INTERNATIONAL TRIBUNAL FOR THE LAW OF THE SEA

2023

Public sitting

held on Monday, 11 September 2023, at 3 p.m.,

at the International Tribunal for the Law of the Sea, Hamburg,

President Albert J. Hoffmann presiding

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

(REQUEST FOR ADVISORY OPINION SUBMITTED TO THE TRIBUNAL)

Verbatim Record

Uncorrected

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List of delegations:

REQUESTING ORGANIZATION

Commission of Small Island States on Climate Change and International Law (COSIS)

Mr Gaston Browne, Prime Minister of Antigua and Barbuda, Co-Chair of COSIS
Mr Kausea Natano, Prime Minister of Tuvalu, Co-Chair of COSIS
Mr Arnold Kiel Loughman, Attorney General, Republic of Vanuatu
Mr Ronald Sanders, Ambassador to the United States of America and the Organization of American States and High Commissioner to Canada of Antigua and Barbuda
Mr Tufoua Panapa, Chief Advisor to the Prime Minister, Tuvalu
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Ms Jutta Brunnée, Dean, Faculty of Law, University of Toronto; University Professor; associate member, Institut de droit international
Mr Eden Charles, Special Representative of the Secretary-General, International Seabed Authority; Lecturer of Law, University of the West Indies; Chair, Advisory Board, One Ocean Hub, UK Research and Innovation
Ms Naima Te Maile Fifita, Founder, Moana Tasi Project; 2023 Sue Taei Ocean Fellow
Mr Vaughan Lowe KC, Emeritus Chichele Professor of International Law, University of Oxford; barrister, Essex Court Chambers; member, Institut de droit international; member, Bar of England and Wales
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Ms Sarah Cooley, Director of Climate Science, Ocean Conservancy
Ms Shobha Maharaj, Science Director, Terraformation
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Mr Alan Boyle, Emeritus Professor of Public International Law, Edinburgh Law School
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THE PRESIDENT: Good afternoon. The Tribunal will now continue its hearing in the request for an advisory opinion submitted by the Commission of Small Island States on Climate Change and International Law.

I would now like to give the floor to Ms Okowa to make her statement.

MS OKOWA: Mr President, members of the Tribunal, I appear before you for the first time as an advocate and it is a special privilege to continue the oral submissions for the Commission of Small Island States on International Law, or COSIS.

As you will hear shortly from Professor Mbengue in greater detail, the applicable law is supplied by UNCLOS, as well as the relationship between UNCLOS and the global climate regime, and it is both a legal and moral imperative for UNCLOS to be interpreted to take into account the most existential problem facing humanity today: pollution from greenhouse gas emissions, or GHG emissions.

I will address two points today. First, I will address why it is critical for this Tribunal to consider scientific evidence and standards in interpreting UNCLOS in light of its object and purpose; second, I will address the unique situation of Small Island Developing States within the context of UNCLOS's object, purpose and constitutional function.

Turning to my first point, negotiating UNCLOS was an enormous task, made all the more difficult by the competing and, at times, seemingly irreconcilable interests at stake. The language of UNCLOS, so painstakingly arrived at, was thus designed to remain effective in the future through interpretation in order to meet new challenges, including those not foreseen at the time of drafting. The devastating impacts of climate change and the pollution of the marine environment by GHG emissions that bring it about, gravely illustrates this point.

Now, as has already been ably submitted by Professor Akhavan, UNCLOS has rightly been described as the 'constitution of the oceans.'[1] The treaty declares in its preamble that the "the problems of the ocean space are closely interrelated and need to be considered as a whole."

UNCLOS thus is a foundational text whose object is to create a functional regime for addressing practical "problems of ... ocean space", including the ongoing need to protect and preserve the marine environment and to prevent, reduce and control marine pollution.[2]

The State Parties' intent plainly was not to limit UNCLOS's scope to the state of the world in 1982. To the contrary, COSIS submits that the scope of State Parties' obligations under Part XII must be informed by the present-day reality of threats and harms facing the marine environment. Assessing that reality requires the best available scientific assessment of those threats and harms.[3]

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[1] *See* COSIS Written Statement, ¶ 53; *See also* TOMMY KOH, A CONSTITUTION FOR THE OCEANS (6 December 1982); *see, e.g.*, Tullio Treves, UN Audiovisual Library of International Law, UNCLOS (10 December 1982); Yoshifumi Tanaka, THE INTERNATIONAL LAW OF THE SEA (4th ed. 2023), p. 40.
[2] *See, e.g.*, UNCLOS, Articles 192, 194.
[3] *See generally* COSIS Written Statement, Part II, Chapter 6; Part III, Chapter 8, Section V.

In this sense, therefore, interpreting UNCLOS in light of the accepted science on climate change is not an aberration at all; it is, in fact, a logical continuation of how the law of the sea has always had to adapt to accommodate scientific and technological change. To properly tackle such problems, the UNCLOS regime cannot remain ossified or static. This is borne out by the text of UNCLOS itself, which contains several mechanisms that allow it to adapt to an ever-changing operational landscape.

COSIS submits that Part XII of UNCLOS reflects a strong commitment to scientific research,[4] and that the various provisions of the treaty envisage the current state of scientific knowledge as the yardstick against which States Parties' obligations are measured.[5] This is demonstrated by the following provisions of UNCLOS, all of which feed into one another.

The Preamble refers to the "promot[ion]" of the "study" of the ocean as part of the "legal order for the seas and oceans." And according to the Proelss Commentary, the Preamble "emphasises the important linkages between marine scientific research, especially research directed towards understanding the sources and impacts of pollution and sustainable development."[6]

Article 1(1)(4), which sets out the definition of "pollution of the marine environment" that is so central to the questions before the Tribunal in these proceedings, arose out of the work of UN technical bodies dedicated to marine research.[7] One prominent commentator has called the definition "essentially a scientific one."[8]

Articles 200 and 201, together, according to their ordinary meaning, envisage a continuing process of collaborative study and research on the marine environment by State Parties.[9] Article 200 encourages the "exchange of information and data acquired about pollution of the marine environment" and the participation in regional and global research programmes. This bedrock of data, research and study thus makes up the foundation of a comprehensive approach to the protection of the marine environment.[10] Article 201 then feeds these findings into the "appropriate scientific criteria" for the creation of rules and standards on the prevention, reduction

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[4] COSIS Written Statement, ¶ 339.

[5] *Responsibilities and Obligations of States with Respect to Activities in the Area*, Case No. 17, Advisory Opinion, 2011 ITLOS REP. 10 (1 February), ¶ 117; *Gabčíkovo-Nagymaros Project (Hungary v. Slovakia)*, Judgment, 1997 ICJ REP 7 ("***Gabčíkovo-Nagymaros* Judgment**"), ¶ 140."

[6] Tim Stephens, *Article 200: Studies, research programmes and exchange of information and data*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Prölß ed. 2017), p. 1342.

[7] Tim Stephens, *Article 200: Studies, research programmes and exchange of information and data*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Prölß ed. 2017), p. 1342.

[8] *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").

[9] COSIS Written Statement, ¶ 326.

[10] *Article 200: Studies, research programmes, and exchange of information and data*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA 1982: A COMMENTARY, vol. IV (Myron H. Nordquist et al. eds. 2013), p. 91.

and control of marine pollution. This ensures that the measures adopted to address marine pollution keep pace with the state of scientific knowledge.[11]

Articles 202 and 203 extend this collaborative ethos and obligation even further by providing for programmes of "scientific, educational, technical and other assistance to developing States" as part of the wider implementation of the obligations to protect and preserve the marine environment and to prevent, reduce and control pollution under both articles 192 and 194, respectively. Article 203 buttresses the support for developing States by affording them priority in the allocation of funding from international organizations.[12]

Articles 204 to 206, when read together, give practical application to the data and research collected by States Parties either through active "surveillance [of] the effects of any activities which they permit" to determine whether they are likely to cause pollution. This takes its most recognizable form in the environmental impact assessment, now accepted as a general obligation under customary international law.[13] The results of such assessments must be published and made available to all States through international organizations.

Articles 240 to 244 in Part XIII on marine scientific research also mirror and complement Part XII's emphasis on scientific research by imposing an obligation to share the results of that research internationally and actively promoting the flow of information and data. This, in turn, reinforces the scientific knowledge that feeds back into the applicable rules and standards for the protection and preservation of the marine environment in Part XII.

It is equally significant that UNCLOS is referred to in Agenda 21 of the 1992 Rio Conference Report as providing "the international basis upon which to pursue the protection and sustainable development of the marine and coastal environment and its resources."[14]

Agenda 21 puts emphasis on an integrated and precautionary approach to the protection of the marine and coastal environment. The intent is clearly to anchor control of marine pollution within the broad framework of the science on prevention of environmental degradation and protection of marine ecosystems more broadly.

It is therefore clear, in COSIS's submission, that the normative content of the provisions just described are mutually reinforcing. The continuous progress of States Parties' knowledge of the marine environment and pollution must necessarily inform applicable rules and standards. These, in turn, fill up the substantive obligations of States under Part XII. This process is, furthermore, a continuous one, as several

[11] Tim Stephens, *Article 201: Scientific criteria for regulations*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Prölß ed. 2017), p. 1344–1345.
[12] COSIS Written Statement, ¶¶ 326, 332–333.
[13] *Pulp Mills on the River Uruguay (Argentina v. Uruguay)*, Judgment, 2010 ICJ REP. 14 (20 April), ¶ 204.
[14] UN Conference on Environment and Development, *Agenda 21*, UN Doc.A/CONF/151/26/rev.1 (1992), ¶ 17.1.

provisions in Part XII provide for the relevant rules and standards concerning marine pollution to be "re-examined from time to time as necessary."[15]

The drafters of UNCLOS, in preparing a constitutional text, also had the additional foresight to reinforce these obligations with an equitable dimension, ensuring that States Parties make knowledge open to all and ensure greater assistance for developing States, which has a particular relevance for small island States.[16] COSIS further submits that this is directly relevant to the Tribunal's answers to the two questions posed, especially given the disproportionate effect climate change will have on Small Island Developing States relative to their historical GHG emissions.

Mr President, members of the Tribunal, this takes me to my second point: the need for UNCLOS to contribute solutions to the practical problems of small island States as identified by the scientific research that UNCLOS seeks to foster.

For small island States, the ocean is central to almost all aspects of life. UNCLOS's status as the "constitution of the oceans", therefore takes on a particular significance. Small island States are, by definition, surrounded by the ocean. They are, therefore, surrounded by the legal regime that governs it. Examples of the profound effects the treaty's provisions have on the lifeworld of small island States are manifold: calculation of baselines and maritime entitlements; Part IV on archipelagic States; Part VIII on the regime of islands; regulation of fisheries; the continental shelf; and, of course, provisions addressed to marine pollution and the protection and preservation of the marine environment.

The Tribunal will certainly have noted that almost all States and international organizations who have filed written submissions and have appeared before you thus far are in firm agreement that the threat posed by climate change is imminent and severe. In the context of the two questions posed to the Tribunal, I would highlight that the accepted scientific consensus, built upon by the research of States Parties, demonstrates severe risk to small island States.

The effects identified will be felt first and hardest by Small Island Developing States, who are particularly vulnerable to the following threats, which, in COSIS's submission, has been amply demonstrated by the evidence before you and the speeches of the Prime Ministers of Antigua and Barbuda and Tuvalu and the Attorney-General of Vanuatu this morning. To recap, I will mention only three of the most important.

First, sea-level rise: rising sea levels will wreak havoc on small island States, causing loss of coastal and marine habitats, which not only threaten the marine environment but would also cause the destruction of the livelihoods across small island States.[17] As the effects of climate change compound, millions face the imminent risk of displacement as small island States such as Tuvalu become uninhabitable or completely submerged.[18]

[15] *See, e.g.*, UNCLOS, Articles 207(4), 208(5), 209(1), 210(4), 211(1).
[16] UNCLOS, Articles 266–268.
[17] *See generally* COSIS Written Statement, ¶ 95; Annex 5, Maharaj Report, ¶¶ 26–29.
[18] *See generally* COSIS Written Statement, ¶ 95; Annex 5, Maharaj Report, ¶ 84.

Second, ocean acidification and warming: the increase in average ocean temperatures and pH levels constitutes a grave threat to not only marine life but also the existence of the marine environment and ecosystem as a whole.[19] This threatens not only livelihoods but the means of sustenance for entire populations of small island States whose food supply depends on the ocean.[20] This strikes at the heart of small island States' means of substance which are themselves protected by international law.

Third, extreme weather events: 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, decimate small island States who suffer flooding damage and strains on their public health and sanitation systems.[21] The scientific consensus is that these extreme weather events would only become more common if climate change continues unabated.[22]

UNCLOS, as a leading constitutional instrument, must be equipped to respond to existential threats to its subject matter: the world's marine environment and the small island States whose fate is bound up with them. The scope of any interpretation of articles 192 and 194 in relation to climate change will directly impact the survival of these States Parties. Such interpretation, therefore, must incorporate the scientific consensus on small island States' particular vulnerability.

To conclude, scientific knowledge informs the obligations of States Parties under UNCLOS. As a living instrument, UNCLOS requires that scientific research and exchange of information lead to the updating of States Parties' obligations in light of newly available data. Accordingly, the substantive duties of States Parties under UNCLOS must keep pace with scientific advancement as supplemented by articles 200 to 206. The science, as it stands today, has been accepted by almost all States that have made written submissions in these proceedings.

Mr President, members of the Tribunal, thank you for your attention. I now request that you invite Dr Sarah Cooley to the floor to share a presentation with the Tribunal.

THE PRESIDENT: Thank you, Ms Okowa. I now give the floor to Ms Cooley to make her statement. You have the floor, madam.

MS COOLEY: Good day. My name is Dr Sarah R Cooley and I am the Director of Climate Science at Ocean Conservancy, a non-profit, non-governmental organization based in Washington, DC.

I was a key contributor to the work of the Intergovernmental Panel on Climate Change (or IPCC), the UN's body for advancing the science of climate change in assessing the impacts of global warming on the ocean. Specifically, I was the Coordinating Lead Author for the chapter entitled "Oceans and Marine Ecosystems and their Services" in the contribution of the Working Group II on Impacts, Adaptation, and Vulnerability in the IPCC's Sixth Assessment report, published just

[19] *See generally* COSIS Written Statement, ¶¶ 87–89, 110–119; Annex 5, Maharaj Report, ¶¶ 42–55.
[20] *See generally* COSIS Written Statement, ¶¶ 87-89; Annex 5, Maharaj Report, ¶¶71–76.
[21] COSIS Written Statement, ¶ 123.
[22] COSIS Written Statement, ¶ 97.

last year. I am a globally recognized expert on the ocean carbon cycle, with 16 years of professional experience focused on climate change impacts to the ocean, including ocean acidification and on ocean-related climate mitigation and adaptation options.

I submitted a report in these proceedings alongside the written statement of the Commission of Small Island States on Climate Change and International Law, or COSIS. In that report, I described climate impacts on the ocean and their effects on marine and human systems, drawing from the latest IPCC assessments.

In my presentation today, I will reiterate and further build upon the points I made in my written report to show that climate change has vast and drastic impacts on the marine environment. I will also summarize the IPCC's assessment that, to avoid the worst of those impacts, urgent and dramatic action is needed to mitigate greenhouse gas emissions and adapt to the impacts that they have on the marine environment.

My presentation will proceed in five stages. First, I will explain why the ocean is central to the climate change system as a heat and carbon sink; second, I will show that as a result of anthropogenic emissions, the ocean is absorbing more heat, and warming at rapid levels; third, I will show that as a result of anthropogenic emissions, carbon dioxide is dissolving into the ocean, which is causing the ocean to acidify; fourth, I will discuss in detail the impacts, risks and predicted future scenarios of climate change under increased ocean warming and acidification; finally, I will set out the targets for mitigation and adaptation that States must reach if they wish to avoid the worst consequences of climate change.

I will start by making the fundamental point that the ocean has a central role in the climate system. The ocean is a major reason why the Earth hosts life. The ocean covers 71 per cent of the planet and supplies fresh water to the atmosphere and the land.[23] The large amount of water on the planet helps keep temperatures within a narrow band compared to other planets.

The ocean is also the world's largest heat sink.[24] Water is especially able to take up heat energy from the atmosphere without showing a rapid temperature rise. So as the Earth's surface receives solar radiation, the ocean surface absorbs a great deal of heat energy due to its size and water's special heat-retaining property. At the same time, heat-trapping gases, or greenhouse gases, in the atmosphere, like carbon dioxide, capture solar energy and some of this heat energy is transferred to the ocean surface by conduction. As human activity has increased the amount of heat-trapping gases in the atmosphere, the atmosphere has captured more solar radiation, and more heat is transferred to the ocean by conduction.[25]

The IPCC assessed that over 91 per cent of the added heat is stored in the ocean, compared to just over 1 per cent of the heat being stored in the atmosphere.[26]

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[23] IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND THE CRYOSPHERE IN A CHANGING CLIMATE (2019), p. 5.
[24] *Id*., p. 9.
[25] COSIS Written Statement, Annex 4, Cooley Report, § II.A.
[26] IPCC, Working Group I, *Chapter 9: Ocean, Cryosphere and Sea Level Change*, Sixth Assessment Report: The Physical Science Basis (2021), p. 1228.

The ocean is also the largest carbon reservoir on Earth. It holds about 50 times more carbon than the atmosphere. Both physical and biological processes move carbon in different forms throughout the ocean. Human industrial activity is increasing the amount of carbon dioxide in the atmosphere at rates faster than any other time in the geologic record.[27] The ocean has taken up about 26 per cent of all the carbon dioxide humans have released to the atmosphere.[28] While this has helped slow the amount of planetary warming a little, this has also changed the chemistry of the ocean.[29]

I will turn now to how the ocean's role as the Earth's largest heat and carbon sink has put it in the crosshairs for the worst impacts of excess greenhouse gas emissions; that is, those GHGs emitted by human activities since roughly 1850.[30]

Let's take absorption of heat by the ocean first. Since the Industrial Revolution, fossil fuel burning and land use changes have unequivocally and dramatically increased the amounts of heat-trapping gases, or greenhouse gases, in the atmosphere.[31] Solar energy makes these gas molecules vigorously bend, twist and vibrate, and their physical movement can be measured as heat. Some of the heat trapped by the atmosphere warms the ocean and land surface.[32] The ocean and land also absorb solar energy directly.[33] Darker surfaces, like open ocean water, absorb heat better than light surfaces, like sea ice.[34]

To give you some statistics on this, the IPCC assessed that the global surface temperature increased 1.09 degrees Celsius between 1850 to 2019.[35] Heat-trapping gases contributed 1.0 to 2.0 degrees Celsius of that increase, while human-released aerosols actually provided a slight cooling effect of 0 to 0.8 degrees Celsius by slightly shading the Earth.[36]

Adding heat to the ocean raises water temperatures. The IPCC assessed that the global mean sea surface temperature has increased since the beginning of the 20th century by 0.88 degrees Celsius,[37] and it is virtually certain that ocean warming will continue over the 21st century.[38] Different global greenhouse gas emissions pathways chosen now will measurably influence sea-surface temperatures as soon as the middle of the century.

This warming has a vast number of knock-on consequences. Many are shown here. Ocean warming is causing mobile marine species to move towards the poles in

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[27] COSIS Written Statement, Annex 4, Cooley Report, §§ II.C–D.
[28] *Id*., ¶¶ 29, 46.
[29] *Id*., § IV.
[30] *See generally* IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), p. 4–5.
[31] COSIS Written Statement, Annex 4, Cooley Report, §§ II.C–D.
[32] *Id*., § II.A.
[33] *Id*.
[34] *Id*., ¶ 23.
[35] IPCC, Working Group I, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 5.
[36] *Id.*
[37] *Id.*
[38] *Id*., p. 18.

search of comfortable temperatures.[39] It is also increasing the frequency and severity of marine heatwaves such as those observed in 2023 around the United Kingdom, Australia, India and both the north-west and south-east USA.[40]

Ocean warming, caused by human activity, has also been the major cause of sea-level rise since 1970.[41] Every material expands slightly when heated, and half of observed sea-level rise from 1971 to 2018 is from heating-driven expansion of seawater.[42] Melting ice from glaciers contributed 22 per cent of sea-level rise, and melting from land-fast ice sheets contributed 20 per cent of sea-level rise.[43] The remaining 8 percent of sea-level rise was due to changes in water storage by land.[44]

Sea-level rise is accelerating. From 1901 to 1990, the average rate was 1.35 millimetres per year, but from 1993 to 2018 the average rate was 3.25 millimetres per year.[45] The IPCC assessed that sea-level rise will continue throughout this century because of past and future ocean heat uptake.[46] Sea-level rise is not reversible on timescales of centuries to millennia, and making exact predictions of sea-level rise rate or amount is difficult because of ice-related major changes that could occur.[47]

Ocean warming also contributes to severe weather and ocean circulation changes.[48] Heat powers storms and evaporates moisture into the atmosphere. This has increased tropical cyclone precipitation.[49] The added heat has also increased melting of polar sea ice and this creates a harmful feedback loop where the dark, ice-free ocean absorbs even more heat.[50]

Warming water also becomes less dense, so warmer seawater does not mix and exchange vertically as well as cooler seawater does, so nutrient recycling from the deep ocean to the upper ocean has decreased and will continue in the future.[51] The

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[39] IPCC, *Chapter 5: Changing Ocean, Marine Ecosystems, and Dependent Communities*, SPECIAL REPORT ON THE OCEAN AND THE CRYOSPHERE IN A CHANGING CLIMATE (2019), p. 481.
[40] *See, e.g.*, *UK Suffers Marine Heatwave*, EUR. SPACE AGENCY (20 June 2023); *Marine heatwave off north-east Australia sets off alarm over health of Great Barrier Reef*, THE GUARDIAN (21 July 2023); *Warming Bay: An ongoing heatwave in India's eastern sea is causing extreme rain in its northwest, say experts*, DOWNTOEARTH (8 July 2023); *Large Marine Heatwave Reaches Oregon and Washington Coasts*, NAT'L OCEANIC & ATMOSPHERIC ADMIN.: FISHERIES (4 August 2023); *The Ongoing Marine Heat Waves in U.S. waters, explained*, NAT'L OCEANIC & ATMOSPHERIC ADMIN. (14 July 2023).
[41] COSIS Written Statement, Annex 4, Cooley Report, § III.B.
[42] IPCC, Working Group I, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 11.
[43] *Id.*
[44] *Id.*
[45] IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND THE CRYOSPHERE IN A CHANGING CLIMATE (2019), p. 20; IPCC, Working Group I, *Chapter 9: Ocean, Cryosphere and Sea Level Change*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 1287.
[46] IPCC, Working Group I, *Chapter 9: Ocean, Cryosphere and Sea Level Change*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 1288.
[47] IPCC, Working Group I, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 21.
[48] COSIS Written Statement, Annex 4, Cooley Report, § III.C.
[49] *Id.*
[50] *Id.*, § III.D.
[51] *Id.*, § III.E.

combination of warming and decreased vertical mixing also contributes to oxygen loss in the ocean's interior.[52]

The IPCC assessed that there is high confidence that ocean oxygen levels have dropped in many regions since the mid-20th century,[53] and that there is high confidence that ocean deoxygenation is projected to increase with ocean warming,[54] which is emissions scenario dependent. Heating also alters wind-stress and ocean currents.[55]

The IPCC has high confidence that many ocean currents will change this century in response to change in wind stress.[56] The IPCC assessed with medium confidence that subtropical gyres, the East Australian Current Extension, the Agulhas Current, and the Brazil Current are projected to intensify in response to wind stress while the Gulf Stream and the Indonesian Throughflow are projected to weaken.[57]

The IPCC assessed with high confidence that all of the four main eastern boundary upwelling systems are projected to weaken at low latitudes and intensify at high latitudes this century.[58] In addition, a decline in Atlantic Meridional Overturning Circulation, a part of the Gulf Stream system that also redistributes heat all over the planet, is very likely this century.[59] Changes in ocean circulation would have very strong effects on regional weather and the water cycle.

Another impact of anthropogenic emissions is the dissolution of carbon dioxide into the ocean.

Carbon is found everywhere on Earth in multiple forms and provides the foundation for life on the planet. For millennia the Earth's carbon cycle was in steady state, with carbon releases from one reservoir balanced by carbon storage in another reservoir.[60] In just 200 years, humans have upended this steady cycling of carbon by burning fossil fuels and dramatically altering land use.[61] Since human activities have begun, about 26 per cent of anthropogenically released carbon dioxide gas has dissolved in the ocean.[62]

Carbon dioxide dissolves in water into a collection of ions – hydrogen, bicarbonate and carbonate – in a series of reversible acid-base chemical reactions. In total, this increases the seawater's acidity, which is measurable as lower pH – and it lowers the concentration of carbonate ions in the water.[63] Altogether, this process is called

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[52] *Id*.
[53] IPCC, Working Group I, *Technical Summary*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 74.
[54] IPCC, Working Group I, *Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 677.
[55] COSIS Written Statement, Annex 4, Cooley Report, §§ III.C, III.E.
[56] IPCC, Working Group I, *Technical Summary*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2022), p. 74.
[57] *Id*.
[58] *Id*.
[59] *Id*., pp. 72, 74.
[60] COSIS Written Statement, Annex 4, Cooley Report, § II.C.
[61] *Id*., §§ III.C–D.
[62] *Id*., ¶¶ 29, 46.
[63] *Id*., § IV.

ocean acidification. It is most apparent in surface seawater, but scientists have detected it deeper in the ocean as well.[64]

Now I will to turn to the impacts, risk and predicted future scenarios of anthropogenic carbon emissions, particularly in light of the ocean warming and acidification risks I just identified.

But first, I will briefly introduce you to the IPCC process.

The impacts, risks, and future projected conditions on the ocean from climate change are regularly assessed by the IPCC. The IPCC brings together 195 Member States of the United Nations or World Meteorological Organization. It carries out a process every five to seven years to develop a set of reports that assess the causes, impacts and future risks of climate change.

These reports also evaluate how adaptation measures or efforts to stop climate change, called mitigation, can reduce climate change risks. The reports are not meant to be policy prescriptive but rather to inform the UN Framework Convention on Climate Change (or UNFCCC) policy negotiations. IPCC reports are created by thousands of subject matter expert volunteers from around the world.

Authors use a rigorous process to compile and assess the latest information on climate change. First, report outlines are agreed upon by UNFCCC member nations. Then report drafts undergo several rounds of expert and government review, and authors are required to make appropriate revisions and respond to each individual comment of the thousands provided throughout this process. The Summary for Policymakers, essentially the executive summary of each report, undergoes a lengthy government approval process.[65]

IPCC reports are written in an extremely dense format, using what's called calibrated language. IPCC authors evaluate the type, amount, quality and consistency of evidence on a particular topic, using previous IPCC reports and all new information produced since. This helps authors examine the degree of agreement of the evidence on the topic.[66]

Authors also examine multiple lines of evidence; for example, they consider models, observations and indigenous knowledge. The amount of evidence and agreement allow authors to determine a confidence statement. When confidence is high to very high and quantitative or probabilistic information is available, authors can even determine the likelihood of a particular outcome.[67] The drawback of this process is that IPCC phrasings and confidence assessments are extremely carefully chosen, but they can be variably interpreted by non-IPCC audiences.

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[64] IPCC, Working Group I, *Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), pp. 728–729.
[65] *See* COSIS Written Statement, Annex 4, Cooley Report, § I.C.
[66] *Id*., § I.C.1; *see also* IPCC, Working Group II, *Technical Summary*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2022), p. 41.
[67] IPCC, Working Group II, *Technical Summary*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2022), p. 41.

Now that I have set out the IPCC's process for assessing impacts, risks and future scenarios of climate change, I will address what those assessments say. In short, warming, acidification and oxygen loss affect marine organisms individually and collectively.

Every species has ideal temperature, acidity and oxygen conditions, but the effects of climate change are shifting these conditions so that it's harder for organisms to find and stay in ideal conditions.[68] Non-ideal conditions place organisms under stress, and this can force organisms to move, adapt or even die.[69] While under stress, organisms' growth and reproduction might be decreased, making the whole population more susceptible to harmful events.[70]

Different species in an ecosystem are likely to respond differently, with some species migrating or disappearing and others adapting. This can disrupt predator-prey relationships, habitat interactions, seasonal events and other beneficial ecosystem interactions. It also reduces marine biodiversity, which places ecosystems at greater risk of harmful events in the future.[71]

The IPCC assessed that average global biomass of marine animals is expected to decline due to climate change, but there will be significant regional variations.[72] Other well-known effects of climate change in the ocean include coral reef bleaching and death, marine heat waves and losses of juvenile Pacific oysters from ocean acidification.[73]

Some harmful algal species appear to survive better in warmer, more acidic conditions.[74] Systems from locations without much natural temperature variability, such as tropical systems and deep-sea systems, are often more sensitive to warming than those from environments with more variable temperature conditions.[75]

Climate hazards affect every ocean system. This figure lists climate-driven changes across the top and ocean systems down the left. Just note the high number of large dark circles, which show the high to very high impacts that are known with a high

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[68] IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND THE CRYOSPHERE (2019), pp. 12–14.
[69] IPCC, *Technical Summary*, SPECIAL REPORT ON THE OCEAN AND THE CRYOSPHERE (2019), pp. 60–61; IPCC, *Chapter 5: Changing Ocean, Marine Ecosystem, and Dependent Communities*, SPECIAL REPORT ON THE OCEAN AND THE CRYOSPHERE (2019), pp. 450–453.
[70] IPCC, *Chapter 5: Changing Ocean, Marine Ecosystem, and Dependent Communities*, SPECIAL REPORT ON THE OCEAN AND THE CRYOSPHERE (2019), pp. 478–481.
[71] *Id*., pp. 451–454, 480–486.
[72] COSIS Written Statement, Annex 4, Cooley Report, § IV.F; IPCC, *Chapter 5: Changing Ocean, Marine Ecosystem, and Dependent Communities*, SPECIAL REPORT ON THE OCEAN AND THE CRYOSPHERE (2019), pp. 452–453.
[73] IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND THE CHANGING CRYOSPHERE (2019), pp. 9, 13; IPCC, Working Group II, *Chapter 11: Australasia,* SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2022), p. 1584; *see also id., Chapter 3: Oceans and Coastal Ecosystems and Their Services,* p. 412.
[74] *Id*., *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, p. 412; COSIS Written Statement, Annex 4, Cooley Report, § V.
[75] IPCC, Working Group II, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2022), p. 400; COSIS Written Statement, Annex 4, Cooley Report, § V.F.

degree of scientific confidence. The many check marks on the right of this figure indicate harmful influences that are present, but not caused by climate change. These frequently worsen climate impacts.

The IPCC assessed with high confidence that climate driven impacts on ocean and coastal environments have caused measurable changes in specific industries, economic losses, emotional harm, and altered cultural and recreational activities around the world.[76]

The challenge to drawing broad conclusions about these impacts is that people's vulnerability to climate change is strongly influenced by local context. So climate-driven harm from ocean changes can and does vary greatly within and among communities.[77]

Sea-level rise is a major hazard for the more than one billion people around the world that will be living in low-lying coastal zones by 2050.[78] Together, sea-level rise, storm surge and heavy rainfall create compound flooding risks that harm and endanger ecosystems, infrastructure, food and people's health and livelihoods.[79] At the same time, climate change is already moving many fisheries poleward and changing the catch composition in specific places.[80] Small-scale, recreational, artisanal and subsistence fishers, which often includes indigenous peoples and local peoples, are less able to adapt to climate-driven fishery changes.[81]

Women are also proportionally more involved in small-scale fisheries, so disruptions worsen not just wealth inequality but also gender inequality.[82]

Climate change is additionally disrupting coastal freshwater aquifers and spreading or increasing water-borne pathogens.

I will turn now to how the IPCC assesses Earth's climate future. IPCC assessments consider the possible outcomes from several emission scenarios, or "shared socioeconomic pathways", that map out different policy and social system assumptions. These are called SSPs, and they are listed in the left column.

The best estimates of average global warming vary among different scenarios. By the middle of the century, the best estimate average global temperature rise under the high emissions scenario is 2.4ºC.[83] The best estimate for the medium emissions scenario is 2.0ºC by mid-century, and for the lowest emissions scenario it is 1.6ºC.[84]

[76] COSIS Written Statement, Annex 4, Cooley Report, § VI.
[77] *Id*.
[78] *Id*., § VI.A.
[79] *Id*., §§ VI.A–B.
[80] *Id*., § VI.C.
[81] *Id*.
[82] *Id*., § VI.C.
[83] IPCC, Working Group I, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 14, table SPM.1.
[84] *Id*.

We are currently at average global warming of 1.1ºC, and average global ocean sea surface warming of 0.88ºC.[85]

Given the widespread and severe impacts already happening today at planetary warming of 1.1ºC, the IPCC wrote that there is high confidence that "[e]very increment of global warming will intensify multiple and concurrent hazards."[86] In plain language, this means that every degree of additional warming beyond where we are today matters greatly.

The IPCC assessed climate risks to open ocean and coastal systems, and reported that ocean temperatures associated with a medium scenario (where the best estimate global average temperature rise will be 2.7ºC by end of century) would place estuaries, salt marshes, mangrove forests, seagrass meadows, kelp forests, sandy beaches, rocky shores, epipelagic systems, eastern boundary upwelling systems and seamount systems at least at moderate risk by end of century, with warm water corals being at very high risk by then.[87]

In all scenarios, there is a 66 to 100 per cent chance that the Arctic Ocean will become practically sea ice free before 2050.[88] And already today these systems are experiencing significant harm, especially from extreme events like marine heat waves.

Some future emissions scenarios involve a period of time where temperature increases will be above 1.5º or 2ºC because of the difficulty of stopping greenhouse gas emissions. These "overshoot" situations are just beginning to be researched. In the ocean, overshoot effects depend on whether a climate impact is reversible.

Impacts like sea surface temperatures, seasonal Arctic ice cover, surface ocean acidification and surface ocean deoxygenation are reversible.[89] But other impacts like sea-level rise are irreversible. Deep ocean changes related to heating, ocean acidification and deoxygenation are irreversible for multiple centuries. Ecological changes, especially species losses, could be irreversible into the next century or beyond.[90]

Climate impacts are also causing some ocean systems to reach "tipping points" where they undergo rapid changes that fundamentally alter the system in ways that make it extremely difficult and unlikely for the system to return to its previous stable state.[91]

Some examples of ocean tipping points under study include: melting of the Greenland Ice Sheet or West Antarctic Ice Sheet; loss of Arctic permafrost and Arctic

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[85] *Id*., p. 5; IPCC, Working Group I, *Chapter 9: Ocean, Cryosphere, and Sea Level Change*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 1214.
[86] IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), p. 12.
[87] IPCC, Working Group II, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2022), pp. 381–384.
[88] IPCC, Working Group I, *Chapter 9: Ocean, Cryosphere, and Sea Level Change*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), p. 1215.
[89] COSIS Written Statement, Annex 4, Cooley Report, § V.H.
[90] *Id*.
[91] *Id*., § V.G.

summer sea ice; widespread coastal and open ocean deoxygenation; severe coastal ocean acidification; large-scale ocean circulation changes; frequent and severe marine heat waves; changes in atmosphere-ocean connections like El Niño and monsoons; and replacement of warm-water coral reefs with macroalgae.[92]

The IPCC assessed that "ocean tipping points are being surpassed more frequently as the climate changes" and that abrupt shifts in marine species occurred over 14 per cent of the ocean in 2015, compared to 0.25 per cent of the ocean in the 1980s.[93] After tipping points are crossed, the new systems offer different opportunities and experiences to people than before, thereby heightening vulnerability for specific groups and economic sectors.

But all is not lost. If States act now and reduce their emissions by the necessary amounts and undertake adaptation measures, these impacts can be reduced or, in some cases, eliminated.

As the IPCC assessed, and as reflected in this figure, global GHG emissions in 2030 associated with the implementation of the Nationally Determined Contributions announced by 2021, prior to COP26, would make it likely that warming will exceed 1.5ºC during the 21st century.[94]

Having a 66 to 100 per cent chance of limiting warming to 2ºC would require rapidly accelerating mitigation efforts after 2030.[95] Policies implemented by the end of 2020 are projected to result in higher GHG levels than those implied by NDCs, indicating an implementation gap between actual emissions and intended pathways.[96]

This figure shows the current gap in 2022. But this gap has shrunk since the initial round of NDCs submitted in 2015 and 2016.[97] The first Global Stocktake last week actually indicated that the gap to emissions consistent with limiting warming to 1.5ºC in 2030 is now estimated to be 20.3-23.9 Gt CO_2.[98]

The IPCC grouped emission scenarios into different categories that have different likelihoods of exceeding different global warming levels both at peak emissions and at 2100.[99]

As shown here, all global modelled pathways that have a greater than 50 per cent chance of limiting warming to 1.5ºC with no or limited overshoot and those that have

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[92] IPCC, Working Group I, *Technical Summary*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), pp. 42, 65, 113–114; IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2022), p. 2071.
[93] IPCC, Working Group II, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2022), p. 448.
[94] IPCC, Working Group III, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: MITIGATION OF CLIMATE CHANGE (2022), p. 14.
[95] *Id*.
[96] *Id.*
[97] *Id.*
[98] UNFCCC, *Technical Dialogue of the First Global Stocktake*, UN Doc. FCCC/SB/2023/9 (8 September 2023), ¶ 10.
[99] IPCC, Working Group I, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: THE PHYSICAL SCIENCE BASIS (2021), pp. 12–14.

a greater than 67 per cent chance of limiting warming to 2ºC involve rapid, deep, and immediate GHG emissions reductions from all sectors.[100]

These emissions reductions include transitioning rapidly from fossil fuels without carbon capture and sequestration to very low or zero carbon energy sources such as renewables or fossil fuels with carbon capture and storage, improving efficiency, reducing non-CO2 emissions and deploying carbon dioxide removal measures to counterbalance residual GHGs.[101]

Carbon dioxide removal research and development has captured many people's imaginations around the world and it's a very active area of work. The IPCC included some modelled analysis of how carbon dioxide removal, or "CDR", would contribute to different emission pathways.[102]

In modelled pathways that assume CDR and that limit warming to 1.5ºC with no or limited overshoot, global cumulative CDR from 2020 to 2100 from bioenergy with carbon capture and sequestration (or "BECCS"), and direct air capture carbon dioxide capture and storage (or "DACCS") is 30 to 780 Gt CO_2 and 0 to 310 Gt CO_2, respectively.[103]

Total cumulative net negative CO_2 emissions including CDR deployment across all modelled pathways are 20 to 660 Gt CO_2.[104] The bottom line is that the longer GHG emissions are allowed to grow, the more challenging it will be to reach temperature targets and the more interventions like carbon dioxide removal will be needed.

But what does the current reality of CDR look like? The current amount of carbon dioxide removal is estimated to be just 2 billion tons, or 2 Gt CO_2 per year.[105] This is just 1 to 10 per cent of the modelled need for carbon removal. And most of that removal currently comes from conventional land management practices rather than engineered or enhanced carbon removal methods.[106]

To meet the IPCC's modelled targets needed to limit warming to 1.5ºC with no or limited overshoot, a massive effort is needed to both cut GHG emissions immediately and explore how CDR could most realistically complement this global systemic shift.

In addition to this, States must also adapt to climate change and its impacts. Another major message from the latest IPCC assessment report cycle is that both adaptation to climate change and mitigation must happen at the same time.

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[100] IPCC, Working Group III, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: MITIGATION OF CLIMATE CHANGE (2022), p. 24.
[101] *Id*., pp. 23–24, 29, 36.
[102] *See, e.g.*, IPCC, Working Group III, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: MITIGATION OF CLIMATE CHANGE (2022), pp. 24–25.
[103] IPCC, Working Group III, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: MITIGATION OF CLIMATE CHANGE (2022), p. 25.
[104] *Id*.
[105] *The State of 'Carbon Dioxide Removal' in Seven Charts*, CARBON BRIEF (19 January 2023).
[106] *Id*.

The IPCC assessed that the combination of adaptation and ambitious, rapid GHG emissions cuts can meaningfully reduce impacts, but available adaptation options are unable to offset climate-change impacts on marine ecosystems and the services they provide.[107] In addition, insufficient mitigation will decrease the number and effectiveness of feasible ocean and marine-based adaptations.[108] One type of action cannot replace the other.

There are three major groups of ocean-focused adaptations: those operating through social institutions, those focused on built infrastructure and technology, and those that leverage marine and coastal nature-based solutions.

Socio-institutional adaptations include actions like increasing participation, diversifying ocean-based livelihoods, improving finance and management.[109] Built infrastructure and technology include things like coastal protection, early warning systems, monitoring systems, or assisted evolution.[110]

Marine and coastal nature-based solutions include activities like habitat restoration, sustainable harvesting, marine spatial planning, and ecosystem-based management.[111]

Human-caused climate change has measurably changed the ocean, the organisms that live in and around it, and the people who depend on ocean resources and environments.

Both adaptation to climate impacts and mitigation of anthropogenic greenhouse gas emissions must occur simultaneously to safeguard people and natural systems from worsening climate damage. There is a gap separating current emissions commitments from nations and the emissions allowable to achieve a 1.5ºC future, which retains more of the ocean functions and relationships that sustain ecosystems and cultures.

This concludes my presentation on the science of climate change impacts on the ocean. I would be happy to answer any questions that you have orally or in writing. For now, unless I can assist the Tribunal further, I would ask that you please invite my colleague Dr Shobha Maharaj to address you.

THE PRESIDENT: Thank you, Ms Cooley. I now give the floor to Ms Maharaj to make her statement. You have the floor, Madam.

MS MAHARAJ: Mr President, honourable members of the Tribunal, good afternoon.

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[107] COSIS Written Statement, Annex 4, Cooley Report, § VI; IPCC, Working Group II, *Chapter 3: Oceans and Coastal Ecosystems and Their Services*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2022), p. 383.
[108] IPCC, Working Group II, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2022), p. 21.
[109] *See* IPCC, Working Group II, *Summary for Policymakers*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2022), pp. 21–28.
[110] *Id*.
[111] *Id*.

It is a privilege to appear before you as a scientific expert on behalf of the Commission of Small Island States on Climate Change and International Law, or COSIS.

I am an environmental biologist with over 15 years of experience investigating the impacts of climate change, particularly on small islands and across global biodiversity hotspots. I participated in various ways in the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, or IPCC, including as a Lead Author of the Small Islands Chapter in Working Group II's contribution to the report. As Dr Cooley explained to you a few minutes ago, the IPCC's reports reflect the best available scientific evidence on climate change and its impacts, including on small islands.

I currently serve as Science Director at Terraformation, a Hawaiian-based company which is dedicated to scaling native, biodiverse reforestation globally. I hold a Bachelor of Science in Zoology and Botany and a Master of Philosophy in Environmental Biology from the University of the West Indies at St. Augustine, in my home country of Trinidad and Tobago. In 2012, I received my Doctorate of Philosophy from the University of Oxford, where I researched the impacts of climate change on biodiversity within Caribbean small islands.

COSIS asked me to give expert testimony on the impacts of climate change on small islands. I already submitted a written report on 16 June 2023. Today, I will focus on two main points:

I will begin by addressing the catastrophic effects of climate change on small islands, which threaten the ability of their residents to reside and thrive on them.

Then I will describe some of the challenges that these highly vulnerable communities face in adapting to the climate that is changing all around them.

Members of the Tribunal, small islands are extremely vulnerable to the impacts of climate change, particularly those stemming from increasing ocean warming and acidification. I will discuss why small islands are so vulnerable, the current and likely future effects of climate change on them, and how those effects create systemic risks to habitability.

Although small islands are vastly diverse in their physical, socioeconomic and cultural characteristics, they share important similarities that make them especially susceptible to the impacts of climate change.

First and foremost, small islands are characterized by their physical boundedness, geographic remoteness, limited terrain and isolation.[112] In part as a result, small islands typically possess a narrow resource base, including limited surface water and land availability.[113]

[112] IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 2048.
[113] *Id.*, p. 2050.

Large proportions of settlements, infrastructure and other economic assets on small islands are often located close to the coast, making island populations extremely vulnerable to the impacts of sea-level rise, storm surges, flooding and extreme weather events.[114] The lack of diversity in small islands' economies subjects these nations to economic volatility and exogenous economic shocks.[115]

Finally, human and natural systems in small islands are highly interconnected, as island populations heavily rely on marine and terrestrial ecosystems for much of their needs including nutrition, culture and development. As such, negative impacts on island ecosystems can often quickly and adversely impact the people who live on these islands.

Synergies among all these unique traits have amplified the impacts of climate change on small islands. As a result, these communities are already suffering, and will continue to suffer, from the compounding and systematic effects of sea-level rise, tropical cyclones, storm surges, droughts and other changes in precipitation patterns which are becoming more frequent and/or severe due to climate change.[116]

The deleterious effects of these compound events on natural and human systems have already been observed by various islands around the world, and they are expected to continue to worsen as global temperatures increase.

One of the most critical of these is sea-level rise, which presents a threat to the very existence of some small islands. As you heard earlier today, rising sea levels risk the complete submergence and inhabitability of entire island nations, such as Tuvalu.

Small islands are also facing increasingly intense tropical cyclones. During 2017 alone, 22 among 29 Caribbean islands were impacted by at least one Category 4 or Category 5 tropical cyclone, damaging hundreds of thousands of human lives, livelihoods and critical infrastructure.[117] These storms are so large that they simply overwhelm small islands in their wake, as you can see here from Hurricane Maria, which hit the Caribbean in September 2017. The Pacific islands, too, are vulnerable to tropical cyclones, such as Tropical Cyclone Gita, shown here south of Tonga in February 2018. Notably, the IPCC has concluded that climate change is likely to make such extreme weather events even more intense.[118]

Climate-induced physical phenomena such as sea-level rise, ocean warming and extreme weather events contribute to the deterioration of key marine ecosystems, such as coral reefs, seagrass meadows, and mangroves, and the ecosystem services they supply.[119] For example, countries like The Bahamas, Vanuatu, Fiji, the Maldives and Palau – shown here – have documented severe coral bleaching and

[114] *Id.*, p. 2063.
[115] *Id.*, p. 2048.
[116] *See id*., pp. 2045, 2052.
[117] *Id.*, p. 2071.
[118] *See* IPCC, *Chapter 6: Extremes, Abrupt Changes and Managing Risks*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE (2019), pp. 591–593.
[119] *See* IPCC, *Chapter 6: Extremes, Abrupt Changes and Managing Risks*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE (2019), pp. 591–593.

death, driven by elevated sea surface temperatures.[120] In fact, globally, coral reefs are projected to decline by 70 to 90 per cent at 1.5 degrees Celsius warming.[121]

Significant declines have also been observed in seagrass meadows and mangroves around many small islands.[122]

These and other climate-induced physical effects also have cascading impacts across both natural and human systems. As the risks to small islands intensify – as summarized in this diagram from the IPCC – communities and settlements across them will continue to suffer not just loss of life but also damage to infrastructure, property and livelihoods, as their food and water security, energy supplies, health, well-being, culture and economies are negatively impacted. Some of these impacts are already being felt on small islands. I will discuss only six of them now.

First, sea-level rise, tropical cyclones, storm surges and the resulting destruction of ecosystems have led to significant losses in marine and coastal biodiversity. Coral reefs, seagrass meadows, and mangroves provide key habitats for marine flora and fauna. Thus, fish and other dependent life-forms have suffered habitat loss with the degradation of these ecosystems.[123] This resulting decline in biodiversity is exacerbated by the destructive impacts of extreme weather events and the migration of species away from small islands towards the poles due to warming of the waters that surround these islands.[124]

Second, coastal settlements, infrastructure, cultural sites and other economic assets have also been impacted by these natural hazards. Critical ecosystems, such as coral reefs, are very effective in buffering wave damage, and so play an important part in reducing the extent of marine inundation and shoreline retreat.[125]

As a consequence, the degradation of these ecosystems has significantly reduced much needed protection services for coastal areas and populations.[126] Such coastal protection is extremely important and vital in small islands, as human populations are very often concentrated near to the shoreline within low-elevation coastal zones.[127]

In addition, the destruction of coastal settlements, cultural sites and critical infrastructure has been further exacerbated by intensifying tropical cyclones.[128] In Dominica, for example, Tropical Cyclone Maria destroyed almost all of the country's infrastructure with losses amounting to more than 225 per cent of its annual gross domestic product.[129]

[120] *Id.*, p. 2071.
[121] *Id.*, p. 2048.
[122] *Id*., p. 2057.
[123] *Id*., p. 2058.
[124] *Id.*
[125] *Id.*
[126] *Id.*
[127] *Id*., p. 2063.
[128] *Id*., p. 2064.
[129] *Id.*

Third, the degradation and loss of coral reefs and mangroves, as well as resulting shoreline erosion, and flooding are already contributing to the deterioration of livelihoods associated with tourism, fishing and coastal agriculture.[130]

As fish and other dependent organisms disappear, the fishing and ecotourism industries, and associated livelihoods dependent on those sectors, will also significantly decline.[131]

Similarly, sea-level rise and extreme-weather events, together with increasingly intense tropical cyclones, will continue to impact agricultural production and associated livelihoods on small islands.[132]

Fourth, the combined effects of increasing tropical storm intensity and sea-level rise threaten water security in small islands by saline intrusion into aquifers.[133]

The IPCC has already confirmed that domestic freshwater resources on small islands may be unable to recover from increased drought, sea-level rise and decreased precipitation by 2030, 2040 or 2060 under both mid- and high future warming scenarios. In fact, some islands are already water insecure.[134] For example, in Barbados, water consumption has reached 100 per cent of the island's capacity, and in Saint Lucia, there is a water supply deficit of close to 35 per cent.[135]

Fifth, climate hazards have also impaired food security in small islands. Their degradation of ecosystems together with the warming of waters which surround these islands are already leading to significant declines in fish stocks, while threats to freshwater supplies have impacted agriculture.[136]

The IPCC has found that some small islands will experience over 50 per cent decline in maximum catch potential by 2100 under both mild and high future warming scenarios.[137] The IPCC has also found that, by 2050, local food accessibility could decrease significantly in islands such as Fiji, the Solomon Islands, Papua New Guinea, the Philippines and other small islands within the Western Pacific, with potentially 300,000 associated deaths.[138]

Sixth and finally, extreme weather events such as tropical cyclones have destroyed human lives and impaired health and well-being.[139] For example, tropical cyclones can damage water and sanitation services causing outbreaks of infectious disease,

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[130] *Id*., pp. 2066, 2096–2097.
[131] *Id*., pp. 2065–2067.
[132] *Id*., p. 2066.
[133] *Id*., p. 2065.
[134] *Id*., *Chapter 16: Key Risks Across Sectors and Regions*, p. 2449.
[135] IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 2065.
[136] *Id.*
[137] IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), pp. 2066.
[138] *Id.*
[139] *Id*., p. 2064–2065.

as was the case with a cholera outbreak that occurred in Haiti during the aftermath of Tropical Cyclone Matthew.[140]

At the end of the day, the inherent vulnerabilities of small islands, combined with the effects of climate change and the resulting systemic harms they suffer, will likely increase the inevitability of the worst effect of all for small islanders: which is, the increasingly serious risk that their homelands may become uninhabitable within their lifetimes or the lifetimes of their children or grandchildren. This is simply the reality of the punishing series of harms that islands face year in and year out.

Members of the Tribunal, I would like to conclude this portion of my presentation with a word on the scientific rigor that backs up the findings of the IPCC on which I have relied in this presentation. The Sixth Assessment Report makes clear that climate change poses risks of serious harm to small islands. Yet at the same time, it assigns levels of certainty to these harms that are sometimes lower than those for the impacts on the ocean as a whole.

This should *not* give the false impression that small islands are not being severely impacted by climate hazards. Lower confidence levels, where they exist, very often indicate simply a lack of published or other available data given the limited resources of small islands. There is, in fact, very high agreement among scientists on the devastating impacts that small islands are facing and will continue to face with changing climate conditions.

Mr President, members of the Tribunal, the IPCC has found that, in light of the extreme risk of serious harm that small islands face as a result of climate change, adaptation to this new, increasingly adverse climate reality is critical to sustain life on small islands. Only through adaptation can we blunt the most catastrophic impacts of climate change, such as food and water scarcity, population displacement and death.

However, the IPCC found with high confidence that, quote, “the vulnerability of small communities in small islands, especially those relying on coral reef systems for livelihoods, may exceed adaptation limits well before 2100 even for a low greenhouse gas emissions pathway,” end quote.[141]

Furthermore, due to the chronic lack of available robust, downscaled, island-specific data, small islands are unable to develop effective adaptation strategies which are essential if they are to enhance their resilience capacities in response to changing climate conditions.[142] I will discuss two key examples that demonstrate how this paucity of data constitutes a critical hurdle to adaptation.

The first is fisheries management. It is impossible to effectively replenish fisheries without adequate data. As I described earlier, fisheries are a pillar of economic development and provide essential food security and livelihoods on many small

[140] *Id*., p. 2065.
[141] IPCC, Working Group II*, Chapter 15: Small Islands*, Climate Change 2022: Impacts, Adaptation and Vulnerability (2022) p. 2046.
[142] IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), pp. 2094–2095.

islands.[143] And yet, access to suitable fisheries monitoring tools is often limited.[144] This has led to a chronic lack of data regarding habitat destruction, changing migration patterns, breeding grounds and population numbers of species.[145]

This paucity of data also inhibits the robust projection and modelling of future trends and changes which are absolutely critical for entities such as the IPCC to deliver accurate assessments of future risks regarding these natural and human ecosystems.

Further, this lack of detailed projections on how small islands may experience the redistribution of fish stocks renders it difficult to develop adequate adaptation strategies.[146] These strategies may include measures such as rehabilitating key ecosystems, for example mangroves, modifying coastal aquaculture infrastructure, or simply changing fishing locations.[147]

My second example is coastline mapping. Although on a global level we have some oceanographic and meteorological mapping data, as well as future sea-level-rise and wave-climate projections, these models are not downscaled to fit the small size of these islands.[148] It is incredibly difficult to plan new infrastructure without adequately downscaled data of this kind to match the complex coastline edges of small islands.[149]

This lack of data also severely constrains modelling studies and inhibits our understanding of sea-level rise, future coastal flooding, erosion and rates of saline intrusion into freshwater aquifers on a country-by-country basis.[150]

Furthermore, the diverse geography of small islands means there is no single one-size-fits-all solution to these issues, and small islands cannot depend on global data.

Further, the building climate-resilient infrastructure requires such highly downscaled data to understand where and what kind of adaptation solutions can be implemented to protect their coastlines from the encroaching sea, or where to build new coastal

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[143] IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 2066; *see also id.* at 2099.
[144] Gill et al., *Making the most of data-poor fisheries: Low cost mapping of small island fisheries to inform policy,* 101 MARINE POLICY (2019), pp. 198–207, https://www.sciencedirect.com/science/article/pii/S0308597X17302312.
[145] IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), pp. 2099–2100.
[146] IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), pp. 2099–2100.
[147] M. Mozumder, Climate change adaptation strategies for small-scale Hilsa fishers in the coastal area of Bangladesh: social, economic, and ecological perspectives, 10 MARINE FISHERIES, AQUACULTURE AND LIVING RESOURCES (27 July 2023), https://www.frontiersin.org/articles/10.3389/fmars.2023.1151875/full.
[148] IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), p. 2047.
[149] *See* J. Morim, *A global ensemble of ocean wave climate projections from CMIP5-driven models*, 7 SCIENTIFIC DATA (27 March 2020) https://www.nature.com/articles/s41597-020-0446-2.
[150] IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), pp. 2047, 2094.

infrastructure that will not wash away in future storm surges or sea-level rise. The graphic here shows the kind of adaptation decisions that governments face on small islands. Without robust data, governments cannot adequately adapt to the rapidly changing climate, and this already is and will continue to result in displacement, loss of livelihood and death of their people.

Compounding all of these issues is the lack of technical and financial aid available to small island nations.[151]

Small islands often lack the economic capacity of larger countries and require global support to adopt the necessary but expensive mitigation and adaptation measures to combat climate change.[152] However, the unavailability of up-to-date baseline and future climate data relevant to small islands impairs our capacity to both understand the current impact and to project the future impacts of climate change on these islands, which further exacerbates the underrepresentation of these nations within global projections and reports such as those of the IPCC.[153]

Mr President, members of the Tribunal, it is clear that the severe consequences of human-driven climate change to the closely interconnected ecological and human systems will render human life incredibly difficult on small islands over time. In some cases, as has been mentioned earlier, islands may become completely submerged, potentially wiping out whole nation States within our lifetimes. However, I would like to highlight a more insidious emerging reality that some islands will likely become uninhabitable over time without ever becoming completely submerged by the ocean. Indeed, millions of people are already being forced to leave their homes, further endangering not only their livelihoods and cultural heritage, but the rights of them and their children to not only survive but thrive in the place they call home. The critical risks of climate change should be a clarion call for us all.

Mr President, members of the Tribunal, this concludes my presentation before you today. Thank you for your kind attention, and I would be happy to take your questions. If I cannot assist you further, may I ask that you please invite Professor Margaretha Wewerinke-Singh to address you after the break.

THE PRESIDENT: Thank you, Ms Maharaj. My idea was to call on Ms Wewerinke-Singh to start with her statement for about 15 minutes and we will take a break. But if you prefer to break now, I am happy to do so and we can start in 30 minutes from now. If you can give me an indication? Sorry, can you use the microphone please.

MR AKHAVAN: Yes, Mr President, if you have no objection, we prefer to break now and have the two concluding speeches, both after the break.

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[151] IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), pp. 2047, 2088.
[152] IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), pp. 2088–2089.
[153] *See* IPCC, Working Group II, *Chapter 15: Small Islands*, SIXTH ASSESSMENT REPORT: IMPACTS, ADAPTATION AND VULNERABILITY (2022), pp. 2093–2094.

THE PRESIDENT: Very well. Then we will break for 30 minutes and we will come back here at 4:50.

(Short break)

THE PRESIDENT: I now give the floor to Ms Wewerinke-Singh to make her statement. You have the floor, madam.

MS WEWERINKE-SINGH: Thank you, Mr President.

Mr President, distinguished members of the Tribunal, it is an honour for me to appear before you on behalf of the Commission of Small Island States on Climate Change and International Law. The point I will be addressing is straightforward, uncontroversial and, above all, of critical importance in the present context – namely, that anthropogenic greenhouse gas emissions constitutes "pollution of the marine environment" under the Convention. This proposition follows from a plain reading of article 1(1)(4) of UNCLOS, which defines "pollution of the marine environment" as follows: "…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 seawater and reduction of amenities."

As we can see, this definition applies disjunctive conditions on three separate counts: it talks about the introduction of "substances" or "energy"; "directly or indirectly"; which "results" or "is likely to result" in deleterious effects.

It is plain from this formulation that anthropogenic greenhouse gas emissions would constitute marine pollution under UNCLOS even if they met only one of each of the disjunctive criteria listed on each count. But, Mr President, members of the Tribunal, the support for understanding anthropogenic greenhouse gas emissions as marine pollution is not just sufficient; it is overwhelming.

Accordingly, what I will demonstrate in the next 30 minutes is not only that greenhouse gas emissions can constitute "pollution of the marine environment" but that it is impossible for these terms to be interpreted as excluding anthropogenic greenhouse gas emissions.

This is so because, in sum, inland and offshore human activities give off greenhouse gases, mainly carbon dioxide, methane and nitrous oxide, which, in turn, introduce energy (in the form of heat), and a substance (carbon) into the marine environment, which results or is likely to result in "deleterious effects", indeed massive harm, to the marine environment.

As noted, this proposition enjoys overwhelming support and is backed by a compelling scientific consensus,[154] amongst participants in the present proceedings,

[154] *See* COSIS Written Statement, Ch. 5.

out of the 29 States and international organizations that address the interpretation of article 1(1)(4) in their written statements, 28 endorse this proposition[155] and only one explicitly rejects it.[156]

The reading of that State is, with respect, clearly erroneous, and the sources that it cites only confirm that article 1(1)(4) is intentionally flexible and should be interpreted in light of the best available scientific evidence. In fact, article 1(1)(4) is a testament to the dynamic and resilient nature of UNCLOS.

Mr President, members of the Tribunal, the proposition at stake here has significant legal implications because it means that the obligations set out in the relevant provisions of UNCLOS govern anthropogenic greenhouse gas emissions and, more specifically, the acts and omissions of States leading to such emissions.

My presentation will proceed as follows. First, I will explain how greenhouse gas emissions introduce both energy and substance into the marine environment; second, I will discuss the terms “marine environment” and “introduction by man” in article 1(1)(4); and, third, I will set out the deleterious effects that greenhouse gas emissions cause, both directly and indirectly, to the marine environment.

I now turn to the first part of my pleading, demonstrating that anthropogenic greenhouse gas emissions constitutes introduction of energy and substances into the marine environment. Such “introduction” of greenhouse gas emissions into the marine environment manifests in two distinct ways. The first is the indirect introduction of energy in the form of excess heat into the marine environment. “Heat” is, in fact, a form of “energy”: the ordinary definition of “energy” is, and I quote, ”power or force derived from the exploitation of physical and chemical resources”, including “light” and “heat”.[157]

As we just heard from Dr Cooley, science leaves no room for questioning the premise that greenhouse gas emissions introduce energy – heat – into the marine environment. She has explained to us how the ocean absorbs heat from the atmosphere through the process of thermal transfer from hotter air to the cooler water, making the ocean Earth’s largest heat sink.[158] The marine cryosphere – that is, sea ice and ice shelves – also absorbs heat at rates higher than land or water.[159] The Intergovernmental Panel on Climate Change (the IPCC) has authoritatively

[155] African Union Written Statement, § IV.B; Australia Written Statement, ¶¶ 24–30; Bangladesh Written Statement, ¶¶ 29–30; Belize Written Statement, ¶¶ 48–52; Canada Written Statement, ¶ 13–16; Chile Written Statement, § III; Democratic Republic of the Congo Written Statement, ¶¶ 171–182; Egypt Written Statement, ¶¶ 20–26; European Union Written Statement, ¶¶ 42–52; France Written Statement, ¶¶ 55–95; Germany Written Statement, ¶ 41; International Seabed Authority Written Statement, ¶¶ 19, 52; International Union for Conversation of Nature Written Statement, ¶ 52; Japan Written Statement, p. 3; Republic of Korea Written Statement, ¶ 12; Latvia Written Statement, ¶ 18; Mauritius Written Statement, §V.A; Micronesia Written Statement, ¶¶ 30–32; Mozambique Written Statement, ¶¶ 3.7–3.19; Nauru Written Statement, ¶ 38; the Netherlands Written Statement, ¶ 4.7; New Zealand Written Statement, Ch. 3, § II; Pacific Community Written Statement, ¶ 34; Rwanda Written Statement, Ch. 5, § I; Sierra Leone Written Statement, ¶¶ 29–48; Singapore Written Statement, Ch. 3; United Kingdom Written Statement, ¶ 91; Vietnam Written Statement, § III.
[156] Indonesia Written Statement, ¶¶ 57–64.
[157] *Oxford English Dictionary*, “energy.”
[158] *See also* COSIS’ Written Statement, § 4.I.A; Annex 4, Cooley Report, § II.
[159] COSIS Written Statement, § 4.II.A.

concluded that the ocean and marine cryosphere have absorbed more than 90 per cent of the excess heat accumulated in the climate system since 1850.[160] We have also heard how this excess heat causes profound physical changes in the marine environment. This includes thermal expansion of water, a melting of sea ice and ice shelves, all contributing to sea-level rise; ocean stratification and deoxygenation; and shifts in ocean and air currents.

The second "introduction" by greenhouse gas emissions manifests in the direct and indirect introduction of excess carbon into the marine environment. "Carbon" is a "substance" both in the ordinary meaning of the term[161] and in its scientific meaning. The International Court of Justice has confirmed that carbon dioxide emissions qualify as "substance" when interpreting an almost identical treaty provision that was applicable in the *Pulp Mills* case.[162]

Human activities have emitted more than 2,400 gigatons of carbon dioxide into the atmosphere, mainly through industrial processes, land-use change and land management, and through the burning of fossil fuels. A whopping one quarter of this amount has been absorbed by the marine environment, causing ocean acidification and related harmful consequences to marine life.[163] Dr Cooley also described how greenhouse gas emissions directly introduce sooty black carbon into the ocean and marine cryosphere and contribute to global warming by reducing the ice-albedo effect.

To conclude this point, Mr President and members of the Tribunal, greenhouse gas emissions indirectly introduce energy into the marine environment in the form of excess heat, and they directly and indirectly introduce a substance (carbon) into the marine environment. Thus, anthropogenic greenhouse gas emissions clearly and unambiguously meet the first limb of the definition.

I will now briefly address two salient points, namely, the interpretation of two of the terms utilized in UNCLOS article 1(1)(4). The two terms are "marine environment" and "introduction by man".

First, on the interpretation of the term "marine environment", it is of note that the term is not expressly defined in UNCLOS. The ordinary meaning of the term clearly indicates that the definition is an inclusive one, comprising the entire marine ecosystem.[164] The definition 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.[165] This reading is also consistent with the context of article (1)(1)(4) and with the object and purpose of UNCLOS, as evidenced by the preamble and application of the term in UNCLOS Part XII.

[160] COSIS Written Statement, Section 4.II.A.
[161] *Oxford English Dictionary*, "substance".
[162] *Pulp Mills on the River Uruguay* (Argentina v. Uruguay), Judgment, 2010 ICJ Rep. 14 (20 April), ¶ 264.
[163] *See* COSIS Written Statement, § 4.III.A.
[164] *See* COSIS Written Statement, ¶¶ 132–142.
[165] *Id.*, ¶ 134.

The interpretation is clear and unambiguous, and therefore conclusive.[166] If resort to supplementary means of interpretation were to be made, however, they lead to the exact same result: the Virginia Commentary to UNCLOS confirms that the drafters intentionally abstained from defining "marine environment", as it, and I quote, "allowed 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."[167]

The jurisprudence of the Tribunal and of Annex VII tribunals also confirms this reading. To cite two examples: this Tribunal, in the *SRFC* Advisory Opinion stated that, I quote, "living resources and marine life are part of the environment."[168]

Similarly, the *South China Sea* Tribunal opined that "marine environment" encompasses "a dynamic complex of plant, animal and micro-organism communities" as well as "their non-living environment."[169]

The second point I would like to briefly reflect on is the meaning of "introduction by man" in article 1(1)(4). The provision talks about "the introduction by man, directly or indirectly, of substances or energy into the marine environment". First, the context for this term provided in Part XII of UNCLOS makes it clear that the human activities leading to the introduction can originate from any source. Article 194(1) specifies that the pollution of the marine environment can come from literally "any source" and explicitly includes land-based sources, with article 207(1) specifically obliging States to adopt laws and regulations to prevent, reduce and control pollution of the marine environment from land-based sources.[170]

The ICJ has recognized the possibility of indirect pollution of a river through a paper plant's carbon emissions in the *Pulp Mills* case.[171] While the dispute was not based on UNCLOS, the applicable treaty, as indicated, included an almost identical provision, which defined the pollution as "the direct or indirect introduction by man into the aquatic environment of substances or energy which have harmful effects".[172] Similarly, in the *MOX Plant* case, this Tribunal recognized the possibility of an "indirect" pollution of the marine environment via atmospheric release.[173]

Now I will turn to the second segment of my presentation where I will demonstrate that anthropogenic greenhouse gas emissions results in a wide range of deleterious

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[166] Vienna Convention on the Law of Treaties, Article 32.
[167] *Article 1: Use of Terms and Scope*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA 1982: A COMMENTARY, vol. IV (Myron H. Nordquist et al. eds. 2013), p. 42.
[168] *SRFC* Advisory Opinion, ¶ 216; *see also Southern Bluefin Tuna* (New Zealand v. Japan; Australia v. Japan) (Case Nos. 3 & 4), Order (Provisional Measures), 1999 ITLOS Rep. 280 (27 August), ¶ 70; *Arctic Sunrise (Netherlands v. Russia)*, PCA Case No. 2014-02, Award on the Merits (14 August 2015), ¶¶ 82, 87, 105.
[169] *South China Sea* (Philippines v. China), PCA Case No. 2013-19, Award on the Merits (12 July 2016), ¶ 945; *see also Chagos Marine Protected Area (Mauritius v. United Kingdom)*, PCA Case No. 2011-03, Award (18 March 2015), ¶ 538;
[170] *See also* UNCLOS Articles 211, 212 and 213.
[171] *Pulp Mills on the River Uruguay* (Argentina v. Uruguay), Judgment, 2010 ICJ Rep. 14 (20 April), ¶ 220.
[172] *See* Statute of River Uruguay, 1935 UNTS 340 (19 November 1975), Article 40.
[173] *MOX Plant (Ireland v. United Kingdom)*, Case No. 10, Order (Provisional Measures), 2001 ITLOS REP. 95 (3 December), ¶¶ 82, 84, 89; *see* COSIS Written Statement, ¶ 149.

effects. First, however, I would like to make an important qualification. As noted in our written statement, it is not our submission that any kind of introduction of substance or energy into the marine environment, no matter how indirect and no matter how remote, will automatically qualify as pollution of the marine environment under UNCLOS.[174] The definition of "pollution" requires that the introduction results in or be likely to result in "deleterious effects". Article 1(1)(4) lists several examples of such deleterious effects. These are, and I quote, "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 seawater and reduction of amenities." Importantly, the list is non-exhaustive and, indeed, the scope of the harmful effects of greenhouse gas emissions is far wider than the handful of examples that I have just listed.

Mr President, distinguished members of the Tribunal, it is our submission that both limbs of this part of the definition are met. Accordingly, I will demonstrate that anthropogenic greenhouse gas emissions have already resulted in deleterious effects and are "likely" to result in further deleterious effects. The term "likely" is defined in the Oxford English Dictionary as "probable [or] having a high chance of occurring."[175] We find particularly authoritative the definition adopted by the IPCC in the context of climate change: according to the IPCC, an outcome being likely means having a 66 to 100 per cent probability of occurrence.[176] *A fortiori*, "likely" must also include the IPCC's confidence levels of "very likely" and "virtually certain", which range from 90 and 99 to 100 per cent, respectively.[177] The IPCC consistently uses the terms "very likely" and "high confidence" when discussing the deleterious effects of anthropogenic greenhouse gas emissions.[178]

Turning to the actual deleterious effects, Dr Cooley and Dr Maharaj have explained in their testimony how staggering amounts of excess heat and excess carbon have been introduced into the marine environment. I will now discuss the deleterious effects thereof, starting with the deleterious effects of the introduction of excess heat, and then those of the introduction of excess carbon.

The deleterious effects that the introduction of excess heat into the marine environment results in, or is likely to result in, include at least the following: *Harm to living resources and marine life*, such as decline in marine biodiversity and abundance, including loss of coral reefs due to heat stress, and ecosystem and food cycle disruption; *Hazards to human health*, such as food insecurity, extreme weather events, lack of access to water and foods, and population displacement due to sea-level rise; *Hindrance to marine activities*, including fishing and other legitimate uses of the sea, such as decline in fish abundance and diversity; and reduction of amenities in the form of beach loss due to flooding and sea-level rise, submergence and destruction of coastal and reef ecosystems, and loss of cultural heritage.

[174] COSIS Written Statement, ¶ 144.
[175] Oxford English Dictionary, "likely."
[176] *See* COSIS Written Statement, § 4.I, footnote 66.
[177] COSIS Written Statement, § 4.I, footnote 65.
[178] IPCC, *Summary for Policymakers*, SIXTH ASSESSMENT SYNTHESIS REPORT (2023), p. 4.

I refer to paragraph 165 of our written statement for a more comprehensive list of these deleterious effects, complete with references to the scientific evidence supporting our submissions.

In addition to the harmful effects of excess heat, greenhouse gas emissions introduce carbon, a substance, into the marine environment causing 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.[179]

Extreme 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. Thus, carbon dioxide emissions exacerbate the changes caused by excess heat.

The introduction of excess carbon dioxide into the marine environment has resulted in or is likely to result in the following deleterious effects, among others: first, decline in marine biodiversity due to the inability of certain species to survive in acidic environments, and this is an evidence of harm to living resources and marine life; second, food insecurity and malnutrition arising out of the decline in seafood as an essential source of animal protein, resulting in hazards to human health; third, decline in abundance and diversity of fish, marine mammals, shellfish and crustaceans, and decline in fishing and ecotourism, which qualifies as a hindrance to marine activities; and finally again, the introduction of excess carbon further exacerbates the deleterious effects of excess heat absorption that I discussed just a couple of minutes ago.

I refer to paragraph 167 of our written statement for a more comprehensive list of these deleterious effects, complete with references to the scientific evidence supporting our submissions.

To conclude, Mr President, distinguished members of the Tribunal, the evidence is compelling, the science is unambiguous, UNCLOS's provisions are unequivocal and the overwhelming consensus among States is evident: anthropogenic greenhouse gas emissions are "pollution of the marine environment" under article 1(1)(4). With that, I rest my case and express my gratitude for your attention. I now ask that you please invite Professor Makane Moïse Mbengue to the podium.

THE PRESIDENT: Thank you, Ms Wewerinke-Singh. I now give the floor to Mr Mbengue to make his statement.

MR MBENGUE: Mr President, distinguished members of the Tribunal, it is an honour to appear before you and to do so on behalf of COSIS.

Mr President, since the birth of international environmental law in the 1970s, the ocean, the seas, and the marine environment, which I will collectively refer to as "the

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

ocean", have been recognized by the international community as being an integral part of the environment, and crucial for the functioning of the Earth system.

The expert testimony that the Tribunal heard earlier today has shown that climate change, driven by anthropogenic greenhouse gas emissions, is harming on a daily basis our ocean and seas, causing severe and existential threats to small island States, but also to other developing and developed nations. Protecting and preserving the marine environment is particularly vital due to the ocean's vulnerability and substantial role in CO2-induced climate change, which has led to rising ocean temperatures, sea-level rise, and ocean acidification.

It is, thus, as emphasized by several written statements,[180] a matter of urgency for the international community, and not only for COSIS, that clarity is brought on what the precise obligations are, under the law of the sea, to protect and preserve the ocean from climate change.

This is not only a matter of "climate urgency"; it is a *sine qua non* to ensure a stable and predictable "legal order for the seas and oceans". UNCLOS, as underlined in its Preamble, was concluded with a view to "establishing a legal order for the seas and oceans", which would "promote the peaceful uses of the seas and ocean, the equitable and efficient utilization of their resources, the conservation of their living resources, and the study, protection and preservation of the marine environment."

Such a "legal order" that forms an integral part of the object and purpose of UNCLOS is today threatened by climate change and its adverse impacts on the ocean. By clarifying the precise obligations for Parties to UNCLOS in relation to climate change, the Tribunal will contribute to preserving the integrity of the Convention while allowing it to fulfil its very object and purpose.

Mr President, by contrast to what some of the participating States have advanced in their written statements, by doing so the Tribunal would surely not act *contra legem*. Indeed, the global climate regime was never intended to displace[181] or dilute UNCLOS,[182] or even less intended to be more specialized than UNCLOS.[183]

As I will show, the relationship between UNCLOS and the global climate regime is, to the contrary, one of complementarity and mutual supportiveness. Such a relationship cannot be and should not be framed in exclusionary terms. Both the climate regime

[180] Australia Written Statement , ¶ 6; Bangladesh Written Statement, ¶ 4, 5; Canada Written Statement, ¶¶ 3 and 6; Djibouti Written Statement, ¶ 7; Egypt Written Statement, ¶ 12; France Written Statement, ¶ 107; Republic of Korea Written Statement, ¶¶ 3, 31; Mauritius Written Statement, ¶ 3; Micronesia Written Statement, ¶ 69; Mozambique Written Statement, ¶ 1.4; Nauru Written Statement, ¶ 5, 6; New Zealand Written Statement, ¶ 9; Norway Written Statement, ¶¶ 2.1, 2.5; Portugal Written Statement, ¶ 90; Democratic Republic of the Congo Written Statement, ¶ 6; Rwanda Written Statement, ¶¶ 2, 7; Sierra Leone Written Statement, ¶ 9; Singapore Written Statement, ¶ 11; The Netherlands Written Statement, ¶¶ 2.1, 7.1; United Kingdom Written Statement, ¶¶ 4, 9; African Union Written Statement, ¶¶ 2, 5.

[181] China Written Statement, ¶¶ 27–28; Indonesia Written Statement, ¶¶ 35-42; Japan Written Statement, p. 3.

[182] Portugal Written Statement, ¶¶ 67, 79, 88.

[183] Singapore Written Statement, ¶ 38; Mauritius Written Statement, ¶ 47; India Written Statement, ¶¶ 16–17, 21.

and UNCLOS are supposed to achieve their respective and specific objects and purposes and to pursue the *raison d'être* for which they were established. And, when it comes to the protection and the preservation of the ocean, there is no doubt that UNCLOS is the cornerstone and remains the applicable legal framework within which the obligations of States must be assessed and determined.

It is this crucial aspect that I will first emphasize, Mr President, that UNCLOS stands at the centre of the legal framework dedicated to the protection and preservation and protection of the ocean. Then, I will demonstrate that UNCLOS is not exclusionary of the global climate regime and surely not incompatible,[184] as advanced by some participants to the present advisory proceedings. UNCLOS can and must be informed by the global climate regime with respect to matters relating to climate change impacts on the ocean.

I turn now to the first part of my submission, in which I will highlight that UNCLOS stands at the centre of the international legal framework dedicated to the protection and preservation of the ocean.

As I mentioned a few minutes ago, since the 1970s, the ocean was a preoccupation of the international community in the early developments of international environmental law. The ocean was considered an essential part of the ecosystem, vulnerable to environmental changes. It is against this background that the Stockholm Declaration, adopted during the UN Conference on the Human Environment, and which marked the birth of international environmental law in 1972, recognized from the outset the need for States to "take all possible steps to prevent pollution of the seas."[185]

The Action Plan for the Human Environment, adopted at the very same Conference, went further, and in a section dedicated to marine pollution it recommended to governments to "[p]articipate fully … in the Conference on the Law of the Sea, scheduled to begin in 1973 … with a view to bringing all significant sources of pollution within the environment … under appropriate controls and particularly to complete elimination of deliberate pollution by oil from ships."[186]

Distinguished members of the Tribunal, the words speak for themselves, and it would be contrary to the basic tenets of the interpretation of international instruments to give them a meaning other than their ordinary and plain meaning. What do those words tell us? Well, that from its very inception, international environmental law – to which the global climate regime forms today an integral part – has called upon the international community to use UNCLOS in order to deal with "all significant sources of pollution" of the marine environment. So, long before its conclusion, UNCLOS was already deemed to be the applicable law for matters related to the protection and preservation of the marine environment, including the prevention, reduction and control of marine pollution. This was the state of international law in 1972; and it has not changed since then.

[184] Indonesia Written Statement, ¶¶ 35–42.
[185] *See, e.g.*, Principle 2, 6, 7.
[186] Report of the UN Conference on the Human Environment, Stockholm, 5–16 June 1972, UN Doc. No. A/CONF.48/14/Rev.1 (1973), Recommendation 86(e).

Indeed, when negotiations for the Convention began at the Third United Nations Conference on the Law of the Sea in 1973, the Stockholm instruments and principles found echoes in the work of the Seabed Committee, the predecessor of the Third United Nations Conference on the Law of the Sea, and, in particular, its Subcommittee III, which was responsible for preparing draft articles on the protection and preservation of the marine environment for consideration by the Conference on the Law of the Sea.[187]

Among the Stockholm echoes, which confirm that international environmental law and UNCLOS were always conceived where relevant to complement each other, the Tribunal has surely noted that the long-standing vision of the international community was that UNCLOS would deal with "all, all significant sources of pollution". The expression is not static. It is by definition adaptive and encompasses today, without any doubt, and as highlighted before us by the scientific testimony of Dr Cooley, emissions of GHG that harm significantly the ocean.

In 1979, when negotiations during the Third United Nations Conference on the Law of the Sea were well under way, the First World Climate Conference, which was convened by the World Meteorological Organization, adopted a declaration that stated that "[t]he nations of the world must work together to … lessen pollution of the atmosphere and the oceans",[188] and it equally highlighted the importance of improving and acquiring "oceanographic" data in order to develop a "success[ful] climate programme".[189]

It seems reasonable, not to say evident, that one of the primary fora where "nations of the world must work together" would be UNCLOS. It was visionary back then; it is compelling today.

The trends initiated by the First World Climate Conference led to subsequent acknowledgment of the synergies between the climate and the ocean, and *par ricochet*, of synergies between the global climate regime and the law of the sea.

For instance, in 1985, the UN Environment Programme, the World Meteorological Organization and the International Council of Scientific Unions jointly organized the Villach Conference on the Assessment of the role of carbon dioxide and of other greenhouse gases in climate variations and associated impacts. Working Group II of the Villach Conference specifically recognized the role of the ocean as the ultimate sink for anthropogenic CO2,[190] and urged governments to strongly support "the study of interactions, among the atmosphere, oceans and ecosystems."[191]

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[187] *See Keynote Address by Mr. Hans Corell, Under-Secretary-General for Legal Affairs, Legal Counsel of the United Nations*, CONFERENCE ON STOCKHOLM DECLARATION AND LAW OF THE MARINE ENVIRONMENT (25 May 2002), <https://legal.un.org/ola/media/info_from_lc/LawSea_stockholm.pdf>.
[188] Declaration of the World Climate Conference, World Climate Conference-1 (WCC-1) (12–23 February 1979, Geneva, Switzerland), WORLD METEOROLOGICAL ORGANIZATION, p. 4.
[189] *Id*, p. 3.
[190] *Report of the International Conference on the Assessment of the Role of Carbon Dioxide and of Other Greenhouse Gases in Climate Variations and Associated Impacts*, Villach, 9–15 October 1985, WMO No 661, WORLD CLIMATE PROGRAMME (1986), p. 50.
[191] *Report of the International Conference on the Assessment of the Role of Carbon Dioxide and of Other Greenhouse Gases in Climate Variations and Associated Impacts*, Villach, 9–15 October 1985, WMO No 661, WORLD CLIMATE PROGRAMME (1986), p. 4.

Mr President, members of the Tribunal, it is exactly in this spirit of interactions – and not exclusions – between the climate and the ocean that the global climate regime, as a legal framework, was going to be shaped. These calls for interactions, as matter of good sense, were never purported at diluting or displacing UNCLOS.

The famous Brundtland Report of 1987, entitled, "Our Common Future", confirms this aspect. The Report, drawing on the Villach Conference's findings,[192] expressed concern about the potential consequences of global temperature rise, which, it noted, would lead to sea-level rise. The report also stressed the importance of adopting strategies needed to minimize damage and cope with climate change and rising sea level.[193] But what is more striking is the subsection of the Brundtland Report dedicated to the law of the sea,[194] and in which it was stated that the "UN Conference on the Law of the Sea" represented "the most ambitious attempt ever to provide an internationally agreed regime for the management of oceans."[195] The Report called on all nations to ratify the Law of the Sea Convention,[196] while encouraging the acceptance of the Convention's provisions, especially as regards "those provisions that relate to the environment."[197]

Again, Mr President, allow me to pause briefly here to reiterate a point of fact and of law that became a constant since the starting of the negotiations of UNCLOS and after its conclusion: the significant role that has been given to UNCLOS to address specifically and continually the concerns of the international community with respect to environmental impacts on the ocean in general, and climate change impacts on the ocean in particular. The Brundtland Report, when read as a whole, confirms this interpretation of the function and operation of UNCLOS.

It does not come as a surprise then that the 1992 Rio Conference on Environment and Development, whose foundations were laid down by the Brundtland Report, reinforced this aspect and crystallized the complementary relationship between the emerging climate regime and UNCLOS.

Indeed, the United Nations Framework Convention on Climate Change, the UNFCCC, which was one of the conventions opened for signature in Rio, was among the new generation of "international agreements which respect the interests of all and protect the integrity of the global environmental … system",[198] the global environmental system of which the ocean forms an integral part.

Mr President, if the Rio Conference, which informs the context of the UNFCCC, contemplated that the UNFCCC could contribute to a certain extent to the protection of the ocean – and thus to UNCLOS – it also stressed how the ocean would primarily benefit from UNCLOS. Agenda 21 is revealing at this level. A whole chapter of that programme of action adopted in Rio, and which is dedicated to the ocean, deals with

[192] Julia Kreienkamp, *The Long Road to Paris—The History of the Global Climate Change Regime*, UCL GLOBAL GOVERNANCE INSTITUTE (November 2019), p. 2.
[193] Brundtland Report, *Chapter 7: Energy: Choices for Environment and Development*, WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT (1987) ("Brundtland Report"), ¶¶ 22–23.
[194] Brundtland Report, *Chapter 10: Managing the Commons*, § I.2.5.
[195] Brundtland Report, *Chapter 10: Managing the Commons*, ¶ 49.
[196] Brundtland Report, *Chapter 10: Managing the Commons*, ¶ 55.
[197] Brundtland Report, *Chapter 10: Managing the Commons*, ¶ 55.
[198] The Rio Declaration on Environment and Development (1992) ("1992 Rio Declaration"), Preamble.

such matters as marine environmental protection, the sustainable use and conservation of marine living resources, and management of the marine environment and climate change.[199] The said chapter, which is the longest of Agenda 21, makes references to UNCLOS which is characterized as "*the* international basis upon which to pursue the protection and sustainable development of the marine and coastal environment and its resources."[200]

This statement shows a strong consensus amongst the international community by 1992 –- two years before the entry into force of UNCLOS – that UNCLOS is the appropriate framework at the international level to develop and strengthen rights and obligations of States concerning the protection of the marine environment, including from the adverse effects of climate change.

Transposed to the present advisory proceedings, it confirms, Mr President, distinguished members of the Tribunal, that COSIS, as a matter of international law, is justified in requesting the Tribunal to provide clarity on the precise obligations of States Parties to UNCLOS in an era of climate change. Such a clarification would not only serve the purpose of UNCLOS, it would also serve the implementation of the UNFCCC and related instruments in a manner compatible with UNCLOS.

I pause here, Mr President, to make one brief interpretative point. These developments in the international environmental law context, which I have just taken you through, have crystallized into what we now call the global climate regime. That regime, as it stands, was never intended to be exclusionary or restrictive in its application for addressing issues relating to climate change. It is thus not a *lex specialis* vis-à-vis UNCLOS and would not prevent the Tribunal to rule on precise obligations under UNCLOS.

Lex specialis is even foreign to the global climate regime for the purposes of the present proceedings. Both the UNFCCC and the Paris Agreement recognize the importance of the ocean within the global climate regime. States Parties to the UNFCCC commit to protecting the "climate system for the benefit of present and future generations of humankind."[201] The "climate system" is defined as "the totality of the atmosphere, hydrosphere, biosphere and geosphere and their interactions",[202] and therefore includes the ocean. As set out in article 2 of the UNFCCC, the main objective of the UNFCCC "and any related legal instruments", such as the Paris Agreement, is "the stabilization of greenhouse gas concentrations … at a level that would prevent dangerous anthropogenic interference with the climate system."[203] The Paris Agreement also highlights in its preamble the "importance of ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity."[204]

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[199] *Agenda 21, Chapter 17: Protection of the Oceans, All Kinds of Seas, Including Enclosed and Semi-Enclosed Seas, and Coastal Areas and the Protection, Rational Use and Development of Their Living Resources*, 1992 Rio Declaration.
[200] *Agenda 21, Chapter 17: Protection of the Oceans, All Kinds of Seas, Including Enclosed and Semi-Enclosed Seas, and Coastal Areas and the Protection, Rational Use and Development of Their Living Resources*, ¶ 1 (emphasis added).
[201] United Nations Framework Convention on Climate Change (21 March 1994) ("UNFCCC"), Article 3(2).
[202] UNFCCC, Article 1(3).
[203] UNFCCC, Article 2.
[204] Paris Agreement, Preamble.

Through this clause, Parties to the Paris Agreement found an "encompassing way of referring to the 'integrity of all ecosystems'" and explicitly mentioning the ocean.[205] This particular recital of the Paris Agreement has been regarded as assuming an integrative role and one as conflict of avoidance with other areas of international law and policy,[206] which include the law of the sea as embodied in UNCLOS. It is against this legal background that, for instance, in its 2019 Special Report on the Ocean and Cryosphere in a Changing Climate, the IPCC explicitly references the crucial role of UNCLOS in strengthening obligations on States Parties to take action to combat the main sources of pollution.[207]

Honourable members of the Tribunal, in sum, and in order to conclude the first part of my intervention today, UNCLOS is and remains the applicable law to deal with climate change impacts on the ocean. The request of COSIS focuses on the interpretation of UNCLOS as the constitution of the ocean, and as such, the Tribunal has jurisdiction to render the requested advisory opinion as will be shown by my colleague Professor McGarry tomorrow.

In interpreting UNCLOS, the Tribunal should take into account new international legal developments of significant importance to the ocean and the marine environment and be informed by them. And those developments include necessarily those that are taking place within the global climate regime. UNCLOS is not incompatible with the global climate regime and vice versa.

This brings me to the second part of my submission, Mr President, in which I will stress that the Tribunal can and should take into account the relevant rules, principles and norms of both the UNFCCC and the Paris Agreement when identifying and interpreting specific obligations under UNCLOS related to the protection and preservation of the marine environment from adverse impacts of climate change.

Before that, allow me to recall that both annual Conferences of the Parties to the UNFCCC and IPCC reports[208] put a growing focus on the role of the ocean. By emphasizing the significance of the ocean's vulnerability to the impacts of the current climate crisis, the global climate regime encourages a mutual supportiveness of the two regimes. The Tribunal, in interpreting obligations under UNCLOS, in the context of the present advisory proceedings, and staying within the confines of the UNCLOS framework, can give *effet utile* to all those relevant legal developments that have permeated the global climate regime. In this context, UNCLOS has a role to play as the centre of the legal framework on matters related to marine protection and preservation.

[205] María Pía Carazo, *Contextual Provisions (Preamble and Article 1) in* KLEIN ET AL (EDS), THE PARIS AGREEMENT ON CLIMATE CHANGE: ANALYSIS AND COMMENTARY (OUP 2017), p. 118.
[206] María Pía Carazo, *Contextual Provisions (Preamble and Article 1) in* KLEIN ET AL (EDS), THE PARIS AGREEMENT ON CLIMATE CHANGE: ANALYSIS AND COMMENTARY (OUP 2017), p. 118.
[207] IPCC, *Summary for Policymakers*, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (2019), p. 96.
[208] *See* IPCC, Working Group II, *Summary for Policymakers*, FIFTH ASSESSMENT REPORT: IMPACTS, ADAPTATION, AND VULNERABILITY (2014), p. 4.

Indeed, UNCLOS as the "constitution for the oceans"[209] and a "living treaty"[210] offers a framework to deal, prevent and govern all impacts – including climate change impacts – on the ocean and seas.[211]

Again, Mr President, this should not come as a scoop. As I have already shown, the climate change challenge was not totally unknown at the time of the finalization of the negotiations of UNCLOS. However, even if the severity of the deleterious effects of climate change were to be perceived as a new and recent challenge, as rightly pointed out, UNCLOS has "built-in flexibility intended to enable it to adapt to new challenges unknown at the time it was negotiated."[212]

UNCLOS is the framework for dealing with climate change impacts on the ocean. In the words of the former President of the Tribunal, Judge Paik, the UNCLOS regime is "stable, yet flexible."[213] This means, Mr President, that while UNCLOS was negotiated at a time when the global climate regime per se was not yet established, it "was never meant to be a static or immutable regime",[214] and "must be interpreted and applied with subsequent developments in international law and policy in mind."[215]

Such a potential integrative approach for UNCLOS, is confirmed, in particular, in Part XII of UNCLOS, which is of utmost importance in the present proceedings and which contains explicit rules governing its interactions with other treaties. During the drafting of Part XII, the drafting committee faced the challenge of establishing a comprehensive framework for the protection of the marine environment, which would remain open for future developments and growing knowledge of the ecology of the ocean.[216]

At the same time, they had to build upon the existing international treaties that dealt with protecting and preserving the marine environment in a piecemeal manner.[217] As a consequence, the provisions in Part XII, Section 1, had to be crafted with enough

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[209] Tommy T.B. Koh, *A Constitution for the Oceans: Remarks by Tommy T.B. Koh, of Singapore President of the Third United Nations Conference on the Law of the Sea* (11 December 1982), http://www.un.org/depts/los/convention_agreements/texts/koh_english.pdf.
[210] Virginia Commentary on the United Nations Convention on the Law of the Sea (1982), Volume IV, pp. 36–37; *see also Request for an Advisory Opinion Submitted by the Sub-Regional Fisheries Commission (SRFC)*, Case No. 21, Advisory Opinion, 2015 ITLOS REP. 4 (2 April), Separate Opinion of Judge Lucky, ¶ 18.
[211] UNGA Res. 67/78, Preamble, Oceans and the Law of the Sea (18 April 2013); UNCLOS Preamble.
[212] Jakobsen, Johansen & Nickels, *The Law of the Sea as Part of the Climate-Change Regime Complex in* JOHANSEN ET AL. (EDS), THE LAW OF THE SEA AND CLIMATE CHANGE: SOLUTIONS AND CONSTRAINTS (CUP), pp. 376–377.
[213] Judge Jin-Hyun Paik, *UNCLOS Conference: How healthy is the ocean's constitution? 25 Years of the United Nations Convention on the Law of the Sea Keynote address* (17 October 2019), ITLOS, p. 1.
[214] 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. 2021), p. 83.
[215] Alan Boyle, *Litigating Climate Change under Part XII of the LOSC*, 34 INT'L J. MARINE & COASTAL L. 458, 462 (2019).
[216] Detlef Czybulka, *Article 192: General Obligation*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Prölß ed. 2017) ("PRÖLß COMMENTARY"), p. 1282.
[217] Detlef Czybulka, *Article 192: General Obligation*, PRÖLß COMMENTARY, p. 1282.

flexibility to accommodate both known and unknown anthropogenic pollution and intrusion. This approach made Part XII dynamic rather than static, allowing it to be adaptable to future legal developments.[218] The global climate regime, as governed by the UNFCCC and the Paris Agreement, reflects subsequent developments in international law and policy that inform rights and obligations under UNCLOS, and can therefore serve to complement and support the UNCLOS regime.

This is a matter of good legal sense since the Preamble of the Convention itself clearly states that "the problems of ocean space are closely interrelated and need to be considered as a whole."[219] Interpreted in the ordinary meaning of its terms and in light of the object and purpose of UNCLOS, this passage of the Preamble cannot refer only to factual problems, such as climate change impacts, that the ocean space faces on a daily basis. This passage also refers to the legal problems, the legal problems or issues with which the ocean space is confronted here, again, on a day-to-day basis. And one of those main problems relates without any doubt to the precise legal obligations that are incumbent upon States to prevent, mitigate and adapt to the adverse effects of climate change on the ocean.

Interpreting UNCLOS in light of the UNFCCC and the Paris Agreement is, thus, necessary to achieve the Convention's purpose of addressing "problems of ocean space" in a "closely interrelated" manner and "as a whole".[220] As rightly pointed out by a commentator, "problems of ocean space should not be considered under the Convention as isolated from any other problems of this space."[221]

Honourable members of the Tribunal, the present advisory proceedings definitely allow the Tribunal to address the problems that arise from oceanic climate change – and more specifically the legal problems – in a way that will guide States Parties, and COSIS in particular, on the content and scope of their obligations under UNCLOS to prevent significant harm to the ocean from adverse climate change impacts taking into account the global climate regime.

As I indicated at the beginning of my speech, COSIS prioritizes, in conformity with the Convention, the need for "a legal order for the seas and oceans."[222] The term "legal order" encompasses "all issues relating to the law of the sea."[223]

According to the Proelss commentary, the use of the term "all issues" as relating to the law of the sea, which is referred to at the very beginning of the Convention, indicates that the Convention chose "a comprehensive approach".[224] The global climate regime, because of its relevance to the ocean, is thus an issue relating to the law of the sea, and should be taken into account where relevant and appropriate by the Tribunal in the present advisory proceedings when identifying and interpreting the specific obligations.

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[218] Detlef Czybulka, *Article 192: General Obligation*, PRÖLß COMMENTARY, p. 1282.
[219] UNCLOS, Preamble.
[220] UNCLOS Preamble; G.A. Res. 3067 (XXVIII) (16 November 1973), ¶ 3. *See* COSIS Written Submission, ¶ 353.
[221] Rainer Lagoni, *Preamble*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY (Alexander Prölß ed. 2017), p. 9.
[222] UNCLOS, Preamble.
[223] Rainer Lagoni, *Preamble*, PRÖLß COMMENTARY, p. 10 (referring to UNCLOS, Preamble).
[224] Rainer Lagoni, *Preamble*, PRÖLß COMMENTARY, p. 8.

In this context, “UNCLOS should not be considered in isolation, but within the wider international legal context of other rules of international law.”[225]

Article 237 of Part XII specifically embodies this inherent dynamism of UNCLOS. It “provides a mechanism for integrating the detailed substantive provision of other legal instruments into the general law of the sea within the overall framework of Part XII.”[226]

The significance of this provision, article 237, was underscored by the Annex VII arbitral tribunal in the *South China Sea* arbitration (*Philippines* v *China*), which affirmed that the contents of the obligations in Part XII are informed by the “corpus of international law related to the environment.”[227]

In interpreting article 192, which is “a broadly-formulated general” provision,[228] the arbitral tribunal stated that the content of that obligation ”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.”[229]

The arbitral tribunal in that case examined two external treaties: The Convention on Biological Diversity and the Convention on International Trade in Endangered Species of Wild Fauna and Flora, which respectively postdate and predate UNCLOS, to specify the substantive content of articles 192 and 194.[230]

Besides article 237, article 293 of the Convention on applicable law further “provides for the possibility to have recourse to other rules of international law.”[231]

In interpreting and applying the specific UNCLOS provisions over which it has jurisdiction in a given case, the Tribunal, as stated in the *M/V "Norstar" (Panama* v *Italy*) case, said that it ”is not precluded from applying other provisions of the Convention or other rules of international law not incompatible with the Convention.”[232] In the advisory opinion in *Responsibilities and Obligations of States with Respect to Activities in the Area*, the Seabed Disputes Chamber explicitly referred to article 293 as the applicable law,[233] while examining the obligations of

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[225] Christina Voigt, *The Power of The Paris Agreement in International Climate Litigation*, 32 RECIEL 237 (2023), p. 244.
[226] *Article 237: Obligations under other conventions on the protection and preservation of the marine environment*, UNITED NATIONS CONVENTION ON THE LAW OF THE SEA 1982: A COMMENTARY, vol. IV (Myron H. Nordquist et al. eds. 2013), p. 423.
[227] *South China Sea (Philippines v. China)*, PCA Case No. 2013-19, Award on the Merits (12 July 2016) (“*South China Sea* Award”), ¶ 941.
[228] Detlef Czybulka, *Article 192: General Obligation*, PRÖLß COMMENTARY, p. 1278 (“The initial section comprising Arts. 192 to 196 is entitled ‘General Provisions’, which reflects the wide-ranging scope of the following articles.”)
[229] *South China Sea* Award, ¶ 942.
[230] *South China Sea* Award, ¶¶ 945, 956. *See also Southern Bluefin Tuna (New Zealand v. Japan; Australia v. Japan)*, Award on Jurisdiction and Admissibility (4 August 2000), ¶ 52.
[231] UNCLOS, Article 293.
[232] *M/V “Norstar” (Panama v. Italy*), Case No. 25, Judgment, ITLOS Reports 2018-2019 (10 April 2019), ¶ 137. *See also South China Sea* Award, ¶ 236.
[233] *Responsibilities and Obligations of States with Respect to Activities in the Area*, Case No. 17, Advisory Opinion, 2011 ITLOS REP. 10 (1 February), ¶¶ 51–52.

sponsoring States in the Area. To shed light on these obligations, the Seabed Disputes Chamber relied on various instruments related to environmental protection, such as the Rio Declaration.[234] The same rationale applies to the global climate regime when it comes to assessing and determining precise obligations under UNCLOS in relation to oceanic climate change.

Mr President, honourable members of the Tribunal, these provisions under Part XII of the Convention make clear that, in answering the questions submitted, the Tribunal can take account of the UNFCCC and the Paris Agreement where relevant and appropriate. All States Parties to UNCLOS are also Parties to the UNFCCC and the Paris Agreement, and in COSIS's view, both agreements form part of the general corpus of international law that informs the content of specific obligations under UNCLOS to prevent, mitigate and adapt to oceanic climate change.[235]

Therefore, and contrary to what certain States have suggested in their written statements, considering the global climate regime as *lex specialis* is fundamentally misguided. The global climate regime is neither a *lex specialis* nor a self-contained regime. When applying and interpreting UNCLOS to respond to the questions posed by COSIS, the Tribunal has the power – under UNCLOS – to take into account that regime. The latter – the climate regime – does not prevent the Tribunal from exercising jurisdiction and from rendering an advisory opinion on legal questions that are, at the end of the day, matters of UNCLOS and not matters of the global climate regime per se.

Mr President, distinguished members of the Tribunal, as the guardian of UNCLOS, and to a certain extent, of "the legal order of the oceans", the Tribunal's task is to guide States on their precise obligations under UNCLOS. In today's era, where climate change undeniably threatens the legal order of the ocean, it is imperative to define States' specific obligations with respect to the marine environment in relation to the adverse effects of climate change, and in particular those obligations in relation to the prevention of marine pollution, mitigation and adaptation. This should be done by taking into account the UNFCCC and the Paris Agreement, where relevant and appropriate.

In this pursuit, the Tribunal will orientate the international community in better addressing the challenge of oceanic climate change that arises at the intersection of both the law of the sea and the global climate regimes.
As the constitution of the ocean, UNCLOS has to play its part and allow the international legal framework for the protection and preservation of the marine environment to be more predictable. This is both a legal and scientific necessity.

Mr President, honourable members of the Tribunal, this will conclude my presentation on behalf of COSIS. My colleagues tomorrow will set out COSIS's submissions on the two questions before the Tribunal. I thank you for your kind attention.

[234] *Area* Advisory Opinion, ¶¶ 125–130, 135.
[235] *See South China Sea (Philippines v. China)*, PCA Case No. 2013-19, Award on the Merits (12 July 2016), ¶ 956.

THE PRESIDENT: Thank you, this brings us to the end of this afternoon's sitting. The hearing will resume tomorrow at 10:00 to hear further oral arguments of the Commission of Small Island States on Climate Change and International Law. The sitting is now closed.

(The sitting closed)