the nature of the laws, regulations and measures that are to be adopted by the . . . State is left to be determined by each . . . State in accordance with its legal system, the . . . State nevertheless has the obligation to include in them enforcement mechanisms to monitor and secure compliance with these laws and regulations. Sanctions applicable . . . must be sufficient to deter violations and to deprive offenders of the benefits accruing from . . . [unlawful conduct].⁴⁵⁹

312. Because environmental enforcement is fundamentally grounded in action at the national level, States should take account of the unique characteristics of their legal system, as well as their culture and institutional capacity in designing and adopting relevant measures. The relevant enforcement mechanisms must however be broadly consistent with minimum requirements of international law, including as to due process, procedural fairness, transparency and accountability. As the Tribunal has emphasized on a number of occasions, the obligations imposed under the Convention “include elementary considerations of humanity and due process of law.”⁴⁶⁰

313. As the ICJ explained in *Pulp Mills*:

It is an obligation which 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, to safeguard the rights of the other party.* The responsibility of a party . . . would therefore be engaged if it was shown that it had failed to act diligently and thus take all appropriate measures to enforce its relevant regulations on a public or private operator under its jurisdiction.⁴⁶¹

The Tribunal, the Seabed Disputes Chamber, and Annex VII tribunals have affirmed that a similar standard of conduct applies under Part XII.⁴⁶²

314. A more exacting obligation of due diligence is also justified in this context, given the potentially catastrophic risk posed to the marine environment from the continued uncontrolled emission of GHGs, which demands that “[t]he standard of due diligence . . . be more severe.”⁴⁶³ As detailed in Chapter 4, the ocean’s absorption of excess heat due to

⁴⁵⁹ *SRFC* Advisory Opinion, ¶ 138.

⁴⁶⁰ *Juno Trader (Saint Vincent and the Grenadines v. Guinea-Bissau)*, Judgment, 2004 ITLOS REP. 19 (18 December), ¶ 77; *see also Tomimaru Case (Japan v. Russia)*, Judgment, 2007 ITLOS REP. (6 August), ¶ 76.

⁴⁶¹ *Pulp Mills* Judgment, ¶ 197 (emphasis added).

⁴⁶² *Area* Advisory Opinion, ¶¶ 111–120; *SRFC* Advisory Opinion, ¶ 131; *South China Sea Award*, ¶ 944.

⁴⁶³ *Area* Advisory Opinion, ¶ 117.

uncontrolled GHG emissions, leads to profound and often irreversible harm to the marine environment and communities that rely on it, including, for example, in the form of ocean warming, melting of sea ice, sea-level rise, changes to ocean and air currents, increasing extreme weather events, ocean stratification and deoxygenation, and ocean acidification.⁴⁶⁴ In the circumstances, the enforcement efforts of States should place greater emphasis on prevention and avoidance of harm from GHG emissions rather than on reparatory mechanisms. To use the words of the ICJ in *Gabčíkovo-Nagymaros*, stringent “vigilance and prevention are required on account of the . . . irreversible character of damage to the environment and of the limitations inherent in the very mechanism of reparation of this type of damage.”⁴⁶⁵

315. To meet the level of due diligence demanded in this context, States must have in place an effective national environmental regime. Necessary conditions for effective enforcement include well-developed laws and regulations, a sufficient institutional framework, training, sufficient enforcement capabilities, and public environmental awareness and education. It is well documented that environmental regulators often suffer from lack of funding, training, and capacity to perform important tasks, particularly in developing States. These issues underscore the importance of the various obligations under Part XII with respect to international cooperation, engagement with international organizations, and the provision of technical and other assistance to developing States.

B. Identification of obligations on States Parties to cooperate with each other

316. The inherent potential of GHG emissions to impact beyond a State’s jurisdiction, and cause significant and irreversible damage to the marine environment, underscores the critical need for international coordination in this area. GHG emissions call for a sophisticated regulatory response, supported by international coordination informed by internationally agreed standards. As such, the Article 194(2) obligations cannot be fully realized without reference to the other complimentary obligations in Part XII, including Article 197, which directs States Parties to “cooperate on a global basis . . . directly or through competent international organizations, in formulating and elaborating international rules, standards and recommended practices and procedures . . . for the protection and preservation of the marine environment.” It is therefore unsurprising that the principle of international cooperation is a core normative thread running throughout the provisions of Part XII. As the Tribunal noted in *MOX Plant*, the duty to cooperate is a “fundamental principle in the prevention of pollution of the marine environment under Part XII of the Convention and general international law.”⁴⁶⁶ As described further below, Part XII imposes a number of obligations requiring States Parties to take concrete steps and adopt measures at the international level in furtherance of the aim of preventing and controlling marine pollution.

I. *States Parties are obliged to harmonize laws regarding pollution of the marine environment*

317. Part XII promotes the aim of eliminating marine pollution by requiring States to coordinate and harmonize their policies and legislative efforts, and thus address common

⁴⁶⁴ See § 4.IV above.

⁴⁶⁵ *Gabčíkovo-Nagymaros Project (Hungary/Slovakia)*, Judgment, 1997 ICJ REP. 7 (25 September) (“*Gabčíkovo-Nagymaros Judgment*”), ¶ 140.

⁴⁶⁶ *MOX Plant Order*, ¶ 82.

environmental problems through mutual learning and shared best practices. Thus, for example, Article 194(1) mandates that States “shall endeavour to harmonize their policies in . . . connection” with the prevention, reduction, and control of pollution of the marine environment.

318. As it concerns the specific issue of pollution from land-based sources, Article 207(3) requires that States “endeavour to harmonize their policies . . . at the appropriate regional level,” with respect to pollution of the marine environment “from land-based sources . . . taking into account internationally agreed rules, standards and recommended practices and procedures.” Marine sources of pollution are addressed in Article 208(4), which requires that States make best efforts to “harmonize their policies . . . at the appropriate regional level,” with respect to the prevention and control of pollution “arising from or in connection with seabed activities subject to their jurisdiction” and from artificial islands, installations, and structures in their respective EEZs and on continental shelves. The Convention similarly mandates inter-State policy coordination with respect to the regulation of pollution “from or through the atmosphere.”⁴⁶⁷

319. In furtherance of these due diligence obligations, States Parties may engage in various established modes of policy and legal harmonization, including the adoption of binding international agreements or nonbinding guidelines and other soft-law instruments that seek to facilitate greater legal coordination between States Parties.

2. *States Parties must take cooperative action through international organizations to address pollution of the marine environment*

320. The general duty of international cooperation enshrined in Part XII applies to States Parties in their relations *inter se*, as well as their engagement in international organizations in which they participate. Part XII imposes multiple obligations on States Parties to take concrete steps at the global level, in the context of competent international organizations, for the purposes of preventing, reducing, and controlling pollution of the marine environment and/or minimizing its effects. These obligations comprise general due diligence obligations, as well as various interrelated obligations of conduct. As the ICJ noted in *Pulp Mills*, States are called upon “to exercise due diligence in acting through [relevant international organizations] for the necessary measures to preserve the ecological balance” and the integrity of the environment.⁴⁶⁸

321. Part XII mandates that States take relevant steps at the international level, including through international organizations, with respect to standard-setting and the progressive development of international law addressing the issue of marine pollution and transboundary and extraterritorial environmental harm. This includes the obligation to formulate and elaborate international rules, standards, and recommended practices.⁴⁶⁹ For example, Article 207 provides that States must act through “competent international organizations or diplomatic conference,” and shall endeavor “to establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control pollution of the marine environment from land-based sources.” In doing so, States are required to take into

⁴⁶⁷ UNCLOS, Article 194(3).

⁴⁶⁸ *Pulp Mills* Judgment, ¶ 187.

⁴⁶⁹ UNCLOS, Article 197.

account “characteristic regional features, the economic capacity of developing States and their need for economic development.”

322. Relevant international organizations in this context include the United Nations—the quintessential international organization—which has core competencies in environmental protection. Critically, the UN system includes the Secretariat of the UNFCCC, the UN entity tasked with supporting the global response to the threat of climate change. The UNFCCC has near universal membership,⁴⁷⁰ and is the umbrella agreement for both the 1997 Kyoto Protocol and the 2015 Paris Agreement. The overriding aim of these instruments is to “stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system, in a time frame which allows ecosystems to adapt naturally and enables sustainable development.”⁴⁷¹ States Parties’ actions in the context of the UNFCCC and related UN bodies are clearly relevant to the discharge of their obligations to “establish global . . . rules, standards and recommended practices” with respect to marine pollution from GHGs.

323. Part XII imposes similar obligations to engage in international action with respect to pollution from marine sources. Under Article 208(5), States are required to take appropriate international actions, including “through competent international organizations” to establish “rules, standards and recommended practices and procedures” to prevent, reduce and control pollution connected to seabed activities subject to their jurisdiction and from artificial islands, installations and structures within their EEZs and continental shelves. Article 214 also requires that States adopt “measures necessary to implement applicable international rules and standards established through competent international organizations or diplomatic conference to prevent, reduce and control pollution of the marine environment” arising within the same jurisdictional zones.

324. The IMO is a recognized forum for international regulation of maritime pollution, including with respect to GHGs. For example, Article 2(2) of the Kyoto Protocol entrusts the reduction of GHG emissions from marine bunker fuels to the IMO. More generally, the IMO’s Marine Environmental Protection Committee has adopted mandatory measures to reduce GHG emissions from ships,⁴⁷² and continues to advance the elaboration of a legal framework for energy efficiency in the shipping industry as a means of tackling GHG emissions. Beyond the realm of shipping, the IMO also coordinates the regulation of carbon capture and storage beneath the seabed to mitigate the impacts of increasing concentrations of carbon dioxide in the atmosphere, as well as ocean fertilization and other marine geoengineering activities.⁴⁷³

325. As it concerns pollution originating from the atmosphere, Article 212(3) requires that States “endeavour” to establish global and regional rules, standards, and practices to prevent and control pollution, including in the context of competent international organizations. This due diligence obligation falls to be fulfilled in institutional contexts such as the International Civil Aviation Organization (“ICAO”). ICAO formulates policies, standards, and recommended practices on aircraft emissions, and conducts outreach activities with a view to

⁴⁷⁰ The UNFCCC has 198 Parties. See UN Treaty Collection, UNFCCC Status List.

⁴⁷¹ UNFCCC, *About the Secretariat*.

⁴⁷² IMO, Marine Environment Protection Committee, 62nd Session (2011).

⁴⁷³ IMO, *Carbon Capture and Sequestration*.

minimizing the adverse effects of international civil aviation on the environment, among other activities.⁴⁷⁴ For example, at its 40th Session in 2019, the ICAO Assembly adopted Resolution A40-18, by which States resolved to “work through ICAO to achieve . . . an aspirational global fuel efficiency improvement rate of 2 per cent per annum from 2021 to 2050,” and that “ICAO and its Member States with relevant organizations will work together to strive to achieve a collective medium-term global aspirational goal of keeping the global net carbon emissions from international aviation from 2020 at the same level.”⁴⁷⁵

326. In addition to the obligations with respect to norm creation and standard-setting, Part XII imposes a number of other obligations with respect to the prevention, reduction, and control of pollution of the marine environment in the context of international organizations. These include the obligations to cooperate through international organizations to:

- (a) Eliminate the effects of marine pollution and prevent or minimize the damage arising therefrom (Article 199), following notice to the competent international organizations and States the notifying State “deems likely to be affected” in cases of imminent or actual damage due to pollution (Article 198);⁴⁷⁶
- (b) Undertake programs of scientific research and encourage the “exchange of information and data acquired about pollution of the marine environment” (Article 200);
- (c) Participate in regional and global programs to “acquire knowledge for the assessment of the nature and extent of pollution, exposure to it, and its pathways, risks and remedies” (Article 200);
- (d) Establish appropriate scientific criteria for the formulation and elaboration of rules, standards, and recommended practices and procedures for the prevention, reduction, and control of pollution of the marine environment (Article 201);
- (e) Promote programs of scientific, educational, technical, and other assistance to developing States for the protection and preservation of the marine environment and the prevention, reduction, and control of marine pollution (Article 202(a));
- (f) Provide appropriate assistance, including to developing States, for the minimization of the effects of major incidents which may cause serious pollution of the marine environment (Article 202(b)), and concerning the preparation of environmental assessments (Article 202(c)); and

⁴⁷⁴ ICAO, *Climate Change*.

⁴⁷⁵ ICAO Assembly, Resolution A40-18 (2019), ¶¶ 4, 6.

⁴⁷⁶ Although “deems likely” appears to introduce an element of subjectivity, “affected” is broad and general, and “is not to be limited to situations in which the State that may be impacted is an ‘injured’ State.” See Tim Stephens, *Article 198: Notification of Imminent or Actual Damage*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Pröhl ed. 2017), p. 1337. When it comes to pollution from GHG emissions, it is clear that every State is “affected.”

- (g) Observe, measure, evaluate and analyze, by recognized scientific methods, the risks or effects of pollution of the marine environment, including 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 (Article 204).

327. In all these contexts, States' due diligence obligations require that they "deploy adequate means . . . exercise best possible efforts . . . [and] do the utmost" in the context of the various organs and activities within relevant international organizations to achieve the substantive aims outlined above.⁴⁷⁷ In so doing, States Parties must be cognizant of the constraints which inhibit developing countries from effectively participating in standard-setting and other international processes. States Parties are obliged to explore tangible ways of facilitating the participation of developing countries in this context, including through capacity building and technical assistance within international organizations.⁴⁷⁸

3. *States Parties must assist and cooperate with Developing States in their efforts to address pollution of the marine environment*

328. As explained above, Part XII of the Convention obliges States Parties to cooperate, both *inter se* and through international organizations, to protect and preserve the marine environment, including with respect to pollution by GHG emissions. This general obligation of cooperation comprises a more specific obligation for States Parties to assist developing States in their efforts to protect and preserve the marine environment through scientific, technical, and financial assistance.

329. This is required, both as a matter of justice and equity, and to enable and facilitate effective implementation of the obligations in Part XII. The twin goals of fairness and effective implementation of environmental obligations animating the specific obligation to assist have a long history in international environmental law and stem from the principle of "common but differentiated responsibilities."⁴⁷⁹ This principle informs numerous multilateral environmental agreements. For instance, the UNFCCC expressly refers to the principle in its Article 3,⁴⁸⁰ and in its Article 4(7) makes implementation by developing States Parties dependent on the effective implementation by developed country Parties of their assistance

⁴⁷⁷ *Area Advisory Opinion*, ¶ 110.

⁴⁷⁸ *See, e.g.*, UNCLOS, Article 269.

⁴⁷⁹ Stockholm Declaration, Principle 12; *see also id.*, Principle 9 ("Environmental deficiencies generated by the conditions of under-development and natural disasters pose grave problems and can best be remedied by accelerated development through the transfer of substantial quantities of financial and technological assistance as a supplement to the domestic effort of the developing countries and such timely assistance as may be required."). The principle was authoritatively restated in Principles 6 and 7 of the 1992 Rio Declaration on Environment and Development.

⁴⁸⁰ UNFCCC, Article 3.

obligations.⁴⁸¹ The Paris Agreement also repeatedly refers to the principle of common but differentiated responsibilities.⁴⁸²

330. UNCLOS is no exception. Article 202 obliges States Parties to provide scientific, technical, and financial assistance to developing States in relation to “the protection and preservation of the marine environment and the prevention, reduction and control of marine pollution.”⁴⁸³ The obligation extends to the marine environment in the State’s national jurisdiction and beyond national jurisdiction. States Parties are obliged to grant such assistance either “directly” or “through competent international organizations.”⁴⁸⁴ UN practice leaves no doubt that the category of “developing States” includes at least the least developed countries, developing Small Island States, and coastal African States.⁴⁸⁵

331. Under Article 202, States Parties must:

- (a) Promote “programmes of scientific, educational, technical and other assistance to developing States for the protection and preservation of the marine environment and the prevention, reduction and control of marine pollution,” including for example:
 - (i) “[T]raining of their scientific and technical personnel”;
 - (ii) “[F]acilitating their participation in relevant international programmes”;
 - (iii) “[S]upplying them with necessary equipment and facilities”;
 - (iv) “[E]nhancing their capacity to manufacture such equipment”;
 - (v) “[A]dvise on and developing facilities for research, monitoring, educational and other programmes”;
- (b) Provide “appropriate assistance . . . for the minimization of the effects of major incidents which may cause serious pollution of the marine environment”; and
- (c) Provide “appropriate assistance . . . concerning the preparation of environmental assessments.”

⁴⁸¹ UNFCCC, Article 4(7) (“The extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology and will take fully into account that economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties”).

⁴⁸² See Paris Agreement, Preamble; *id.*, Articles 2(2), 4(3), 4(19).

⁴⁸³ UNCLOS, Article 202.

⁴⁸⁴ *Id.*

⁴⁸⁵ See James Harrison, *Article 202: Scientific and Technical Assistance to Developing States*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Pröbß ed. 2017), p. 1350, fn. 19 (citing UN General Assembly, Resolution 67/78 (11 December 2012), ¶ 9).

332. The broad, general terms “other assistance” and “appropriate assistance” in Article 202 must be understood to encompass financial assistance.⁴⁸⁶ Article 203 confirms this point, as it expressly refers to the “allocation of appropriate funds.”⁴⁸⁷ And indeed this is how the obligation has been implemented in practice.⁴⁸⁸

333. Article 203 supplements the obligations regarding assistance for developing States.⁴⁸⁹ The provision stipulates that international organizations must grant developing States preference in the allocation of appropriate funds and technical assistance, and the utilization of their specialized services, for the purposes of preventing, reducing, and controlling pollution of the marine environment and its effects. This makes clear that the primary beneficiaries of financial and technical assistance granted through international organizations must be developing States.

334. The obligations in Articles 202 and 203 are echoed in Article 266, which is contained in Part XIV of the Convention. Article 266 is broader as it addresses technology transfers not necessarily in connection with the protection and preservation of the marine environment.⁴⁹⁰ Notably, Article 266(2) expressly refers to the protection and preservation of the marine environment as one area where States shall promote “the development of the marine scientific and technological capacity of States which may need and request technical assistance.”⁴⁹¹

335. These cooperation and assistance obligations are crucial in the context of climate change. As Dr. Maharaj explains in her expert report, Small Island States must deal with data gaps that slow down and hamper scientific analysis and action in response to the existential threat that they face.⁴⁹² Dr. Maharaj identifies the impacts of sea-level rise, tropical cyclones, climate-related migration, and lack of access to finance as areas in particular need of additional research.⁴⁹³

336. In sum, States Parties must comply with their express obligation to cooperate and provide scientific, technical, and financial assistance to developing States. This will help address the fundamental inequity that the very States that face the most severe threats from climate change and have contributed the least to the crisis are fundamentally hampered the most by resource and financial constraints that prevent them from analyzing and responding most effectively to those threats.

⁴⁸⁶ *See id.*, pp. 1349–1350.

⁴⁸⁷ UNCLOS, Article 203(a).

⁴⁸⁸ *See James Harrison, Article 202: Scientific and Technical Assistance to Developing States*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Pröhl ed. 2017), pp. 1349–1350.

⁴⁸⁹ UNCLOS, Article 203.

⁴⁹⁰ *See id.*, Article 266(1) (“States, directly or through competent international organizations, shall cooperate in accordance with their capabilities to promote actively the development and transfer of marine science and marine technology on fair and reasonable terms and conditions”).

⁴⁹¹ UNCLOS, Article 266(2).

⁴⁹² Maharaj Report, § II.

⁴⁹³ *See id.*, § III.

III. Necessary measures in light of current scientific evidence and international rules and standards

337. In fulfilling their due diligence obligation under Article 194 and generally under Part XII, States Parties must take all necessary measures to prevent, reduce, and control anthropogenic GHG emissions constituting pollution of the marine environment in light of current scientific evidence (Subsection A) and international rules and standards (Subsection B). That knowledge and those standards coalesce around a target of limiting temperature increase to 1.5°C above pre-industrial levels and taking urgent measures to address the devastating harm of climate change.

A. Measures reflecting current scientific evidence

338. To fulfill States Parties' due diligence obligations under the Convention, the measures that they adopt to prevent, reduce, and control anthropogenic GHG emissions must reflect current scientific knowledge. The obligation to “take . . . all measures . . . necessary” to address pollution of the marine environment is not self-judging or discretionary. In these circumstances, settled scientific conclusions based on current and best available evidence dictate what is “necessary”—in the sense of being “imperative” or “indispensable”⁴⁹⁴—for preventing, reducing, and controlling pollution of the marine environment.

339. Part XII reflects a strong commitment to science and scientific research in informing States Parties' obligations to prevent, reduce, and control pollution of the marine environment. As noted in Chapter 5, that term is “essentially a scientific one,” having been developed in UN technical bodies dedicated to marine research, and Articles 200 and 201 reference “scientific research,” “information and data acquired about pollution of the marine environment,” as well as “scientific criteria for the formulation and elaboration of rules, standards and recommended practices and procedures for the prevention, reduction and control of pollution of the marine environment” in light of scientific research.⁴⁹⁵

340. International courts and tribunals likewise have emphasized that up-to-date scientific data is a critical yardstick against which States' environmental due diligence obligations must be measured. As the Seabed Disputes Chamber explained in *Area*, what is required in the “due diligence” context “may change over time as measures considered sufficiently diligent at a certain moment may become not diligent enough in light, for instance, of *new scientific or technological knowledge*.”⁴⁹⁶ Similarly, the ICJ noted in its judgment in *Gabčíkovo-Nagymaros*, that a State's evaluation of environmental risks pursuant to due diligence obligations required that “current standards must be taken into consideration.”⁴⁹⁷

⁴⁹⁴ OXFORD ENGLISH DICTIONARY, “necessary.”

⁴⁹⁵ See § 7.II.B.2 above.

⁴⁹⁶ *Area* Advisory Opinion, ¶ 117 (emphasis added). The ILC has also recognized this principle in Article 3 of its Articles on Prevention of Transboundary Harm from Hazardous Activities, which reflects the customary obligation to “take all appropriate measures to prevent significant transboundary harm or at any event to minimize the risk thereof.” The ILC notes that, as part of that duty, States must “keep abreast of technological changes and scientific developments,” because “what might be considered an appropriate and reasonable procedure, standard or rule at one point in time may not be considered as such at some point in the future.” ILC, Commentaries Articles on Prevention of Transboundary Harm from Hazardous Activities, UN Doc. A/56/10 (2001), Article 3, ¶ 11.

⁴⁹⁷ *Gabčíkovo-Nagymaros* Judgment, ¶ 140.

341. It follows that compliance with Article 194 and other provisions in Part XII requires that States take full account of the accepted scientific determinations relating to GHG emissions and the deleterious effects on the marine environment. It may also require, *inter alia*, adopting measures as are appropriate by way of “abundant caution,” even if complete scientific certainty does not exist, to prevent serious irreversible damage to the marine environment.⁴⁹⁸

342. With respect to climate change, the international scientific consensus has concluded that every increment of global warming will intensify the hazards of global warming, and that the risk of catastrophic, global damage will increase significantly if average global temperature increases by more than 1.5°C. The same body of evidence demonstrates that the global climate system will avoid some of the worst consequences of climate change should average temperatures remain below 1.5°C above pre-industrial levels.

343. That international scientific consensus is expressed in the reports of the IPCC. As explained in Chapter 4, these reports are the leading scientific authority on climate change and its impacts. Hundreds of leading scientists contribute to the IPCC’s assessments of “thousands of scientific papers published each year to provide a comprehensive summary of what is known about the drivers of climate change, its impacts and future risks, and how adaptation and mitigation can reduce those risks.”⁴⁹⁹ UN Member States then review those takeaways before publication. In this respect, the IPCC assessments reflect States Parties’ obligation under Article 200 to cooperate through international organizations to undertake programs of scientific research and to encourage the exchange of information and data acquired about pollution of the marine environment.

344. The IPCC concluded with high confidence in March 2023 that “[e]very increment of global warming will intensify multiple and concurrent hazards.”⁵⁰⁰ The IPCC went on to conclude, again with high confidence, that “[d]eep, rapid, and sustained reductions in GHG emissions would lead to a discernible slowdown in global warming within around two decades, and also to discernible changes in atmospheric composition within a few years.”⁵⁰¹ Specifically, the IPCC underscored the need to reduce GHG emissions by at least 43 percent by 2030 and 60 percent by 2035 compared to 2019 levels, as well as to remove and store atmospheric carbon, to avoid the most catastrophic effects of climate change.⁵⁰²

⁴⁹⁸ See, e.g., Rio Declaration, Principle 15 (“In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”); UNFCCC, Article 3 (“The Parties should take precautionary measures to anticipate, prevent, or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures.”); *Area Advisory Opinion*, ¶ 131 (finding the precautionary approach “applies in situations where scientific evidence concerning the scope and potential negative impact of the activity in question is insufficient but where there are plausible indications of potential risks”); ILC, Commentaries on the Prevention of Transboundary Harm from Hazardous Activities, UN Doc. A/56/10 (2001), Article 3, ¶ 14.

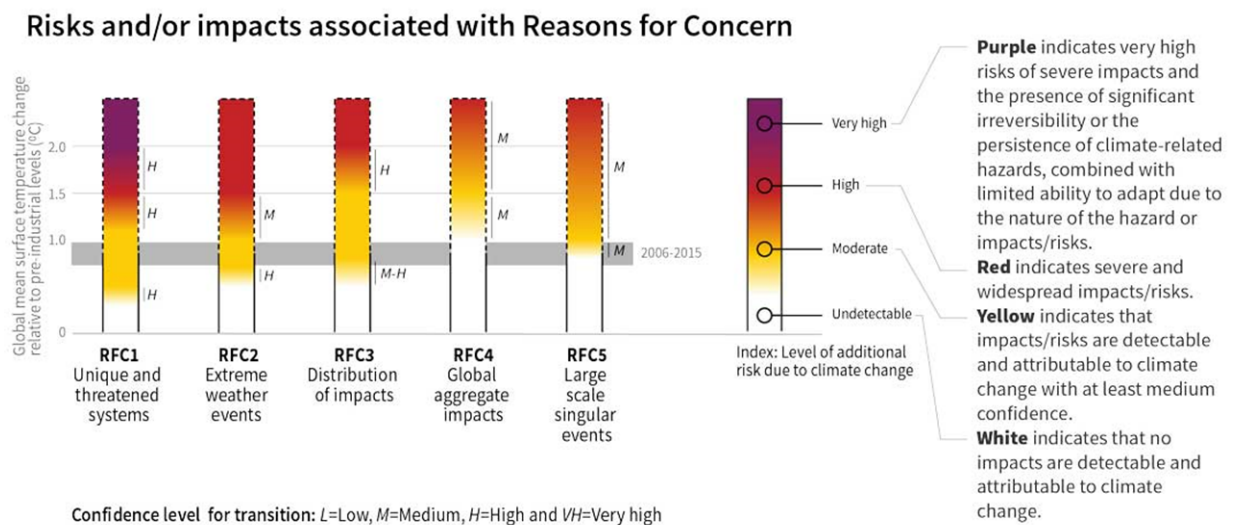
⁴⁹⁹ IPCC, [About the IPCC](#).

⁵⁰⁰ IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), p. 12.

⁵⁰¹ *Id.*

⁵⁰² *Id.*, p. 56.

345. With medium to high confidence, the IPCC has identified 1.5°C as a particularly significant threshold over which the risks of catastrophic damage significantly increase. Some “unique and threatened systems” in particular, such as coral reefs, are at “risk from climate change at current temperatures, with increasing numbers of systems at potential risk of severe consequences at global warming of 1.6°C above pre-industrial levels.”⁵⁰³ Furthermore, the risks associated with each of the IPCC’s four other Reasons for Concern—extreme weather events, disproportionate distribution of impacts, global aggregate impacts, and large-scale singular events—jumps from moderate to high once average global temperature rise exceeds 1.5°C above pre-industrial levels.⁵⁰⁴ The following chart demonstrates that the risk of catastrophic harm escalates significantly with average warming increases above 1.5°C.



346. Critically, dramatic decreases in anthropogenic GHG emissions, plus carbon capture and storage, are urgently needed to keep under that threshold. As also explained in Chapter 4, the IPCC has concluded that the Earth is close to exhausting the estimated remaining carbon budget above which global average temperatures will rise 1.5°C above pre-industrial levels. The IPCC concluded with very high confidence in March 2023 that the window of opportunity to “secure a liveable and sustainable future for all” is “rapidly closing.”⁵⁰⁵ The IPCC estimates that, to have a 50 or 67 percent chance of limiting global warming to 1.5°C above pre-industrial levels, “the remaining carbon budgets amount to 500 and 400 billion tonnes of CO₂, respectively, from 1 January 2020 onward. Currently, human activities are emitting around 40 billion tonnes of CO₂ into the atmosphere in a single year.”⁵⁰⁶

⁵⁰³ See § 4.I.C., ¶ 78 (citing IPCC, *Chapter 3: Impacts of 1.5°C of Global Warming on Natural and Human Systems*, SPECIAL REPORT: GLOBAL WARMING OF 1.5°C (2018), p. 253).

⁵⁰⁴ See § 4.I.C., ¶ 78 (citing IPCC, *Chapter 3: Impacts of 1.5°C of Global Warming on Natural and Human Systems*, SPECIAL REPORT: GLOBAL WARMING OF 1.5°C (2018), p. 254).

⁵⁰⁵ IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), p. 25.

⁵⁰⁶ IPCC, Working Group I, *Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 777.

347. These well-accepted scientific findings must inform the due diligence obligations under Articles 194 and 192, as well as the other specific obligations in Part XII outlined above relevant to pollution of the marine environment.⁵⁰⁷

B. Measures reflecting international rules and standards

348. All measures adopted by States Parties pursuant to Part XII to prevent, reduce and control pollution of the marine environment constituting GHG emissions must also reflect agreed rules and standards and recommended practices. This is required by (1) the express terms of UNCLOS, (2) international law rules and principles, and (3) the very nature of States Parties' due diligence obligation in environmental law.

1. *The express terms of Part XII require that States Parties' measures reflect international rules and standards*

349. Consistent with the fundamental principle of international cooperation which runs throughout UNCLOS,⁵⁰⁸ Part XII in various provisions requires that the legislative, regulatory and other measures adopted by States should, so far as possible, take into account, internationally agreed rules, standards and best practices. This duty applies to all measures enacted to prevent, reduce, and control the various sources of marine pollution.

- (a) Article 207(1) mandates that laws and regulations adopted to address marine pollution from land-based sources should take account of “internationally agreed rules, standards and recommended practices and procedures.” Article 207(5), further requires that States Parties adopt laws and regulations in relation to land-based sources to “minimize, to the fullest extent possible, the release of toxic, harmful or noxious substances, especially those which are persistent, into the marine environment.” As noted at Chapter 4, the introduction of heat and carbon into the marine environment are both harmful and persistent. The goal of minimizing “release” of “harmful” GHG emissions “to the fullest extent possible” necessarily requires that States Parties adopt measures at least as rigorous as international standards to which they have agreed.
- (b) Article 208(3) likewise requires that laws, regulations, and measures adopted to address marine pollution *associated with activities in seabed* should “be no less effective than international rules, standards and recommended practices and procedures.”
- (c) Article 212(1) also makes clear that laws and regulations adopted to regulate marine pollution *from and through the atmosphere* must take account of “internationally agreed rules, standards and recommended practise and procedures.”

⁵⁰⁷ Of course, this temperature threshold may change as the scientific evidence and resulting international consensus continue to take account of the best available information and technical knowledge. Accordingly, the specific obligations under UNCLOS must reflect and otherwise take account of such developing evidence.

⁵⁰⁸ See § 7.II.B.2.

- (d) States are obliged to take account of international rules and standards not only when formulating substantive rules and policies, but also in designing the enforcement mechanisms implemented to ensure compliance. Thus, for example, Article 213 requires that States “adopt laws and regulations and take other measures necessary to implement applicable international rules and standards . . . to prevent, reduce and control pollution” from relevant sources. Article 222 imposes similar obligations regarding regulation of pollution “from or through the atmosphere.”
- (e) The Convention goes even further with respect to *pollution from vessels* flying a State Party’s flag or of its registry. Article 211(2) requires that States Parties adopt laws and regulations to prevent, reduce, and control pollution from vessels that “have the same effect as that of *generally accepted* international rules and standards.” That means that the laws and regulations that each State Party must adopt per Article 211(2) must be at least as effective as generally accepted international rules and standards—even if the State Party has not specifically agreed to them.

350. States are thus required to adopt measures that are no less effective than internationally agreed or even generally accepted rules, standards, and recommended procedures. Indeed, the duty to cooperate enshrined in Article 197—which the Tribunal has called a “fundamental principle in the prevention of pollution of the marine environment under Part XII of the Convention and general international law”⁵⁰⁹—would be meaningless if the content of the obligations under Part XII is somehow construed to be weaker than the international rules, standards, and practices to which States Parties have agreed.

2. *Applicable treaty interpretation and customary international law require that States Parties’ measures reflect international rules and standards*

351. It is beyond cavil that the obligations in UNCLOS must be interpreted and applied in light of relevant rules of international law as outlined in Article 31(3)(c) of the VCLT. Furthermore, “when several norms bear on a single issue they should, to the extent possible, be interpreted so as giving rise to a single set of compatible obligations.”⁵¹⁰ For example, the *South China Sea* tribunal affirmed that the contents of the obligations in Part XII are informed by “[t]he corpus of international law relating to the environment,”⁵¹¹ as well as “specific obligations set out in other international agreements, as envisaged in Article 237 of the Convention.”⁵¹² In its award, the tribunal interpreted Article 194 by reference to the CBD—which postdates UNCLOS by over a decade—in identifying States Parties’ obligations under Part XII.⁵¹³ Similarly, the *Southern Bluefin Tuna* tribunal, noting that a

⁵⁰⁹ See ¶ 149 above (citing *MOX Plant* Order, ¶¶ 82, 84, 89).

⁵¹⁰ ILC, Fragmentation of International Law: Difficulties Arising from the Diversification and Expansion of International Law, UN Doc. A/CN.4/L/682 (2006), p. 8, ¶ 4.

⁵¹¹ *South China Sea* Award, ¶ 941 (quoting *Nuclear Weapons* Advisory Opinion, ¶ 29).

⁵¹² *Id.*, ¶ 942.

⁵¹³ *Id.*, ¶ 945.

“parallelism of treaties” often bear on a particular question, found that the “current range of international legal obligations benefits from a process of accretion and cumulation.”⁵¹⁴

352. Similarly, Draft Guideline 3 of the ILC’s Draft Guidelines on the Protection of the Atmosphere formulates States’ obligation to protect the atmosphere as one of “due diligence in taking appropriate measures, *in accordance with applicable rules of international law*, to prevent, reduce or control atmospheric pollution and atmospheric degradation.”⁵¹⁵ In its commentary to Draft Guideline 9(1), the ILC states that the “rules of international law relating to the protection of the atmosphere and other relevant rules of international law,” including the law of the sea, “should, to the extent possible, be identified, interpreted and applied in order to give rise to a single set of compatible obligations in line with the principles of harmonization and systemic integration” per Article 31(3)(c) of the VCLT.⁵¹⁶ Draft Guideline 9(3) adds that, in doing so, “special consideration should be given to persons and groups particularly vulnerable to atmospheric pollution and atmospheric degradation, [including] people of low-lying coastal areas and *small island developing states affected by sea-level rise*.”⁵¹⁷

353. This systemic approach to UNCLOS, which embeds Part XII within the wider body of environmental law, is important for environmental protection, given that the fragmentation of international standards often undermines efforts to address interrelated threats to the global environment.⁵¹⁸ Systemic integration of UNCLOS with other international standards is thus necessary to achieve its purpose of addressing “problems of ocean space,” which “are closely interrelated and need to be considered as a whole.”⁵¹⁹

3. *States Parties’ due diligence obligation as applied in international environmental law requires that the measures they adopt take account of international rules and standards*

354. Finally, international environmental rules play a particularly important role in giving content to due diligence obligations. As noted above, the Seabed Disputes Chamber found in *Area* that compliance with specific rules may be a relevant factor in meeting the due diligence obligation under Part XII.⁵²⁰ Other sources of international environmental law contribute to those rules. This is because, in assessing whether States have in fact taken “all measures . . . necessary” to prevent, reduce and control pollution of the marine environment, it will be critical to determine whether States have properly taken account of and given proper weight to relevant international environmental rules, standards and practices, especially insofar as those norms reflect current scientific consensus.

⁵¹⁴ *Southern Bluefin Tuna Order*, ¶ 52.

⁵¹⁵ ILC, Draft Guidelines on the Protection of the Atmosphere, UN DOC. A/76/10 (2021), Guideline 3 (emphasis added).

⁵¹⁶ *Id.*, Guideline 9(1).

⁵¹⁷ *Id.*, Guideline 9(3) (emphasis added).

⁵¹⁸ See UN Secretary-General, Gaps in International Environmental Law and Environment-related Instruments: Towards a Global Pact for the Environment, UN DOC. A/73/419 (2018) (concluding that “international environmental law is piecemeal and reactive” and “is characterized by fragmentation and a general lack of coherence and synergy among a large body of sectoral regulatory frameworks”).

⁵¹⁹ UNCLOS, Preamble.

⁵²⁰ *Area Advisory Opinion*, ¶ 123.

355. As the ICJ explained in *Gabčíkovo-Nagymaros*, when exercising due diligence in the context of environmental risks “current standards must be taken into consideration.”⁵²¹ The Court further observed:

In order to evaluate the environmental risks, *current standards must be taken into consideration*. . . .

Throughout the ages, mankind has, for economic and other reasons, constantly interfered with nature. In the past, this was often done without consideration of the effects upon the environment. *Owing to new scientific insights* and to a growing awareness of the risks for mankind—for present and future generations—of pursuit of such interventions at an unconsidered and unabated pace, *new norms and standards have been developed*, set forth in a great number of instruments during the last two decades. Such *new norms have to be taken into consideration*, and such *new standards given proper weight*, not only when States contemplate new activities but also when continuing with activities begun in the past.⁵²²

356. In short, UNCLOS Part XII cannot properly be applied without reference to the wider normative environment of international legal rules, standards, and practices with regard to marine pollution and environmental protection more generally.

4. *In light of scientific consensus and international standards, States Parties must adopt measures aimed at limiting the global average temperature increase to 1.5°C above pre-industrial levels*

357. Current international rules and standards—driven by the well-accepted international consensus around the best available scientific evidence—converge around a target of limiting temperature increase to 1.5°C above pre-industrial levels and taking urgent measures to address the devastating harm of climate change, including to the marine environment. Thus, the measures that States Parties must adopt to comply with their due diligence obligation must reflect current international rules and standards, such that the Convention requires States Parties to adopt measures aimed at limiting the global average temperature increase to 1.5°C above pre-industrial levels.

358. The IPCC’s findings have driven the international community to coalesce around a precise standard around which States have agreed to achieve reductions in GHG emissions necessary to avoid the catastrophic risks posed by climate change. One-hundred ninety-five States—including all States Parties to the Convention—worked under the auspices of the United Nations to negotiate, draft, and adopt the Paris Agreement pursuant to the framework of the UNFCCC. The Paris Agreement in Article 2(1)(a) sets forth the aim, “in enhancing the implementation of the UNFCCC” to “strengthen the global response to the threat of climate change . . . including by”:

⁵²¹ See *Gabčíkovo-Nagymaros* Judgment, ¶ 140.

⁵²² *Id.* (emphasis added); see also ILC, Commentaries on the Prevention of Transboundary Harm from Hazardous Activities, UN Doc. A/56/10 (2001), Article 3, ¶ 4 (noting that international rules and standards “constitute a necessary reference point to determine whether measures adopted are suitable” for the purposes of preventing the pollution of the environment).

Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to *limit the temperature increase to 1.5°C above pre-industrial levels*, recognizing that this *would significantly reduce the risks and impacts of climate change . . .*⁵²³

359. Since the Paris Agreement was adopted in 2016, the States Parties to the UNFCCC have reaffirmed and underscored the target of 1.5°C in their annual Conference of the Parties. At the most recent Conference of the Parties in 2022, the States Parties agreed that:

- (a) “[L]imiting the global average temperature increase to 1.5 °C above pre-industrial levels with no or limited overshoot would avoid increasingly severe climate change impacts, stressing that the severity of impacts will be reduced with every increment of global warming avoided”;⁵²⁴
- (b) “[K]eeping the global average temperature rise to below 1.5 °C will be essential to limiting future loss and damage”;⁵²⁵ and
- (c) “[L]imiting global warming to 1.5 °C requires rapid, deep and sustained reductions in global greenhouse gas emissions, including reducing global carbon dioxide.”⁵²⁶

360. The limit of 1.5°C above pre-industrial levels thus reflects internationally agreed, science-backed consensus on what is necessary to prevent the most catastrophic effects of climate change. This standard thus reflects global consensus—made consistent with States Parties’ cooperation obligations under Article 201 of the Convention—that the incremental rise in global temperatures above pre-industrial levels must stop at 1.5°C. A State Party to the Convention could hardly be said to be taking “all measures necessary” to prevent, reduce, and control GHG emissions if those measures do not reflect that consensus.

361. The ambitiousness of the 1.5°C limit is commensurate with the extreme risks of climate change—which the IPCC has concluded with very high confidence present threats as serious as “human well-being and planetary health.”⁵²⁷ The level of that risk and the foreseeability of that harm are relevant factors in determining the level of due diligence required,⁵²⁸ meaning that to address a high risk of disastrous harm such as climate change requires States Parties to prevent, reduce, and control GHG emissions constituting pollution of the marine environment in line with the 1.5°C limit.

362. The States Parties to the Paris Agreement also agreed to take specific measures toward achieving the 1.5°C limit that they set. In Article 4 of the Paris Agreement, States Parties agreed to “reach global peaking of greenhouse gas emissions as soon as possible,” and

⁵²³ See Paris Agreement, Article 2(1)(a) (emphasis added).

⁵²⁴ COP27, Decision 21/CP.27, UN Doc. FCCC/CP/2022/10/Add.2 (2023), ¶ 7.

⁵²⁵ COP27, Draft Decision -/CP.27 -/CMA.4, UN Doc. FCCC/CP/2022/L.18-FCCC/PA/CMA/2022/L.20 (2022), Preamble.

⁵²⁶ COP27, Decision 21/CP.27, UN Doc. FCCC/CP/2022/10/Add.2 (2023), ¶ 8.

⁵²⁷ IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), p. 24.

⁵²⁸ See § 7.I., ¶ 285 (quoting *Area Advisory Opinion*, ¶ 117 (“the standard of due diligence has to be more severe for the riskier activities”)).

that developed States Parties should undertake economy-wide absolute emission reduction targets.⁵²⁹ They also agreed to strengthen the global response to climate change, including by “[i]ncreasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production,” and “[m]aking finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.”⁵³⁰ The States Parties also agreed that they should “conserve and enhance” sinks and reservoirs of GHGs, including the ocean and the rest of the marine environment.⁵³¹

363. All of these points of agreement under the Paris Agreement thus also constitute factors relevant to States Parties’ due diligence obligations under Article 194 of the Convention. Specifically, in exercise of their due diligence obligations, States Parties should:

- (a) Enact and enforce laws and regulations to prevent, reduce, and control GHG emissions consistent with the target of limiting the temperature increase to 1.5°C above pre-industrial levels (Paris Agreement, Article 2(1)(a));
- (b) Aim to reach global peaking of GHG emissions as soon as possible (Paris Agreement, Article 4(1));
- (c) Reflect a State’s highest possible ambition (Paris Agreement, Article 4(3));
- (d) Increase the ability to adapt to the adverse impacts of climate change and foster climate resilience and low GHG emissions development, in a manner that does not threaten food production (Paris Agreement, Article 2(1)(b));
- (e) Make finance flows consistent with a pathway towards low GHG emissions and climate-resilient development (Paris Agreement, Article 2(1)(c));
- (f) For developed States Parties, undertake economy-wide absolute emission reduction targets (Paris Agreement, Article 4(4)); and
- (g) Promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of the ocean and the rest of the marine environment as sinks and reservoirs of GHGs (Paris Agreement, Article 5(1)).

364. In very concrete terms, one of the best practicable means for purposes of Article 194(1) at the disposal of States, according to their capabilities, is the obligation under the Paris Agreement for each State to prepare, communicate, and maintain *successive* nationally determined contributions (“NDCs”) that it intends to achieve. Each Party’s obligation to set up its NDC “is a binding procedural obligation of result.”⁵³² Each State’s

⁵²⁹ Paris Agreement, Article 4.

⁵³⁰ *Id.*, Article 2(b)–(c).

⁵³¹ *Id.*, Article 5(1).

⁵³² Lavanya Rajamani, *Due Diligence in International Climate Change Law*, DUE DILIGENCE IN THE INTERNATIONAL LEGAL ORDER 163 (2020), p. 169.

NDC will vary depending on its own capabilities and level of development.⁵³³ It must also reflect progression towards a state's highest possible ambition, reflecting common but differentiated responsibilities and respective circumstances.⁵³⁴ Once a State's NDC is established in good faith, it is deemed to reflect the "best practicable means" at the disposal of this State, and should contain a list of measures that form a minimum baseline of what is necessary to prevent, reduce and control marine pollution through the emission of GHGs. Consequently, it is submitted that the obligation "to take all measures necessary" under Article 194(1) includes, but is not limited to, all the measures presented in the NDC of each State Party to the Paris Agreement.

365. To conclude, the Paris Agreement, in requiring States *inter alia* to "reflect [their] highest possible ambition" and clarifying the temperature goal, "sets a standard for giving effect" to provisions of UNCLOS.⁵³⁵ Notably, while compliance with the procedural obligation to generate NDCs does not automatically fulfill the due diligence obligations of States Parties under UNCLOS, at the very least States' obligations to prevent, reduce, and control pollution of the marine environment in relation to climate change require them to "limit the temperature increase to 1.5°C above pre-industrial levels," and must be implemented to take account of the adopted NDCs.

⁵³³ See Paris Agreement, Article 4 (detailing the process of preparation, communication, and maintenance of NDCs, and recognizing the particular difficulties developing States may face).

⁵³⁴ States Parties must submit periodical updates of their NDCs. See Paris Agreement, Articles 4(10)–(11).

⁵³⁵ Alan Boyle, *Protecting the Marine Environment from Climate Change: The LOSC Part XII Regime*, THE LAW OF THE SEA AND CLIMATE CHANGE: SOLUTIONS AND CONSTRAINTS 81 (2020), p. 89.

**PART III:
RESPONSE TO SECOND QUESTION**

**CHAPTER 8:
GENERAL OBLIGATION TO PROTECT AND PRESERVE THE MARINE
ENVIRONMENT UNDER ARTICLE 192**

366. The second question before the Tribunal is:

What are the specific obligations of State Parties to [UNCLOS], including under Part XII . . . to protect and preserve the marine environment in relation to climate change impacts, including ocean warming and sea level rise, and ocean acidification?

367. As described above in Chapter 2, the second question before the Tribunal is independent, but complementary to the first, in that it goes beyond the definition of “marine” pollution to encompass the more general obligation that States Parties to UNCLOS have, under both the Convention and customary international law, to protect and preserve the marine environment in regulating the activities that cause climate change impacts, including ocean warming and sea level rise, and ocean acidification. It therefore represents an independent basis for imposing specific obligations on States Parties to UNCLOS.

368. Article 192 of UNCLOS, entitled “General obligation,” provides:

States have the obligation to protect and preserve the marine environment.

Article 192 is both a general obligation and framework provision with independent legal force. It creates a broad substantive obligation to protect and preserve the marine environment, which is widely regarded to reflect customary international law. This broad obligation gains color when read in the context of the other provisions of Part XII as well as generally accepted international rules and standards.

369. The obligation codified in Article 192 has both positive and negative dimensions, requiring States to take positive action to protect and preserve the marine environment, as well as to refrain from degrading the marine environment.⁵³⁶ The duty to “protect” requires States to prevent future damage to the marine environment. It requires them not only to take action to prevent harm to the marine environment caused by their agents, but also by individuals within their control. The duty to “preserve” requires States to maintain or improve the marine environment’s present condition. This includes a duty to *restore* parts of the marine environment or ecosystems that have suffered degradation. As to the standard against which the obligations to protect and preserve are to be assessed, Article 192 reflects an obligation to act with due diligence. As explained above with respect to Article 194, this due diligence standard is informed by scientific knowledge as well as applicable international rules and standards.⁵³⁷

⁵³⁶ See § 8.III.A below.

⁵³⁷ See § 6. I above.

370. Unlike other provisions in Part XII, the scope of Article 192 is not limited to environmental harm caused by marine pollution.⁵³⁸ It applies to all harm caused to the marine environment, without regard to cause or vector. Article 192 is wide enough to encompass, *inter alia*, the protection of ecosystems; conservation of depleted or endangered marine species and habitats; and physical harm, destruction, or alteration of the marine environment, irrespective of whether it satisfies the definition of marine pollution. Article 192 pertains to the entire marine environment, including areas beyond national jurisdiction.⁵³⁹ It imposes obligations on States to take measures to protect the marine environment from the deleterious effects of climate change.

371. COSIS submits that the Tribunal should answer the second question by finding that Article 192 imposes specific substantive and procedural obligations, including a duty of due diligence on States Parties to protect and preserve the entire marine environment from the deleterious effects of climate change, in areas both within and beyond national jurisdiction, and regardless of the vector through which those effects occur. This due diligence duty gives rise to three categories of specific obligations. *First*, States are required to take measures to *mitigate* climate change, the effects of which inevitably harm the marine environment. This will necessarily include an obligation to take measures to reduce GHG emissions consistent with the international standard, reflecting scientific consensus, of 1.5°C global average temperature rise. *Second*, in view of the fact that climate change will continue to occur notwithstanding the best efforts of States to prevent it, States are required to *implement* resilience and adaptation measures to protect and preserve the marine environment. *Third*, in light of the fact that the marine environment is, itself, the world’s largest carbon sink and plays an inherent role in lessening the deleterious effects of climate change, States are required to take substantive measures to *protect* marine ecosystems that sequester carbon dioxide.

372. This Chapter 8 proceeds as follows. Adopting the primary and supplementary means of interpretation set out in the VCLT, Section I clarifies the scope of Article 192, while Sections II and III interpret the meaning of “marine environment” and “protect and preserve,” including the nature of the due diligence standard imposed. Section IV addresses the interpretation of Article 192 in the light of other provisions of Part XII and other international instruments and rules. In the light of these interpretations, Section V identifies specific obligations on States under Article 192 to combat the deleterious effects of climate change.

I. The Scope of Article 192

373. Article 192 provides for a general obligation, and is framed in mandatory terms: “States have the obligation to protect and preserve the marine environment.” The use of the term “States,” not “States Parties,” indicates that the drafters intended to provide “in general and universal terms what is regarded as the right or the duty of every State as a general principle of international law.”⁵⁴⁰ In Article 192, the use of the term “obligation” confirms

⁵³⁸ See § 8.I below.

⁵³⁹ See § 8.II below.

⁵⁴⁰ *Article 192: General Obligation*: VIRGINIA COMMENTARY, vol. IV, p. 40. The terms “State Party” and “States Parties” are used 245 times in the Convention. References to these terms are in almost all major parts of the Convention. Their omission from Part XII is, therefore, notable.

that a duty is established, albeit a broad duty. The precise meanings of “marine environment” and “protect and preserve” are discussed below in Sections II and III.

374. Article 192 is an expression of the customary obligation to prevent harm to the environment.⁵⁴¹ In 1996, in *Nuclear Weapons*, the Court held that “[t]he existence of the general obligation of States to ensure that activities within their jurisdiction and control respect the environment of other States or of areas beyond national control is now part of the corpus of international law relating to the environment.”⁵⁴² Further, in *Pulp Mills*, the ICJ found that a State is “obliged to use all the means at its disposal in order to avoid activities which take place in its territory, or in any area under its jurisdiction, causing significant damage to the environment of another State.”⁵⁴³ As to areas beyond national jurisdiction, which are discussed below in Section II, the Seabed Disputes Chamber in *Area*, referring to *Pulp Mills*, observed that “[t]he Court’s reasoning in a transboundary context may also apply to activities with an impact on the environment in an area beyond the limits of national jurisdiction.”⁵⁴⁴

375. As regards context, Article 192 appears in the “General Provisions” section of Part XII on the protection and preservation of the marine environment. Other provisions cast light on its meaning. The editors of the Virginia Commentary observe that “Article 194 links the two statements of general principle contained in articles 192 and 193 to the formal rules of law appearing in the subsequent articles of Part XII.”⁵⁴⁵ Further, Article 194 is said to be “where the rather general principles of Arts. 192 and 193 are concretized and transformed into specific obligations of States . . . Art. 194(1)-(3) model the two general principles proclaimed in Arts. 192 and 193 to the specific and ‘formal’ rules of law laid down in the subsequent articles of Part XII.”⁵⁴⁶ Crucially, as noted above, Articles 192 and 194 differ in substantial respects: Article 194 is concerned with marine pollution specifically, whereas Article 192 provides for a general obligation and is concerned with *all* acts and omissions that cause harm to the marine environment, or a threat thereof, regardless of the vector.⁵⁴⁷

376. The overarching importance of the obligation within Article 192 is reflected by its “prominent position” as “the opening provision to the environmental part of the Convention, reflect[ing] its great significance.”⁵⁴⁸ Further, the decision to not just leave the protection and

⁵⁴¹ In *Request for an Examination of the Situation in Accordance with Paragraph 63 of the Court’s Judgment of 20 December 1974 in the Nuclear Tests (New Zealand v. France)*, the ICJ held that its findings in relation to French nuclear testing were “without prejudice to the obligations of states to respect and protect the environment.” Order, 1995 ICJ REP. 288 (22 September), ¶ 64.

⁵⁴² *Nuclear Weapons* Advisory Opinion, ¶ 29. As to areas beyond national jurisdiction, see § 8.II below

⁵⁴³ *Pulp Mills* Judgment, ¶ 101; see also *Certain Activities and Construction of a Road* Judgment, ¶ 104.

⁵⁴⁴ *Area* Advisory Opinion, ¶ 148.

⁵⁴⁵ VIRGINIA COMMENTARY, vol. IV, p. 53.

⁵⁴⁶ Detlef Czybulka, *Article 194: Measures to Prevent, Reduce and Control Pollution of the Marine Environment*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Pröhl ed. 2017), p. 1297.

⁵⁴⁷ See § 8.I above.

⁵⁴⁸ Detlef Czybulka, *Article 192: General Obligation*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Pröhl ed. 2017), p. 1284; see also *South China Sea Award*, ¶ 939 (noting that the obligation to protect and preserve the marine environment (Article 192) “form[s] a prominent component of the legal regime of the Convention”).

preservation of the marine environment to the Preamble, but also to place it within a substantive provision, highlights the intentional importance underlying the obligation.

377. Article 192 is therefore both a general obligation and a framework provision. This framework approach is consistent with the object and purpose of UNCLOS to, *inter alia*, “establish[] through this Convention, with due regard for the sovereignty of all States, a legal order for the seas and oceans which will facilitate . . . the study, protection and preservation of the marine environment.”⁵⁴⁹

378. According to the editors of the Virginia Commentary,

the reciprocating decisions of UNCLOS III endow the clause with additional characteristics within the broader context of the law of the sea as a whole. They make it unnecessary to include detailed and highly technical aspects in the Convention on the Law of the Sea itself The combination thus meets the practical requirements imposed by the dynamics of environmental protection.⁵⁵⁰

379. Support for this proposition can be drawn from the preparatory work. States gathered at Third Conference engaged in significant debate as to whether to qualify the scope of the obligation in Article 192. Ultimately, all such proposals were rejected, and Article 192 was intentionally phrased in broad language.⁵⁵¹

380. Subsequent commentary has reflected on the preparatory work, observing that “[i]t is clear from the Convention . . . that the obligation in article 192 (and with it the right of article 193) is always subject to the specific rights and duties laid down in the Convention.”⁵⁵² The Drafting Committee “decided to put specific emphasis on the environmental duty by codifying it in a single article, while the subsequent Article 193 is aimed at balancing this obligation with the right of States to exploit their natural resources.”⁵⁵³

381. Expert commentators agree that Article 192 “represents the first attempt in international law and practice to formalize the obligation to protect and preserve the marine environment as a general obligatory legal rule entailing legal consequences. *There is no doubt that in this case a declarative statement was being transformed into a treaty provision.*”⁵⁵⁴ Further, as the editors of the Virginia Commentary point out, Article 192

explicitly proclaim[s], in positive terms, as a general principle of law, that all States have the obligation to protect and preserve the marine environment, and implicitly (in negative

⁵⁴⁹ UNCLOS, Preamble, ¶ 4.

⁵⁵⁰ *Article 192: General Obligation*, VIRGINIA COMMENTARY, vol. IV, pp. 21–22.

⁵⁵¹ *See id.*, p. 36.

⁵⁵² *Id.*, p. 43.

⁵⁵³ Detlef Czybulka, *Article 192: General Obligation*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Prölß ed. 2017), p. 1284.

⁵⁵⁴ Alexander Yankov, *The Concept of Protection and Sustainable Development of the Marine Environment*, 18 OCEAN Y.B. 267 (2004), p. 271 (emphasis added).

terms) the obligation not to degrade it deliberately (or perhaps even carelessly). This is the first occasion on which a disposition of this character has been included in a general international treaty of a comprehensive and universal scope.⁵⁵⁵

382. Professor Nilüfer Oral notes that, in the context of the use of the term “marine environment” in Article 192, UNCLOS “creates a broad and unqualified duty for all states to protect and preserve the marine environment.”⁵⁵⁶ Article 192 (and Article 194) not only imposes an obligation on States to protect and preserve the marine environment, but also to prevent activities within their jurisdiction or control from harming the marine environment in contravention of Article 192.⁵⁵⁷

383. Subsequent judicial interpretation supports the view that Article 192 has independent legal force. As the *South China Sea* tribunal stated:

Although phrased in general terms, the Tribunal considers it well established that Article 192 does impose a duty on States Parties, the content of which is informed by the other provisions of Part XII and other applicable rules of international law. . . .⁵⁵⁸

The content of the general obligation in Article 192 is further detailed in the subsequent provisions of Part XII, including Article 194, as well as by reference to specific obligations set out in other international agreements, as envisaged in Article 237 of the Convention.⁵⁵⁹

384. The *South China Sea* tribunal recalled the provisional measures order of ITLOS in *M/V Louisa*, in which ITLOS held that Article 192 “imposes an obligation on States to protect and preserve the marine environment.”⁵⁶⁰ ITLOS made similar findings in its provisional measures order in *Ghana / Côte d’Ivoire*.⁵⁶¹ More generally, as noted above, in *SRFC*, ITLOS stated the reference to “marine environment” in Article 192 included the conservation of the living resources of the sea.⁵⁶²

385. The *South China Sea* tribunal found that Article 192 established a freestanding obligation as well as obligations arising from other provisions of UNCLOS. The tribunal found that China breached its obligation under Article 192 (and that provision only) to protect

⁵⁵⁵ VIRGINIA COMMENTARY, vol. IV, pp. 40–41.

⁵⁵⁶ Nilufer Oral, *Implementing Part XII of the 1982 UN Law of the Sea Convention and the Role of International Courts*, INTERNATIONAL COURTS AND THE DEVELOPMENT OF INTERNATIONAL LAW (2013), p. 403.

⁵⁵⁷ See *South China Sea Award*, ¶ 964.

⁵⁵⁸ *Id.*, ¶ 941.

⁵⁵⁹ *Id.*, ¶ 942.

⁵⁶⁰ *M/V Louisa (Saint Vincent and the Grenadines v. Spain)*, Case No. 18, Provisional Measures, 2008–2010 ITLOS REP. 58 (23 December 2010), ¶ 76.

⁵⁶¹ *Dispute Concerning Delimitation of the Maritime Boundary between Ghana and Côte D’Ivoire in the Atlantic Ocean (Ghana/Côte D’Ivoire)*, Case No. 23, Provisional Measures, 2015 ITLOS REP. 146, ¶ 69.

⁵⁶² See *SRFC Advisory Opinion*, ¶¶ 120, 216.

and preserve the marine environment through its “construction activities” related to the development of artificial islands in the reefs of the Spratly Islands.⁵⁶³ It also found that China had breached its obligations under Article 192 by engaging in artificial island-building activities, when Article 192 and Article 194(5) were considered in tandem, along with other applicable international rules and standards.⁵⁶⁴

II. The meaning of “marine environment”

386. The obligation in Article 192 pertains to the “marine environment,” which is not defined in UNCLOS. As discussed in Chapter 5, the obligation should be read to apply in all maritime zones and in areas beyond national jurisdiction, and the “marine environment” encompasses the entire marine ecosystem, including the living and non-living resources of the ocean, the seabed, and the entire water column.⁵⁶⁵

387. In relation to the application of Article 192 to areas beyond national jurisdiction, recent support also can be drawn from the Draft 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 (the “BBNJ Agreement”). Following five rounds of negotiation, the draft text of the BBNJ Agreement was adopted by UNCLOS States Parties on 4 March 2023. The preamble to the Agreement grounds its text in the Article 192 obligation to protect and preserve the marine environment, and the substantive text *inter alia* imposes an obligation on States to conduct environmental impact assessments to satisfy their obligation to protect and preserve the marine environment in areas beyond national jurisdiction,⁵⁶⁶ and requires States to consider the prevention of significant adverse impacts on the marine environment in areas beyond national jurisdiction in their decisions as to whether to conduct activities in their maritime zones.⁵⁶⁷ These provisions, and their preliminary acceptance by UNCLOS States Parties for extending the obligation to protect and preserve the marine environment, applies to areas beyond national jurisdiction. For this and the reasons above, it is evident that the Article 192 obligation lacks a spatial limitation and applies to the entire marine environment.

III. The obligation to “protect and preserve”

A. The meaning of “protect and preserve”

388. The obligation to “protect and preserve” in Article 192 has both positive and negative aspects, and it relates to both the current and future condition of the marine environment. According to the *South China Sea* tribunal:

This “general obligation” extends both to “protection” of the marine environment from future damage and “preservation” in the sense of maintaining or improving its present condition. Article 192 thus entails the *positive obligation to take active*

⁵⁶³ *South China Sea Award*, ¶ 983.

⁵⁶⁴ *See id.*, ¶¶ 939–966.

⁵⁶⁵ *See* § 5.I.A above.

⁵⁶⁶ *See* BBNJ Agreement, Part IV; Articles 21*bis*, 22, 24(1)(a)(ii)–(b).

⁵⁶⁷ *Id.*, Article 38.

measures to protect and preserve the marine environment, and by logical implication, entails the *negative obligation not to degrade the marine environment*.⁵⁶⁸

389. The obligation to *protect* requires States to actively prevent harm from being inflicted on the marine environment. On the other hand, the obligation to *preserve*, “in the sense of maintaining or improving” the present condition of the marine environment, goes beyond protection.⁵⁶⁹ It can be interpreted to not only encompass the maintenance of the present condition of the marine environment, but also to include an obligation to *restore* degraded marine environments and ecosystems. Restoration would be “the logical measure” to ensure improvement of the present condition of the marine environment.⁵⁷⁰ Further, preservation implies the maintenance of the marine environment in a sustainable condition, which requires action to address existing harm as well as future activities.

390. The term “restoration” did not arise in the preparatory work, but it has become an important norm in relevant regimes of environmental law in recent years, primarily with the objective of enhancing ecosystem resilience, including to the impacts of climate change. For instance, Principle 7 of the Rio Declaration provides that “States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth’s ecosystem.” Maintaining and improving ecosystem resilience is also one of the general principles and approaches stipulated in the BBNJ Agreement.⁵⁷¹ Article 5(g) provides:

An approach that builds ecosystems resilience, including to the adverse effects of climate change and ocean acidification, and also maintains and restores ecosystem integrity, including the carbon cycling services that underpin the ocean’s role in climate.⁵⁷²

391. Further, the CBD requires Contracting Parties to “[r]ehabilitate and restore degraded ecosystems and promote the recovery of threatened species.”⁵⁷³ This approach is of particular relevance for the interpretation of UNCLOS from the perspective of Article 31(3)(c) of the VCLT. As to what the obligation of preservation through restoration involves, the Contracting Parties to the CBD have agreed that ecological restoration

refers to the process of managing or assisting the recovery of an ecosystem that has been degraded, damaged or destroyed as a means of sustaining ecosystem resilience and conserving biodiversity. Degradation is characterized by a decline or loss of biodiversity or ecosystem functions. Degradation and

⁵⁶⁸ *South China Sea Award*, ¶ 941 (emphasis added).

⁵⁶⁹ Detlef Czybulka, *Article 192: General Obligation*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Prölß ed. 2017), p. 1286.

⁵⁷⁰ *Id.*

⁵⁷¹ *See* § II above.

⁵⁷² BBNJ Agreement, Articles 5(g), 14(c).

⁵⁷³ CBD, Article 8(f).

restoration are context-specific and refer to both the state of ecosystems and to ecosystem processes.⁵⁷⁴

392. Restoration is the process of reversing degradation. To satisfy their obligation to preserve the marine environment, States must implement measures to restore degraded marine environments and ecosystems. The specific content of the obligation to restore is context-specific.

B. Protection and preservation as a due diligence obligation

393. As noted in Chapter 7, due diligence informs how the obligation in Article 192 must be performed in terms of both (i) the level or “degree” of diligence required, and (ii) the choice of measures available to the State in discharging this duty. Chapter 7 sets out that understanding in respect of Part XII, which applies equally to Article 192.⁵⁷⁵

IV. Interpretation of Article 192 in light of other provisions and instruments

394. The interpretation and application of Article 192 in light of external norms arising from the corpus of international law relating to the environment is in accordance with the principle of systemic integration and the aim of mutually supportive implementation of obligations arising under different regimes.⁵⁷⁶ Chapter 7 sets out that understanding in respect of Part XII, which applies equally to Article 192.⁵⁷⁷

395. Other relevant international instruments and rules do not replace the application of the rule codified in Article 192 of UNCLOS to the conduct at stake, *i.e.*, acts and omissions that cause or may cause harm to the marine environment, nor do they substitute themselves to the requirements of this rule. But some specific aspects of them can be relied upon to interpret this rule, without supplanting it or its requirements. Thus, as described above, the choice of specific measures in the exercise of due diligence under the obligations of Part XII may gain color from other provisions in Part XII in line with the interpretive approach espoused in Article 31(2) of the VCLT, and the obligations undertaken by States, and as contemplated by Article 237 of UNCLOS and Article 31(3) of the VCLT, including international instruments and generally accepted international rules and standards.⁵⁷⁸ The meaning of “protect and preserve” can be elaborated by reference to these sources.

A. Other articles in Part XII of UNCLOS

396. Article 192 is followed by Article 193, which provides:

States have the sovereign right to exploit their natural resources pursuant to their environmental policies and in accordance with their duty to protect and preserve the marine environment.

⁵⁷⁴ CBD Conference of the Parties, Decision XII/5 on Ecosystem Restoration: Short-Term Action Plan, CBD/COP/DEC/XIII/5 (10 December 2016) (Annex), ¶ 4.

⁵⁷⁵ See § 7.II above.

⁵⁷⁶ See VCLT, Article 31(3)(c).

⁵⁷⁷ See § 7.I above.

⁵⁷⁸ See § 7.III.B.2 above.

397. Article 193 serves to qualify the content of Article 192, and vice versa. States are only permitted to exploit their natural resources, whether their activities unfold in their land and maritime territory or in maritime areas under their jurisdiction, to the extent that such exploitation is consistent with their obligation to protect and preserve the marine environment. As to reconciling Articles 192 and 193, Professors Robin Churchill, Vaughan Lowe, and Amy Sander observe that the significance of Article 193 is that “it emphasises that the right of States to exploit the natural resources of their maritime zones (and land territory) is subject to the obligation in article 192 to protect and preserve the marine environment. Article 193 may thus be seen as a precursor to the principle of sustainable development.”⁵⁷⁹ As such, a State’s right to exploit its natural resources is necessarily encumbered by a positive obligation to protect and preserve the marine environment.

398. To this end, Articles 192 and 193 involve a balancing exercise between the right of States to exploit their natural resources with their obligation to protect and preserve the marine environment.⁵⁸⁰ The Article 192 obligation may be “prioritized” over the Article 193 sovereign right

since States, while exploiting their resources even in “their” territorial sea, have to comply with the general obligation (and its existing implementations) laid out in Art. 192.⁵⁸¹

399. This balancing exercise within the Convention largely reflects the customary international law principle codified in Principle 21 of the Stockholm Declaration⁵⁸² and Principle 2 of the Rio Declaration.⁵⁸³ Further, it “demonstrates the compromise that had to be made between the proper consideration of the different economic status of States . . . and the common awareness of the need to protect and preserve the marine environment. While the foremost purpose of Art. 193 has been to guarantee States’ demand for natural resources and the right to exploit them, it also underlines the precept: ‘No use of the ocean without its protection.’”⁵⁸⁴

⁵⁷⁹ Robin R. Churchill et al., *THE LAW OF THE SEA* (4th ed. 2022), p. 383.

⁵⁸⁰ See Detlef Czybulka, *Article 193: Sovereign Right of States to Exploit Their Natural Resources*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Pröhl ed. 2017), p. 1288; *Article 193: Sovereign Right of States to Exploit Their Natural Resources*, VIRGINIA COMMENTARY, vol. IV, p. 49 (“The balance drawn between concepts in article 193 represents a compromise between the interests of individual States in their economic development and the universal interests in the protection and preservation of the marine environment.”).

⁵⁸¹ Detlef Czybulka, *Article 193: Sovereign Right of States to Exploit Their Natural Resources*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Pröhl ed. 2017), pp. 1288–1289 (emphasis in original); see *South China Sea Award*, ¶¶ 940, 976, 983 (observing that China’s extensive island building of seven reefs in the Spratly Islands using millions of tons of dredged coral, rocks and sand breached its obligation under Article 192, independently of the question of sovereignty over these natural resources).

⁵⁸² *Article 193: Sovereign Right of States to Exploit Their Natural Resources*, VIRGINIA COMMENTARY, vol. IV, pp. 45–46.

⁵⁸³ See *Nuclear Weapons Advisory Opinion*, ¶ 29.

⁵⁸⁴ Detlef Czybulka, *Article 193: Sovereign Right of States to Exploit Their Natural Resources*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Pröhl ed. 2017), p. 1289. As Dr. James Harrison has observed, Article 193 is relevant to the interpretation of Part XII as a whole.

400. As to other articles in Part XII, Article 194 may require States to establish marine protected areas to comply with their Article 192 obligations.⁵⁸⁵ Professor Boyle has observed that Article 194 is the most important of the provisions of Part XII to provide content to the Article 192 obligations.⁵⁸⁶ Others have noted that Article 194 gives “a particular shape to the duties following Art 192 in the context of fragile ecosystems. These obligations concern the prevention on harm that would affect species and habitats and may extend to the establishing of marine protected areas.”⁵⁸⁷ As noted above, the *South China Sea* tribunal held that Article 194 informs the content of Article 192.⁵⁸⁸ Articles 192 and 194 can therefore be “read together” to provide specific content to the general obligation to protect and preserve the marine environment. For instance, “if Article 194(5) is interpreted in light of the broader principle to protect and *preserve* the marine environment in Article 192, it is possible to conclude that this provision should also require States to take steps to prevent ecosystems from becoming rare in the first place.”⁵⁸⁹

B. Part XII generally

401. The content of the obligation to “protect and preserve” in Article 192 is also informed by the provisions, structure, and interpretation of Part XII. Any suggestion that the content of Article 192 can be limited to the pollution of the marine environment, as opposed to the protection of the marine environment from harm and threats generally, has been rightly rejected by international courts and tribunals, most emphatically by the *Chagos Marine Protected Area* tribunal. It found that the measures that a State is required to take to preserve and protect the marine environment in accordance with Article 194(5) are “not limited to measures aimed strictly at controlling marine pollution,” and that, “[w]hile the control of pollution is certainly an important aspect of environmental protection, it is by no means the only one.”⁵⁹⁰

402. Professor Boyle has confirmed that “it is clear from the totality of Articles 192–196 that Part XII was never intended to be simply about pollution, and that it encompasses protection of ecosystems, conservation of depleted or endangered species of marine life and control of alien species.”⁵⁹¹

James Harrison, *SAVING THE OCEANS THROUGH LAW: THE INTERNATIONAL LEGAL FRAMEWORK FOR THE PROTECTION OF THE MARINE ENVIRONMENT* (2017), pp. 24–25.

⁵⁸⁵ See § V below.

⁵⁸⁶ Alan Boyle, *Protecting the Marine Environment from Climate Change: The LOSC Part XII Regime*, *THE LAW OF THE SEA AND CLIMATE CHANGE: SOLUTIONS AND CONSTRAINTS* (Johansen et al. eds. 2020), p. 86 (citing *South China Sea Award*, ¶ 941).

⁵⁸⁷ Detlef Czybulka, *Article 194: Protection and Preservation of the Marine Environment*, *UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY* (Alexander Prölß ed. 2017), p. 1298.

⁵⁸⁸ *South China Sea Award*, ¶ 942.

⁵⁸⁹ James Harrison, *SAVING THE OCEANS THROUGH LAW: THE INTERNATIONAL LEGAL FRAMEWORK FOR THE PROTECTION OF THE MARINE ENVIRONMENT* (2017), p. 31; see § III.A above.

⁵⁹⁰ Philippe Sands & Jacqueline Peel, *PRINCIPLES OF INTERNATIONAL ENVIRONMENTAL LAW* (4th ed. 2018), p. 551 (citing *Chagos Award*, ¶¶ 320, 538).

⁵⁹¹ Alan Boyle, *The Environmental Jurisprudence of the International Tribunal for the Law of the Sea*, 22 INT’L J. MARINE & COASTAL L. 369 (2007), p. 373.

403. This position is supported by the preparatory work. According to the editors of the Virginia Commentary, the preparatory work to Article 192 and Part XII illustrates that the concept of the protection and preservation of the marine environment

goes much further than merely combating pollution after it has already taken place. It entails the active taking of legal and administrative measures, and the application of scientific methods and procedures which are all designed not simply to check or abate the deterioration of marine ecosystems, but also to provide the means for protecting and preserving the marine environment from the harmful effects of pollution and other hazards. . . . It may also be assumed that while the word “protect” indicates measures relating to imminent or existing danger or injury, the word “preserve” conveys the meaning of conserving the natural resources and retaining the quality of the marine environment.⁵⁹²

C. Other international instruments and generally accepted international rules and standards

404. As explained above at paragraph 50, the meaning of terms in UNCLOS can be informed by other relevant rules of international law applicable between the parties or otherwise internationally accepted. For example, the *South China Sea* tribunal, in determining the definition of “ecosystem” for the purposes of considering the measures that States are required to take pursuant to Article 194(5), considered that the definition within Article 2 of the CBD, which is “internationally accepted,” could assist.⁵⁹³

405. The tribunal also considered that the Convention on International Trade in Endangered Species (“CITES”) “forms part of the general corpus of international law that informs the content of Article 192 and 194(5).”⁵⁹⁴ To this end, Article 192 encompasses a due diligence obligation “to prevent the harvesting of species that are recognised internationally as being at risk of extinction and requiring international protection.”⁵⁹⁵ As such, “Article 192 imposes a due diligence obligation to take those measures “necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life,” thereby extending the scope of Article 192 to encompass not only the direct harvesting of species recognized as being at threat of extinction, but also “the prevention of harms that would affect depleted, threatened, or endangered species indirectly through the destruction of their habitat.”⁵⁹⁶ This obligation was positive in nature; a failure to take measures to prevent the harvesting of coral and giant clams constitutes a breach of Articles 192 and 194(5).⁵⁹⁷ Further, Articles 192 and 194(5)

⁵⁹² *Article 192: General Obligation*, VIRGINIA COMMENTARY, vol. IV, p. 11.

⁵⁹³ *South China Sea Award*, ¶ 945.

⁵⁹⁴ *Id.*, ¶ 956.

⁵⁹⁵ *Id.*

⁵⁹⁶ *Id.*, ¶ 959.

⁵⁹⁷ *Id.*, ¶ 960.

require States not only to promulgate measures to protect endangered species but also to enforce those rules and measures.⁵⁹⁸

406. More generally, the arbitral tribunal also found that Chinese construction activities related to its artificial island-building activities in the Spratly Islands had resulted in a breach of its Article 192 obligations, that its dredging activities leading to pollution of the marine environment had resulted in a breach of Article 194(1), and that its failure to protect and preserve rare or fragile ecosystems and the habitats of depleted, threatened or endangered species and other forms of marine life breached its duty under Article 194(5).⁵⁹⁹

407. The Tribunal adopted an “expansive interpretation,” which “provides a precedent linking Part XII of UNCLOS to other environmental law treaty regimes.”⁶⁰⁰ This approach is consistent with and supportive of the principle of progressive development. As Professor Chie Kojima observes:

The reference to Article 237 by the Arbitral Tribunal indicates the Tribunal’s positive attitude towards the principle of systematic integration in interpreting UNCLOS. . . . Therefore, the Arbitral Tribunal’s references to CITES indicate an example whereby the content of UNCLOS can be updated or revised over time by interacting with other treaty regimes existing at the time.⁶⁰¹

408. The interpretive approach adopted by the *South China Sea* tribunal toward Article 192 is therefore instructive. The tribunal found that the provision was given color by, in particular, Article 194 of UNCLOS and the provisions of the CBD and CITES. These provisions were drawn upon to expand the scope of Article 192 to require States to take active measures to prevent the reduction in marine biodiversity and to protect and preserve the marine environment. “[G]eneric terms included in UNCLOS can . . . have an active interaction with general international law and evolve through interpretation.”⁶⁰²

409. Other international courts and tribunals have also adopted an expansive approach to Article 192.

- (a) The *Chagos Marine Protected Area* tribunal determined that the protection and preservation of the marine environment was not limited to measures related to pollution control, and extends to the declaration of marine protected areas (operationalizing Article 194(5)).⁶⁰³

⁵⁹⁸ *Id.*, ¶ 964.

⁵⁹⁹ *Id.*, ¶ 983.

⁶⁰⁰ Seokwoo Lee & Lowell B. Bautista, *Part XII of the United Nations Convention on the Law of the Sea and the Duty to Mitigate Against Climate Change: Making Out a Claim, Causation, and Related Issues*, 45 *ECOLOGY L. Q.* 129 (2018), p. 138.

⁶⁰¹ Chie Kojima, *South China Sea Arbitration and the Protection of the Marine Environment: Evolution of UNCLOS Part XII through Interpretation and the Duty to Cooperate*, 21 *ASIAN Y.B. INT’L L.* 166 (2015), pp. 172–173.

⁶⁰² *Id.*, p. 175.

⁶⁰³ *Chagos Award*, ¶¶ 320, 538.

- (b) ITLOS in the *Southern Bluefin Tuna* cases and *SRFC* held that the “conservation of the living resources of the sea is an element in the preservation of the marine environment.”⁶⁰⁴
- (c) In *SRFC*, ITLOS reaffirmed its finding as to the scope of the Article 192 obligation in *Southern Bluefin Tuna* and additionally held that States are required to take necessary measures to ensure compliance with protection and preservation measures by vessels flying its flag.⁶⁰⁵ ITLOS generally found that States are required to take measures to combat illegal, unreported, and unregulated fishing.

410. Ultimately, Article 192 covers “all types of harm to the marine environment” and is “wide enough to cover other potential impacts, such as physical harm, destruction or alteration of the marine environment and its components, whether or not it falls within the definition of pollution.”⁶⁰⁶ Article 192 should be given “a living interpretation in light of the developments in international law.”⁶⁰⁷ It is a “textbook example of an evolutionary provision, as it is very open-ended and contains multiple ‘generic’ terms. It should thus be interpreted and applied to cover all contemporary threats to the marine environment, including those that emerged following its adoption.”⁶⁰⁸ Such an expansive approach would include threats to the marine environment in areas beyond national jurisdiction.⁶⁰⁹

D. Application of Article 192 to climate change

411. Article 192 and the other provisions of Part XII impose obligations governing States’ obligations to take measures to prevent and reduce the deleterious effects of climate change, providing “an umbrella for claims of a variety of environmental law violations caused by activities at sea.”⁶¹⁰ For instance, Bastiaan Ewoud Klerk observes that

Given the immense threat posed to the marine environment by climate change, any State seeking to comply with its obligation under Article 192 and arguably Part XII as a whole, needs to take measures to reduce greenhouse gas emissions and protect the marine environment from the adverse effects of climate change. Any other conclusion would render Article 192 void, and would arguably be in violation of the principle of good

⁶⁰⁴ *Southern Bluefin Tuna* Order, ¶ 70 (emphasis omitted).

⁶⁰⁵ *SRFC* Advisory Opinion, ¶¶ 120, 136.

⁶⁰⁶ James Harrison, *SAVING THE OCEANS THROUGH LAW: THE INTERNATIONAL LEGAL FRAMEWORK FOR THE PROTECTION OF THE MARINE ENVIRONMENT* (2017), p. 24.

⁶⁰⁷ Seokwoo Lee & Lowell B. Bautista, *Part XII of the United Nations Convention on the Law of the Sea and the Duty to Mitigate Against Climate Change: Making Out a Claim, Causation, and Related Issues*, 45 *ECOLOGY L. Q.* (2018), pp. 129, 140.

⁶⁰⁸ Bastiaan E. Klerk, *Protecting the Marine Environment from the Impacts of Climate Change: A Regime Interaction Study*, 32 *REV. EUROPEAN, COMPARATIVE & INT’L ENV. L.*, (2022), pp. 44, 50.

⁶⁰⁹ See § II above.

⁶¹⁰ Natalie Klein, *Adapting UNCLOS Dispute Settlement to Address Climate Change*, in *RESEARCH HANDBOOK ON CLIMATE CHANGE, OCEANS AND COASTS* (McDonald et al. 2020), p. 104.

faith as enshrined in Article 300 UNCLOS and Articles 26 and 31 VCLT.⁶¹¹

412. As conclusively established in Part II, climate change causes—and will cause—significant harm to the marine environment. To this extent, Article 192 must encompass State obligations to act on the deleterious effects of climate change.⁶¹² The scope of those obligations is examined in the next section.

V. Identification of specific obligations related to Article 192

413. The previous Sections have identified the content and scope of Article 192, and its nature as containing due diligence obligations. This Section identifies specific obligations under Article 192. It is clear that ‘doing little or nothing is not an option’ for States in international law with respect to addressing the crisis of climate change.

414. In particular, this section sets out three obligations that States are required to take in furtherance of their Article 192 obligations. *First*, States have an obligation to reduce GHG emissions in accordance with the best available science to prevent climate change, given that both GHG emissions as such and the effects of climate change driven by such GHG emissions harm the marine environment (Subsection A). *Second*, in view of the fact that climate change will continue to occur notwithstanding the best efforts of States to prevent it, States have an obligation to implement resilience and adaptation measures to protect and preserve the marine environment (Subsection B). *Third*, in light of the fact that the marine environment is, itself, the world’s largest carbon sink but also an object to be protected as such, States are obliged to protect marine ecosystems that sequester carbon dioxide, both for mitigation purposes and to protect and preserve the marine environment. Each category is discussed in turn.

A. Obligations directed at mitigating emissions to protect the marine environment from the deleterious effects of climate change

415. As set out in Chapter 4, the ocean, which is part of the climate system and of the environment at large, is being significantly harmed by the adverse effects of climate change on the marine environment (*e.g.*, its chemical composition, its biodiversity, etc.). The importance of the marine environment both as an object to be protected in and of itself and instrumentally for effective mitigation and adaptation to climate change has also long been explicitly recognized, for example, by the Conference of the Parties to the CBD.⁶¹³ The case law confirms that the conservation of living resources of the sea is “an element in the protection and preservation of the marine environment.”⁶¹⁴ By reading Article 192 together with Article 194(5), the *South China Sea* tribunal found that, in addition to prohibiting direct harvesting, “Article 192 imposes a due diligence obligation to take those measures ‘necessary to protect and preserve rare or fragile ecosystems,’” and that this obligation “extends to the

⁶¹¹ Bastiaan Ewoud Klerk, *Protecting the marine environment from the impacts of climate change: A regime interaction study*, REV. EUROPEAN, COMP. & INT’L ENV. L. 1 (2022), p. 7.

⁶¹² *Id.*; see also Alan Boyle, *Litigating Climate Change under Part XII of the LOSC*, 34(4) INT’L J. MARINE & COASTAL L. 440 (2019), p. 463.

⁶¹³ See, *e.g.*, CBD Conference of the Parties, Decision X/29 on Biological Diversity at Its Tenth Meeting CBD/COP/DEC/X/29 (2010), ¶¶ 7–8.

⁶¹⁴ *Southern Bluefin Tuna Order*, ¶ 70; *South China Sea Award*, ¶ 956.

prevention of harms that would affect depleted, threatened, or endangered species *indirectly* through the destruction of their habitat.”⁶¹⁵

416. States Parties are therefore obliged to mitigate GHG emissions, to prevent climate change, and to protect the marine environment from its deleterious effects. This includes all measures necessary to protect and preserve the marine environment—including rare or fragile ecosystems such as coral reefs, as well as the habitats of depleted, threatened, or endangered species and other forms of marine life—that climate change impacts, such as by ocean acidification and sea-level rise.

417. Further, if an activity is likely to cause harm to the marine environment by accelerating the deleterious effects of climate change, then necessary measures include the obligation of a State to conduct an environmental impact assessment under Article 206, including the duty to monitor the effects of such activities under Article 204. Likewise, transboundary pollution States are required to conduct environmental impact assessments as an obligation of customary international law.⁶¹⁶ In a similar vein, States may be required to implement marine protected areas to protect the marine environment and vulnerable ecosystems and species therein.⁶¹⁷

B. Obligation to promote resilience of the marine environment and ecosystems to minimize the deleterious effects of climate change

418. Maintaining and improving ecosystem resilience is important to protect and preserve the marine environment, as well as to enable adaptation to climate change risks and impacts.⁶¹⁸ Increasing the ability to adapt to the adverse impacts of climate change and fostering climate resilience are furthermore key objectives of the UNFCCC and the Paris Agreement.⁶¹⁹ To this end, Article 192 obliges States to promote the resilience of the marine environment to minimize the impact of climate change on it (thereby protecting and preserving the marine environment), in view of the fact that even with the most extensive measures implemented under the first category, climate change will continue to occur and its deleterious effects (even if lessened) will continue to harm the marine environment.

419. Such measures include those necessary for building resilience to enhance adaptive capacity, and reducing vulnerability to the adverse effects of climate change and ocean acidification.

C. Obligation to protect marine ecosystems to increase their resilience and enable them to continue to minimize the deleterious effects of climate change

420. As noted above, the obligations flowing from Article 192 involve protecting marine ecosystems for their own sake, not just instrumentally. At the same time, it is important to recognize the valuable role that marine ecosystems play in minimizing the deleterious effects of climate change. As has been observed in previous chapters, the ocean is the world’s

⁶¹⁵ *South China Sea Award*, ¶ 959 (emphasis added).

⁶¹⁶ *Pulp Mills Judgment*, ¶ 204.

⁶¹⁷ See § 7.I.A above.

⁶¹⁸ See L. C. Flensburg et al., *An Indicator-Based Approach for Assessing Marine Ecosystem Resilience*, ICES J. MARINE SCIENCE (2023).

⁶¹⁹ UNFCCC, Article 2; Paris Agreement, Articles 2(1)(b), 7.

primary carbon sink, absorbing up to 25 percent of all carbon dioxide emissions and up to 90 percent of the excess heat generated by these emissions. Seagrass meadows, tidal marshes, and mangroves are among the most intensive carbon sinks in the biosphere. These ecosystems are capable of sequestering significant amounts of carbon dioxide.⁶²⁰

421. They are, however, vulnerable to degradation arising from the deleterious effects of climate change impacting marine ecosystems. This degradation may have two relevant impacts: ability of these carbon sinks to absorb carbon dioxide is greatly reduced, therefore leading to an increased level of carbon dioxide in the atmosphere and more significant harm to the marine environment; and the release of sequestered carbon held by these carbon sinks into the atmosphere, leading to a significant increase in GHG emissions. Both of these impacts will result in significant harm to the marine environment and will magnify the deleterious effects of climate change.⁶²¹ To this end, Article 192 requires States to protect and preserve the marine environment to enable it to continue to serve its function as a carbon sink, thereby preventing further harm to the marine environment, including through ocean warming and acidification. These may include measures to build resilience in marine ecosystems, such as to protect tidal marshes, mangroves, and sea grasses.

422. This obligation also extends to the obligation to restore the marine environment. The obligation to protect and preserve is to be read in the light of the obligations under Article 4(1)(d) of the UNFCCC and under Article 5 of the Paris Agreement, which provide respectively that States shall “[p]romote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and *oceans* as well as other terrestrial, *coastal and marine ecosystems*” and that “Parties should take action to *conserve and enhance*, as appropriate, *sinks and reservoirs of greenhouse gases*”—including the marine environment.⁶²²

423. States must maintain and improve the current condition of marine ecosystems, including through active restoration measures of degraded ecosystems, to conserve and enhance the ocean’s carbon cycling services that underpin the ocean’s role in the global climate system. For instance, States may be required to enhance or restore habitats like sea grass and meadows, or improve the conservation of species (e.g., whales) that help sequester large amounts of carbon. Importantly, this obligation must not be implemented in a manner that exacerbates ocean acidification, such as through ocean fertilization.⁶²³

424. Finally, the realization of the obligation to protect and preserve the marine environment requires an informed and active citizenry. To this end, education of current and future generations about environmental matters is essential “to broaden the basis for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension.”⁶²⁴

⁶²⁰ See §§ 4.II.A, 4.III.A above.

⁶²¹ See § 4.III.B above; Cooley Report, § IV.

⁶²² UNFCCC, Article 4(1)(d) (emphasis added); Paris Agreement, Article 5 (emphasis added).

⁶²³ IPCC, Working Group II, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2022), p. 36.

⁶²⁴ Stockholm Declaration, Principle 19.

PART IV: CONCLUSION

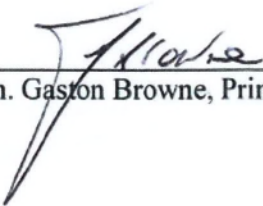
425. Part XII of the Convention—and in particular Article 194—imposes specific obligations on States Parties to take measures to prevent, reduce and control pollution of the marine environment, which encompasses anthropogenic GHG emissions responsible for climate change. These specific obligations are informed by the standard of due diligence and require taking account of the best practicable means, level of risk and foreseeability of harm, a State’s capabilities, the best available scientific and technical knowledge, and applicable international rules and standards. The irrefutable scientific evidence—generally accepted by the global community—clearly demonstrates that every increment of warming intensifies the risks and harms of climate change, but that limiting average global temperature rise to 1.5°C above pre-industrial levels would significantly reduce them. In answer to the first question before the Tribunal, at a minimum, the specific obligations of Part XII—read in light of the accepted scientific evidence and international standards—require States Parties to take all necessary measures, including adopting legislative and regulatory measures, aimed at reducing GHG emissions from all sources and limiting average global temperature rise to 1.5°C above pre-industrial levels.

426. Under Article 192, States have a broad obligation to “protect and preserve the marine environment” from climate change and its effects. This is a general duty of due diligence on States Parties to protect and preserve the entire marine environment from the deleterious effects of climate change, in areas both within and beyond national jurisdiction, and regardless of the vector through which those effects occur. In answer to the second question before the Tribunal, the specific obligations under Article 192 fall into three categories: to mitigate climate change, to implement resilience and adaptation measures, and to protect marine ecosystems that sequester carbon dioxide.

427. The Tribunal’s elucidation of these specific obligations under the Convention, by means of an advisory opinion responding to the two questions submitted, would provide meaningful guidance to States Parties in safeguarding the ocean, and both mitigating and adapting to the existential threats posed by climate change.

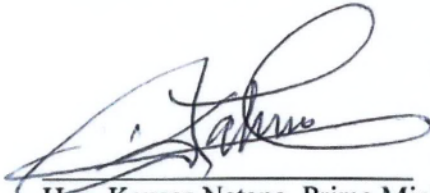
THE CO-CHAIRS OF THE COMMISSION OF SMALL ISLAND STATES
ON CLIMATE CHANGE AND INTERNATIONAL LAW

FOR THE GOVERNMENT OF ANTIGUA
AND BARBUDA



Hon. Gaston Browne, Prime Minister

FOR THE GOVERNMENT OF TUVALU



Hon. Kausea Natano, Prime Minister

16 June 2023

ON BEHALF OF THE COMMISSION:

Antigua and Barbuda
Niue
Republic of Palau
Saint Christopher (Saint Kitts) and Nevis
Saint Lucia
Saint Vincent and the Grenadines
Tuvalu
Republic of Vanuatu

CERTIFICATION

I certify that the annexes to this written statement are true copies of the documents to which they refer.



Catherine Amirfar
Co-Representative of the Commission

16 June 2023