

INTERNATIONAL TRIBUNAL FOR THE LAW OF THE SEA

(CASE NO. 31)

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

WRITTEN STATEMENT SUBMITTED TO THE INTERNATIONAL  
TRIBUNAL FOR THE LAW OF THE SEA BY THE UNITED NATIONS  
ENVIRONMENT PROGRAMME (“UNEP”)

In Response to the Invitation Contained in Order No. 2022/4 dated  
16 December 2022

16 JUNE 2023

**WRITTEN STATEMENT SUBMITTED TO THE INTERNATIONAL  
TRIBUNAL FOR THE LAW OF THE SEA BY THE UNITED NATIONS  
ENVIRONMENT PROGRAMME (“UNEP”)**

1. On 12 December 2022, a Request for an advisory opinion under article 138 of the Rules of the International Tribunal for the Law of the Sea (the *Tribunal*) was submitted to the Tribunal by the Commission of Small Island States on Climate Change and International Law (the *Commission*) pursuant to article 2(2) of the Agreement for the Establishment of the Commission (the *Agreement*).
  
2. On 16 December 2022, the Tribunal adopted an Order No. 2022/4 on the conduct of the proceedings in Case No. 31 on the 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*). By that Order, the Tribunal, *inter alia*, “[i]nvite[d], in accordance with article 133, paragraph 3, of the Rules of the Tribunal, the States Parties to the Convention, the Commission and the other organizations . . . to present written statements on the questions submitted to the Tribunal for an advisory opinion”.
  
3. On 19 December 2022, pursuant to the said Order, UNEP was invited to present a written statement (*Statement*) on the questions submitted to the Tribunal for an advisory opinion. Accordingly, the following Statement is submitted.

# CHAPTER 1

## INTRODUCTION

4. UNEP was established in 1972, in furtherance of the 1972 Declaration of the United Nations Conference on the Environment held in Stockholm.<sup>1</sup> UNEP's mandate was set out in General Assembly resolution 2997 (XXVII) and subsequently reaffirmed in Agenda 21 of the 1992 Rio Declaration on Environment and Development (the *Rio Declaration*), and the 1997 Nairobi Declaration on the Role and Mandate of UNEP (the *Nairobi Declaration*).<sup>2</sup> The Nairobi Declaration confirmed UNEP as “the leading global environmental authority that sets the global environmental agenda, that promotes the integrated and coherent implementation of the environmental dimension of sustainable development within the United Nations system and that serves as an authoritative advocate for the global environment”.<sup>3</sup> Following the United Nations Conference on Sustainable Development in 2012, Member States revised the governing structure of UNEP and established the United Nations Environment Assembly (*UNEA*) as UNEP's new governing body.<sup>4</sup> The UNEA has universal membership of UN Member States, ensuring wide participation in decision making on the global environment agenda.

5. UNEP's mandate includes, *inter alia*: the analysis of the state of the global environment; the promotion of international cooperation and action to address environmental threats, using the best scientific and technical capabilities available; the furtherance of the development of international environmental law; and the advancement of the implementation of and compliance with agreed international norms and policies.<sup>5</sup> Pursuant to this mandate, and as referred to in further detail in this Statement:

- (a) UNEP publishes analysis and scientific reports on the state of the global environment, including its flagship report series titled the *Global Environmental Outlook (GEO)*;

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<sup>1</sup> Report of the United Nations Conference on the Human Environment, Stockholm, Chapter I, *Declaration of the United Nations Conference on the Human Environment*, 5-16 June 1972, **Exhibit 1**.

<sup>2</sup> United Nations General Assembly, Resolution A/RES/27/2997, 15 December 1972, **Exhibit 2**; Nairobi Declaration on the Role and Mandate of the United Nations Environment Programme, UNEP: Report of the Governing Council on the work of its 19th session, Annex I, Decision No. 19/1, 17 June 1997 (*Nairobi Declaration*), **Exhibit 3**.

<sup>3</sup> Nairobi Declaration, **Exhibit 3**, para. 2.

<sup>4</sup> United Nations General Assembly, Resolution A/RES/67/213, 21 December 2012, **Exhibit 4**.

<sup>5</sup> Nairobi Declaration, **Exhibit 3**, para. 3.

- (b) UNEP convenes or facilitates science-policy platforms that bring together scientists, governments, industry, civil society, and international organizations to promote convergence between science and governmental decision-making, including the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (*IPBES*) and the Intergovernmental Panel on Climate Change (*IPCC*) (jointly hosted by UNEP and the World Meteorological Organization (*WMO*)); and
- (c) UNEP administers or provides secretariat functions for multilateral environmental agreements (*MEAs*), including the Convention on Biological Diversity (*CBD*) and a number of Regional Seas Conventions and Action Plans (*RSCAPs*).<sup>6</sup>

6. In light of its position as the leading global environmental authority, as well as its mandate to promote the use of best available science in environmental policy and decision-making and the environmental rule of law, UNEP submits this Statement on the questions posed to the Tribunal regarding the specific obligations of States Parties to the 1982 United Nations Convention on the Law of the Sea (*UNCLOS* or the *Convention*). In particular, UNEP seeks to assist the Tribunal as to how international law should be informed by climate science.

7. The remainder of this Statement is organized as follows:

- (a) **Chapter 2** discusses the centrality of climate science to States' efforts to address the causes and impacts of climate change. It also identifies and summarizes the most up-to-date conclusions from climate science relevant to the interpretation and application of States' obligations under international law to protect and preserve the marine environment.
- (b) **Chapter 3** identifies rules of international law that appear to be relevant to the Tribunal's advisory opinion. These include principles and approaches

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<sup>6</sup> There are three types of RSCAPs, covering 18 different regions: (i) UNEP-administered RSCAPs covering seven regions; (ii) non-UNEP administered RSCAPs covering seven regions, which have been established under the auspices of UNEP; and (iii) independent RSCAPs covering four regions, which have not been established by UNEP, but cooperate with the Regional Seas Programme and attend regular meetings. These RSCAPs are discussed in further detail in Chapter 3 of this Statement.

of international environmental law that are reflected in MEAs administered by UNEP or established under its auspices, as well as existing and emerging human-rights norms.

## CHAPTER 2

### CLIMATE SCIENCE

8. Science is of course central to informing the global response to the causes and impacts of climate change. The 195 States Parties to the Paris Agreement have committed to addressing the causes and impacts of climate change on the basis of “the best available science”;<sup>7</sup> and at the 3<sup>rd</sup> Conference of the Parties serving as the Meeting of the Parties to the Paris Agreement in November 2021, States Parties again “[r]ecogniz[ed] the importance of the best available science for effective climate action and policymaking”.<sup>8</sup> The central role of science was further reiterated at the recent 5<sup>th</sup> Session of the UNEA in March 2022, where 196 Member States “recognize[d] the importance of the best available science for effective action and policymaking on climate change, biodiversity and pollution”.<sup>9</sup> The findings of an international court or tribunal on States’ obligations to address the causes and impacts of climate change should similarly be based on the best available climate science.

9. In the remainder of this Chapter, UNEP: notes, by way of introduction, that international courts and tribunals have repeatedly relied on scientific evidence to interpret and apply international environmental law, including in respect of the Convention (**I**); describes the role and work of the IPCC as the world’s most authoritative source on climate science (**II**); and summarizes the most recent and relevant conclusions from climate science (**III**).

#### I. The use of scientific evidence by international courts and tribunals

10. International courts and tribunals have used scientific information to interpret and apply States’ obligations under international law, specifically with respect to interpreting the scope of a legal obligation (**A**) and identifying breach of a legal obligation (**B**). In UNEP’s respectful submission, these examples illustrate how climate science might be used by the Tribunal to interpret and apply relevant provisions of the Convention.

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<sup>7</sup> Paris Agreement to the United Nations Framework Convention on Climate Change, 12 December 2015, preamble, para. 4, Article 4(1) (mitigation), Article 7(5) (adaptation).

<sup>8</sup> *Glasgow Climate Pact*, Decision 1/CMA.3, Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement, FCCC/PA/CMA/2021/10/Add.1, 13 November 2021, **Exhibit 5**, para. 1.

<sup>9</sup> United Nations Environment Assembly, Ministerial Declaration No. UNEP/EA.5/HLS.1, 7 March 2022, **Exhibit 6**, para. 18.

A. The use of scientific evidence to interpret the scope of a legal obligation

11. Scientific evidence ought to inform the interpretation of the content and scope of provisions of the Convention, of other instruments, and under customary international law. This has been recognized by the Tribunal. For example, in *Dispute concerning delimitation of the maritime boundary between Bangladesh and Myanmar in the Bay of Bengal (Bangladesh/Myanmar)*, the Tribunal held that UNCLOS article 76 (on the definition of the continental shelf) “contains elements of law and science” and therefore “its proper interpretation and application requires both legal and scientific expertise”.<sup>10</sup>

12. The Tribunal has also recognized that States’ obligations under international law may be dynamic. For example, in *Request for Advisory Opinion submitted by the Sub-Regional Fisheries Commission (SRFC)*, the Tribunal held that under UNCLOS article 63(4), in their Exclusive Economic Zones, States “must ensure that . . . conservation and management measures are based on the best scientific evidence available”.<sup>11</sup> Similarly, with respect to the “due diligence” obligation of a flag State to ensure its fishing vessels do not act in a way that undermines the flag State’s obligations under UNCLOS to protect and preserve the marine environment, the Tribunal indicated that “‘due diligence’ is a variable concept” that may evolve over time, based on new scientific or technological knowledge.<sup>12</sup>

13. In a similar vein, the World Trade Organization Appellate Body in *United States – Import Prohibition of Certain Shrimp and Shrimp Products*, noted that “the generic term ‘natural resources’ in article XX(g) [of the GATT] is not ‘static’ in its content or reference but is rather ‘by definition, evolutionary’”.<sup>13</sup> The Appellate Body relied on

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<sup>10</sup> *Delimitation of the maritime boundary in the Bay of Bengal (Bangladesh/Myanmar)*, Judgment, 14 March 2012, *ITLOS Reports 2012*, para. 411.

<sup>11</sup> *Request for Advisory Opinion submitted by the Sub-Regional Fisheries Commission*, Advisory Opinion, 2 April 2015, *ITLOS Reports 2015*, paras. 208(ii), 219(6). *See also* Separate Opinion by Judge Lucky, para. 18 (“The 1982 Convention and the Statute of the Tribunal are ‘living instruments’. This means that they ‘grow’ and adapt to changing circumstances. An act/ statute is always ‘speaking’. The law of the sea is not static. It is dynamic and, therefore, through interpretation and construction of the relevant articles a court or tribunal can adhere and give positive effect to this dynamism. Since 1982, technology has advanced and therefore in my view judges must take a robust approach and apply the law in a legal but pragmatic way.”).

<sup>12</sup> *Request for Advisory Opinion submitted by the Sub-Regional Fisheries Commission*, Advisory Opinion, 2 April 2015, *ITLOS Reports 2015*, para. 132 (citing *Responsibilities and obligations of States with respect to activities in the Area*, Advisory Opinion, 1 February 2011, *ITLOS Reports 2011*, para. 117).

<sup>13</sup> *United States – Import Prohibition of Certain Shrimp and Shrimp Products*, Report of the Appellate Body, WT/DS58/AB/R, 12 October 1998, para. 130.

“modern biological sciences”, including a report by the UN World Commission on Environment and Development, to interpret the term “exhaustible natural resources” under article XX(g) as covering both non-living and living resources, as “[l]iving resources are just as ‘finite’ as petroleum, iron ore and other non-living resources”.<sup>14</sup>

14. Scientific evidence may be directly relevant to the precise quantitative content of a legal obligation. A central issue in the *Indus Waters Kishenganga Arbitration (Pakistan v. India)* was whether India was required to maintain a certain minimum flow of water in the Kishenganga/Neelum River, in constructing a hydroelectric dam upstream of Pakistan. In its Partial Award, the tribunal held that “States have ‘a duty to prevent, or at least mitigate’ significant harm to the environment when pursuing large-scale construction activities”; and that, to give effect to this duty, the tribunal would identify, in quantified terms, what minimum flow India was required to maintain. The tribunal traversed extensive expert evidence on technical and scientific matters, including an “extensive analysis, attempting to capture complex interactions within the river ecosystem” submitted by Pakistan.<sup>15</sup> In its Final Award, the tribunal decided that the minimum flow must be such as to “mitigate adverse effects” to Pakistan, having due regard to the customary international obligation of preventing transboundary environmental harm, while also balancing India’s right to development. Drawing on the scientific evidence before it, the tribunal concluded that India was under an obligation to maintain a minimum water flow 9 m<sup>3</sup>/s.<sup>16</sup>

B. The use of scientific evidence to identify breach of a legal obligation

15. International courts and tribunals have also relied on scientific data and analysis in assessing whether a legal obligation has been complied with. In *The South China Sea Arbitration (Philippines v. China)*, the Annex VII tribunal considered whether the

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<sup>14</sup> *United States – Import Prohibition of Certain Shrimp and Shrimp Products*, Report of the Appellate Body, WT/DS58/AB/R, 12 October 1998, paras. 128-131. In its interpretation, the Appellate Body also considered that international conventions and declarations, including the Convention, “make frequent references to natural resources as embracing both living and non-living resources”.

<sup>15</sup> *Indus Waters Kishenganga Arbitration (Pakistan v. India)*, PCA Case No. 2011-01, Final Award, 20 December 2013, para. 98.

<sup>16</sup> *Indus Waters Kishenganga Arbitration (Pakistan v. India)*, PCA Case No. 2011-01, Final Award, 20 December 2013, paras. 89-116.



environmental obligations set out in Part XII of the Convention, particularly Articles 192 and 194, applied to certain construction and fishing activities in the South China Sea.

- (a) The tribunal held that article 194, concerning the protection and preservation of “rare or fragile ecosystems” was engaged, because scientific evidence showed that the marine environments where the activities took place constituted “rare or fragile ecosystems” and habitats of “depleted, threatened or endangered species”.<sup>17</sup> The tribunal went on to find, based on scientific evidence, that there had been widespread harvesting of threatened species, and thus the obligation to protect and preserve these rare or fragile ecosystems had not been complied with.<sup>18</sup> The tribunal also referred to expert evidence that the use of cyanide and dynamite fishing was “highly destructive” and constituted “pollution” of the marine environment within the meaning of the Convention.<sup>19</sup>
- (b) The tribunal also relied upon extensive scientific evidence on the environmental impact of construction activities in the South China Sea, including that certain construction activities had “impacted reefs on a scale unprecedented in the region”<sup>20</sup> that would “take decades to centuries to recover”.<sup>21</sup> The expert evidence also touched on secondary impacts, including diminished fish stocks and “cascading effects” for the ecology of the South China Sea.<sup>22</sup>

16. Similarly, in *Pulp Mills on the River Uruguay (Argentina v. Uruguay)*, the International Court made extensive reference to scientific evidence and expert studies to determine whether there had been a breach of substantive obligations to “protect and preserve the aquatic environment and, in particular, to prevent its pollution” set out in the

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<sup>17</sup> *The South China Sea Arbitration (The Republic of Philippines v. The People’s Republic of China)*, PCA Case No. 2013-19, Award, 12 July 2016, para. 945.

<sup>18</sup> *The South China Sea Arbitration (The Republic of Philippines v. The People’s Republic of China)*, PCA Case No. 2013-19, Award, 12 July 2016, paras. 850-851, 953-960.

<sup>19</sup> *The South China Sea Arbitration (The Republic of Philippines v. The People’s Republic of China)*, PCA Case No. 2013-19, Award, 12 July 2016, para. 970 (citing UNCLOS, Articles 1 and 194).

<sup>20</sup> *The South China Sea Arbitration (The Republic of Philippines v. The People’s Republic of China)*, PCA Case No. 2013-19, Award, 12 July 2016, para. 978.

<sup>21</sup> *The South China Sea Arbitration (The Republic of Philippines v. The People’s Republic of China)*, PCA Case No. 2013-19, Award, 12 July 2016, para. 978.

<sup>22</sup> *The South China Sea Arbitration (The Republic of Philippines v. The People’s Republic of China)*, PCA Case No. 2013-19, Award, 12 July 2016, para. 979.

1975 Statute of the River Uruguay, as a result of Uruguay's operation of a paper mill factory. To assess the existence of a breach, the Court considered scientific evidence of pollution of the river waters through the emission of phosphorus, phenolic substances, and other chemicals, and evidence of harm caused to the aquatic environment as a result of the presence of those chemicals in the river, including a decline in dissolved oxygen concentrations.<sup>23</sup> The Court considered each chemical in turn, by reference to detailed scientific reports produced by each party, ultimately concluding that Uruguay had complied with its obligations.<sup>24</sup>

17. Scientific evidence may also go to determining the nature and extent of harm resulting from a breach, as well as in prescribing the appropriate reparation. An early example is the *Trail Smelter Arbitration (United States v. Canada)*, which concerned a claim by the United States for air pollution caused by a Canadian-based smelting operation. To determine “the cause” and “the degree of damage” resulting from the emission of sulphur dioxide from the smelting factory, the tribunal considered carefully a series of scientific and technical data, including a “careful study of the time, duration, and intensity of the fumigations recorded”, and took into account reports by technical assessors appointed by the tribunal and scientific experts designated by the parties.<sup>25</sup> In its final award, the tribunal also reviewed an extensive “investigation of meteorological and other conditions which have been found to be of significance in smoke behavior”, which included factors such as “wind directions and velocity, atmospheric temperatures, lapse rates, turbulence, geostrophic winds, barometric pressures, sunlight and humidity”. Relying upon this body of scientific evidence, the tribunal prescribed an emissions control regime to be undertaken by the smelting company.<sup>26</sup> Importantly, it also indicated that the regime could be modified if “scientific advance in the control of fumes should make it possible and desirable”.<sup>27</sup>

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<sup>23</sup> *Pulp Mills on the River Uruguay (Argentina v. Uruguay)*, 20 April 2010, *ICJ Reports 2010*, para. 237.

<sup>24</sup> *Pulp Mills on the River Uruguay (Argentina v. Uruguay)*, 20 April 2010, *ICJ Reports 2010*, paras. 229-265.

<sup>25</sup> *Trail Smelter Arbitration (United States v. Canada)*, Awards, 16 April 1938 and 11 March 1941, *RIAA*, pp. 1922-1931 and 1958-1959.

<sup>26</sup> *Trail Smelter Arbitration (United States v. Canada)*, Awards, 16 April 1938 and 11 March 1941, *RIAA*, pp. 1968-1974.

<sup>27</sup> *Trail Smelter Arbitration (United States v. Canada)*, Awards, 16 April 1938 and 11 March 1941, *RIAA*, p. 1973.

18. UNEP turns next to describing the work of the IPCC, as an important source of climate science relevant to the Tribunal’s consideration of this matter.

## II. The Intergovernmental Panel on Climate Change

19. In 1988, UNEP together with the WMO supported the establishment of the IPCC as an intergovernmental body of the United Nations. The IPCC’s mandate is to assess the risk of climate change caused by human activities, its potential impacts, and possible options for prevention.<sup>28</sup> The IPCC has 195 Member Countries and is governed by an elected bureau of scientists (the *IPCC Bureau*) who serve for a 6-to-7-year assessment cycle, during which time the IPCC publishes a new round of reports reflecting the latest climate science. The findings of the IPCC are regarded by the international community as authoritative statements of climate science, as may be seen in multiple resolutions of the General Assembly<sup>29</sup> and the UNEA.<sup>30</sup>

20. The IPCC has three working groups and a task force dedicated to reporting on the state of knowledge on climate change. These are called “Assessment Reports”. The IPCC does not produce original research: its working groups examine relevant scientific literature, relying on thousands of scientists and other experts as peer reviewers. Peer reviews are compiled into “Assessment Reports” for policy makers and the general public. To prepare the Assessment Reports, the IPCC Bureau elects a panel of scientists as lead authors from a list of names nominated by governments and observer organisations. The IPCC reports undergo multiple rounds of review by experts and governments and are “accepted” or “adopted” by the IPCC in plenary sessions or by the

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<sup>28</sup> Principles Governing the Work of the Intergovernmental Panel on Climate Change, 1 October 1998, **Exhibit 7**, para. 2.

<sup>29</sup> *See, e.g.*, United Nations General Assembly, Resolution A/RES/77/165, 14 December 2022, **Exhibit 8**, preamble at p. 4; United Nations General Assembly, Resolution A/RES/76/205, 17 December 2021, **Exhibit 9**, preamble at p. 4, para. 6; United Nations General Assembly, Resolution A/RES/73/232, 20 December 2018, **Exhibit 10**, preamble at p. 4; United Nations General Assembly, Resolution A/RES/74/219, 19 December 2019, **Exhibit 11**, preamble at p. 3; United Nations General Assembly, Resolution A/RES/75/217, 21 December 2020, **Exhibit 12**, preamble at p. 4; United Nations General Assembly, Resolution A/RES/68/212, 20 December 2013, **Exhibit 13**, preamble at p. 2, para. 9; United Nations General Assembly, Resolution A/RES/63/32, 26 November 2008, **Exhibit 14**, preamble at p. 2, para. 2; United Nations General Assembly, Resolution A/RES/64/73, 7 December 2009, **Exhibit 15**, para. 8; United Nations General Assembly, Resolution A/RES/65/159, 20 December 2010, **Exhibit 16**, preamble at p. 2, para. 8; United Nations General Assembly, Resolution A/RES/62/86, 10 December 2007, **Exhibit 17**, preamble at pp. 2, 3.

<sup>30</sup> *See, e.g.*, United Nations Environment Assembly, Resolution UNEP/EA.5/Res.5, 2 March 2022, **Exhibit 18**, preamble, para. 2.

relevant Working Group. Each report is summarized into a “Summary for Policymakers” document, which is approved line-by-line in a plenary session of government officials representing IPCC Member Countries.<sup>31</sup>

21. The latest Assessment Report cycle of the IPCC commenced in 2015 and concluded in 2023 (the *Sixth Assessment Report*, or *AR6*). AR6 encompasses reports by the three working groups (the *2021 Working Group I report on Climate Change 2021: The Physical Science Basis (AR6 WGI Report)*<sup>32</sup>); the *2022 Working Group II report on Climate Change 2022: Impacts, Adaptation and Vulnerability (AR6 WGII Report)*<sup>33</sup>; and the *2022 Working Group III report on Mitigation of Climate Change (AR6 WGIII Report)*<sup>34</sup>),<sup>35</sup> as well as three special reports (the *2018 Special Report on Global Warming of 1.5°C (Special Report on 1.5°C)*<sup>36</sup>); the *2019 Special Report on Climate Change and Land (Special Report on Climate Change and Land)*<sup>37</sup>; and the *2019 Special Report on the Ocean and Cryosphere in a Changing Climate (Special Report on the Ocean and*

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<sup>31</sup> Appendix A to the Principles Governing the Work of the Intergovernmental Panel on Climate Change: Procedures for the Preparation, Review, Acceptance, Adoption, Approval and Publication of IPCC Reports, 1 October 1998, **Exhibit 19**, Sections 4.3.4, 4.3.5 4.4, 4.5, 4.6.

<sup>32</sup> IPCC, 2021: *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, V. Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.) (*AR6 WGI Report*), **Exhibit 20**.

<sup>33</sup> IPCC, 2022: *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, and B. Rama (eds.) (*AR6 WGII Report*), **Exhibit 21**.

<sup>34</sup> IPCC, 2022: *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, and J. Malley (eds.) (*AR6 WGIII Report*), **Exhibit 22**.

<sup>35</sup> The Working Group Reports were accepted by the IPCC or the relevant Working Group *See* AR6 WGI Report, **Exhibit 20**, preface, p. ix (“accepted during the 54<sup>th</sup> Session of the IPCC”); AR6 WGII Report, **Exhibit 21**, preface, p. x (“accepted at the 12<sup>th</sup> Session of IPCC Working Group II”); AR6 WGIII Report, **Exhibit 22**, preface, p. vii (“accepted by the Panel at its 56<sup>th</sup> Session”).

<sup>36</sup> IPCC, 2018: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*, V. Masson-Delmotte, P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.) (*Special Report on 1.5°C*), **Exhibit 23**.

<sup>37</sup> IPCC, 2019: *Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*, P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.-O. Pörtner, D.C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, and J. Malley (eds.) (*Special Report on Climate Change and Land*), **Exhibit 25**.

*Cryosphere*<sup>38</sup>)).<sup>39</sup> AR6 concluded in March 2023 with a synthesis report that draws together key findings of all reports published in the Sixth Assessment cycle (the *AR6 Synthesis Report*<sup>40</sup>).<sup>41</sup>

22. Section III of this Chapter sets out relevant findings from these reports, including relevant “confidence” or “probability” assessments made by the IPCC in its review of the latest scientific literature. These are references to the likelihood that a particular statement or observation can be relied on as fact. Specifically:

- (a) *Confidence levels* are qualitative expressions of whether a scientific statement is to be regarded as an established fact, depending on the type, amount, quality, and consistency of evidence available. Confidence is expressed using five qualifiers: very low, low, medium, high, and very high. Confidence increases as the supporting evidence becomes more robust and scientific consensus increases.
- (b) *Probabilities* are quantitative expressions of whether a scientific statement is to be regarded as an established fact, based on statistical analysis of observations, model results, or expert judgment. Probabilities are expressed using qualifiers such as virtually certain (99–100% probability); very likely (90–100%); likely (66–100%); more likely than not (>50–100%); about as likely as not (33–66%); unlikely (0–33%); very unlikely (0–10%); and exceptionally unlikely (0–1%).<sup>42</sup>

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<sup>38</sup> IPCC, 2019: *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*, H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegria, M. Nicolai, A. Okem, J. Petzold, B. Rama, and N.M. Weyer (eds.) (*Special Report on the Ocean and Cryosphere*), **Exhibit 24**.

<sup>39</sup> The Special Reports were accepted by the IPCC in its plenary sessions. See Special Report on 1.5°C, **Exhibit 23**, preface, p. viii (“accepted at the 48<sup>th</sup> Session of the IPCC”); Special Report on Climate Change and Land, **Exhibit 25**, preface, p. viii (“accepted at the 50<sup>th</sup> Session of the IPCC”); Special Report on the Ocean and Cryosphere, **Exhibit 24**, preface, pp. ix and x (“accepted by the IPCC at its 51<sup>st</sup> Session”).

<sup>40</sup> At the time of writing, the Full Volume of the AR6 Synthesis Report has not yet been published. See IPCC, 2023: *Climate Change 2023: Synthesis Report. A Report of the Intergovernmental Panel on Climate Change, Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, H. Lee and J. Romero (eds.) (Adopted Draft Version; unpublished) (*AR6 Synthesis Report*), **Exhibit 26**.

<sup>41</sup> The AR6 Synthesis Report was adopted by the IPCC in its 58<sup>th</sup> Session. See Intergovernmental Panel on Climate Change, Decision IPCC-LVIII-3, **Exhibit 27**.

<sup>42</sup> M.D. Mastrandrea, C.B. Field, T.F. Stocker, O. Edenhofer, K.L. Ebi, D.J. Frame, H. Held, E. Kriegler, K.J. Mach, P.R. Matschoss, G.-K. Plattner, G.W. Yohe, F.W. Zwiers, *Guidance note for lead authors of the IPCC Fifth Assessment Report on consistent treatment of uncertainties*.

23. As one would expect, confidence and probability levels have changed over the years, as more evidence has been gathered and models have increased in sophistication. For example, robust detection of global warming was not yet possible in 1990 but has been characterized as *unequivocal* (i.e., virtually certain) by the IPCC since 2007.<sup>43</sup> Scientists have also stressed the importance of viewing confidence and probability levels within the context of the severity and magnitude of the potential harm in question. If a threatened harm is extreme in scale and severity, action may be warranted even if the confidence level is low. This is consistent with the precautionary principle or approach, discussed further at Chapter III.C of this Statement.

### III. The best available climate science

24. This Section identifies findings and conclusions of reports published by the IPCC that UNEP considers relevant to understanding the following issues raised by the questions before the Tribunal:

- (a) The meaning of “anthropogenic greenhouse gas emissions” and whether they constitute “pollution of the marine environment” within the meaning of article 1(4) of the Convention<sup>44</sup> (A);

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*Intergovernmental Panel on Climate Change* (2010), **Exhibit 28**. See also Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 1.9.2, Figure 1.4, p. 106.

<sup>43</sup> IPCC, 2007: *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, R.K. Pachauri and A. Reisinger (eds.), **Exhibit 29**, Section 1.1, p. 30 (“Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level”). See also AR6 WGI Report, **Exhibit 20**, Chapter 1, FAQ 1.1 (“Understanding of climate system processes has also improved. For example, in 1990 very little was known about how the deep ocean responds to climate change. Today, reconstructions of deep-ocean temperatures extend as far back as 1871. We now know that the oceans absorb most of the excess energy trapped by greenhouse gases and that even the deep ocean is warming up. As another example, in 1990, relatively little was known about exactly how or when the gigantic ice sheets of Greenland and Antarctica would respond to warming. Today, much more data and better models of ice-sheet behaviour reveal unexpectedly high melt rates that will lead to major changes within this century, including substantial sea level rise.”).

<sup>44</sup> UNCLOS, Article 1(4) (“‘pollution of the marine environment’ means the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities”).

- (b) The meaning of “deleterious effects that result or are likely to result from climate change,” including “ocean warming and sea level rise, and ocean acidification” (**B**); and
  - (c) The circumstances relevant to interpreting the requirement to “prevent, reduce and control” the impacts of climate change, as well as “protect[ing] and preserv[ing] the marine environment in relation to climate change impacts” (**C**).
25. While the majority of the discussion of climate science in this Section draws from the IPCC’s reports, UNEP also refers to a limited number of other reports published by UNEP or by scientific bodies convened by or under the auspices of IPBES.

#### A. Greenhouse gas emissions and global warming

26. Greenhouse gases (**GHGs**) are atmospheric gases responsible for causing global warming. GHGs cause global warming because they absorb radiation and trap heat in the atmosphere.<sup>45</sup> As the concentration of GHGs in the atmosphere increases, so does the amount of heat energy trapped in the atmosphere and reflected back to the Earth, thereby changing the climate.<sup>46</sup> The most common GHGs are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O). Less prevalent but powerful GHGs include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF<sub>4</sub>).<sup>47</sup>
27. GHG emissions by humans (referred to as “anthropogenic” GHG emissions), particularly emissions of CO<sub>2</sub> and methane, have increased since the Industrial Revolution (*i.e.*, 1850 to 1900).<sup>48</sup> Indeed, the average annual GHG emissions during 2010 to 2019 was higher than in any previous decade,<sup>49</sup> and in 2019, atmospheric CO<sub>2</sub>

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<sup>45</sup> AR6 WGI Report, **Exhibit 20**, Annex VII, Glossary, p. 2232 (“Greenhouse gases (GHGs), clouds and some aerosols absorb terrestrial radiation emitted by the Earth’s surface and elsewhere in the atmosphere. These substances emit infrared radiation in all directions”).

<sup>46</sup> AR6 WGI Report, **Exhibit 20**, Annex VII, Glossary, p. 2232 (“An increase in the concentration of GHGs increases the magnitude of [the greenhouse] effect”).

<sup>47</sup> AR6 Synthesis Report, **Exhibit 26**, Annex I, Glossary, p. 9 (“Greenhouse gases”).

<sup>48</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.1, p. 8.

<sup>49</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.1, p. 8. *See also* UNEP, 2022: *Emissions Gap Report 2022: The Closing Window – Climate crisis calls for rapid transformation of societies (Emissions Gap Report)*, **Exhibit 30**, Section 2.2.1, p. 5 (While the rate of growth of GHG emissions in the past decade has slowed compared to the previous decade, average GHG emissions in the last decade were the highest on record).

concentrations were higher than at any time in at least two million years (*high confidence*) and concentrations of other GHGs were higher than at any time in at least the past 800,000 years (*very high confidence*).<sup>50</sup> These are concentrations far exceeding natural multi-millennial changes (*very high confidence*).<sup>51</sup>

28. In 2019, approximately 34% of global GHG emissions came from the energy sector (*high confidence*), with other emissions coming from industry (24%), agriculture, forestry and other land use (22%), transport (15%), and buildings (6%).<sup>52</sup> Relative contribution from different sources to these emissions varies significantly across the world. The 10% of households with the highest per-capita emissions contribute 34 to 45% of global consumption-based household GHG emissions, while the bottom 50% contribute only 13 to 15% (*high confidence*).<sup>53</sup> Least Developed Countries (*LDCs*) and Small Island Developing States (*SIDS*) have much lower per-capita emissions than the global average and have contributed least to current concentrations of GHG emissions.<sup>54</sup>

29. Scientists already observe the impacts of increased GHG emissions, and these impacts are discussed in further detail below.<sup>55</sup> It is now *unequivocal* that the release of GHGs into the atmosphere by humans has already caused an average of approximately 1.1°C of global warming since between 1850 and 1900.<sup>56</sup> Future global warming is modelled by the IPCC using quantitative projections of different “scenarios” or

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<sup>50</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.1, p. 6. *See also* Emissions Gap Report 2022, **Exhibit 30**, Section 2.2.1, p. 5 (“Total global GHG emissions averaged 54.4 gigatons of CO<sub>2</sub> equivalent (GtCO<sub>2e</sub>) between 2010 and 2019, and reached a high in 2019.”), Section 2.2.1, p. 6 (“Global CO<sub>2</sub> concentrations continued to grow from 2019 to 2020”).

<sup>51</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.1, pp. 6-7. *See also* IPBES, 2019: *Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*, S. Díaz, J. Settele, E.S. Brondízio, H.T. Ngo, M. Guèze, J. Agard, A. Arneeth, P. Balvanera, K.A. Brauman, S.H.M. Butchart, K.M.A. Chan, L.A. Garibaldi, K. Ichii, J. Liu, S.M. Subramanian, G.F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razzaque, B. Reyers, R. Roy Chowdhury, Y.J. Shin, I.J. Visseren-Hamakers, K.J. Willis, and C.N. Zayas (eds.) (*IPBES 2019 Global Assessment Report*), **Exhibit 31**, Section 2.1.17, pp. 126-127.

<sup>52</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.1, p. 10.

<sup>53</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.1, p. 10.

<sup>54</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.1, p. 10. *See also* Emissions Gap Report, **Exhibit 30**, Section 2.3, p. 7 (“The top seven emitters (China, the EU27, India, Indonesia, Brazil, the Russian Federation and the United States of America) plus international transport accounted for 55 per cent of global GHG emissions in 2020. Collectively G20 members are responsible for 75 per cent of global GHG emissions. Per capita Eight major emitters – seven G20 members and international transport – contributed more than 55 per cent of total global GHG emissions in 2020: China, the United States of America, the European Union (27), India, Indonesia, Brazil, the Russian Federation, and international transport (figure 2.2). The G20 as a whole contributed 75 per cent of the total.”).

<sup>55</sup> *See below*, Chapter 2, Section III.B.

<sup>56</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.1, p. 6.



“pathways” of future concentrations of global GHG emissions.<sup>57</sup> Different GHG emissions pathways lead to different levels of global warming above pre-industrial levels.<sup>58</sup>

30. The IPCC’s models show that the risks and projected adverse impacts from climate change will escalate with every increment of global warming (*very high confidence*).<sup>59</sup> In addition, with further warming, climate change risks will become increasingly complex and more difficult to manage: in particular, multiple climatic and non-climatic risk-drivers will interact, resulting in compound and knock-on impacts across a range of sectors and regions (*high confidence*).<sup>60</sup> For any given warming level, the level of risk will also depend on trends in vulnerability and exposure of humans and ecosystems (*high confidence*).<sup>61</sup>

31. In recognition of the anticipated serious impacts and risks of future climate change, the Paris Agreement establishes the goal of (a) holding the increase in the global average temperature to “well below 2°C above pre-industrial levels” and (b) “pursuing efforts to limit temperature increase to 1.5°C above pre-industrial levels” by the end of 2100.<sup>62</sup> The States Parties to the Paris Agreement have recognized that “the impacts of climate change will be much lower at the temperature increase of 1.5°C compared with

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<sup>57</sup> AR6 Synthesis Report, **Exhibit 26**, Section 3.1.1, pp. 33–34. For a detailed discussion of climate models used by the IPCC, see AR6 WGI Report, **Exhibit 20**, Annex II: Models, pp. 2087-2120.

<sup>58</sup> See, e.g., AR6 Synthesis Report, **Exhibit 26**, Figure 3.1.

<sup>59</sup> AR6 Synthesis Report, **Exhibit 26**, Section 3.1.2, p. 36. See also Section 3.1.1, p. 34 (“With every additional increment of global warming, changes in extremes continue to become larger.”).

<sup>60</sup> AR6 Synthesis Report, **Exhibit 26**, Section 3.1.2, p. 36; IPBES 2019: Global Assessment Report, **Exhibit 31**, Section 2.1.17, p. 127. “Compound events” refers to the combination of multiple drivers and/or hazards that contribute to societal and/or environmental risk. See AR6 Synthesis Report, **Exhibit 26**, Glossary, p. 19. See also AR6 Synthesis Report, **Exhibit 26**, Section 2.1, p. 16 (“Compound extreme events include increases in the frequency of concurrent heatwaves and droughts (*high confidence*); fire weather in some regions (*medium confidence*); and compound flooding in some locations (*medium confidence*). Multiple risks interact, generating new sources of vulnerability to climate hazards, and compounding overall risk (*high confidence*). Compound climate hazards can overwhelm adaptive capacity and substantially increase damage (*high confidence*).”)

<sup>61</sup> AR6 Synthesis Report, **Exhibit 26**, Section 4.3, p. 62 (“The level of risk for humans and ecosystems will depend on near-term trends in vulnerability, exposure, level of socio-economic development and adaptation”). See also AR6 Synthesis Report, **Exhibit 26**, Section 4.3, p. 63 (“Human and ecosystem vulnerability are interdependent (*high confidence*). Vulnerability to climate change for ecosystems will be strongly influenced by past, present, and future patterns of human development, including from unsustainable consumption and production, increasing demographic pressures, and persistent unsustainable use and management of land, ocean, and water (*high confidence*).”).

<sup>62</sup> Paris Agreement, **Exhibit 6**, Articles 2(1) and 4.

2°C” and have therefore “resolv[ed] to pursue efforts to limit the temperature increase to 1.5°C”.<sup>63</sup>

## B. Observed and projected impacts of global warming

32. Having set out the causes of global warming, this Sub-section describes physical and biological impacts of global warming on the world’s oceans and the marine environment, including observed impacts, as well as projected future impacts under different emissions scenarios and pathways.

### 1. Ocean warming, melting of ice caps and sea ice, and ocean circulation

33. Atmospheric warming causes ocean warming to occur, because heat in the atmosphere is absorbed by the oceans. In addition, global warming causes ice to melt, resulting in potentially significant volumes of freshwater entering the world’s oceans, altering the salinity and nutrient content of certain bodies of water and impacting ocean circulation.<sup>64</sup>

34. **Observed impacts:** The world’s oceans have warmed since 1970 (*virtually certain*) due to human influence (*extremely likely*).<sup>65</sup> Oceans have absorbed more than 90% of the atmospheric heat generated by anthropogenic GHG emissions (*high confidence*).<sup>66</sup> Importantly, the rate of ocean warming has more than doubled since 1993 (*likely*).<sup>67</sup>

35. Warming of the upper ocean (0 to 700m deep) has contributed to mass loss from ice sheets, particularly the Antarctic ice sheet in the Southern Ocean (*very high confidence*), as well as reductions in sea ice extent and thickness (*very high confidence*).<sup>68</sup>

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<sup>63</sup> Glasgow Climate Pact, Decision 1/CMA.3, 13 November 2021, **Exhibit 5**, paras. 20-22 (reaffirming Article 2(1) of the Paris Agreement and recognizing that “the impacts of climate change will be much lower at the temperature increase of 1.5°C compared with 2°C” and “resolv[ing] to pursue efforts to limit the temperature increase to 1.5°C”).

<sup>64</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 3.1, Figure 3.1, p. 210.

<sup>65</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.2, p. 11; Special Report on 1.5°C, **Exhibit 23**, Section 3.3.7, p. 204; Special Report on the Ocean and Cryosphere, **Exhibit 24**, Technical Summary, TS 2.4, p. 74.

<sup>66</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.2, p. 11 (“Ocean warming accounted for 91% of the heating in the climate system”, meaning that 91% of the thermal radiation that would otherwise have been emitted to space has been absorbed by the oceans); Special Report on the Ocean and Cryosphere, **Exhibit 24**, Summary for Policy Makers, Section A.2, p. 9.

<sup>67</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Technical Summary, TS.5, p. 58.

<sup>68</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Summary for Policy Makers, Section A.1, p. 6. *See also* Section 3.3.1.5.1 (discussing “ocean drivers” of ice sheet mass change).

Scientists observe that between 1997 and 2014, sea ice shrunk about four times as fast as it had done over the previous two decades.<sup>69</sup> There is also *high confidence* that ocean warming and melting ice caps and sea ice have affected ocean currents and the circulation of nutrients and oxygen.<sup>70</sup> In addition to broader ocean warming, localized extreme ocean temperatures (known as “marine heatwaves”) have doubled in frequency since the 1980s and are increasing in intensity (*high confidence*).<sup>71</sup> As discussed in more detail below, these localized extreme events have had a significant impact on biodiversity.<sup>72</sup>

36. **Projected impacts:** Ocean warming is projected to increase during the 21<sup>st</sup> century, in all scenarios of GHG emissions (*virtually certain*).<sup>73</sup> By 2100, the ocean is *very likely* to warm by 2 to 4 times as much under low-emissions scenarios, and by 5 to 7 times as much under high-emissions scenarios, compared with observed changes since 1970.<sup>74</sup> Changes to sea ice will be significantly different under a 1.5°C warming scenario, compared with a 2°C scenario: in the former scenario, the Arctic will maintain sea ice cover throughout summer in most years; whereas in the latter, the prospects of a sea ice-free Arctic during the summer increase substantially (*medium confidence*).<sup>75</sup> Marine heatwaves are also projected to be more frequent at 2°C compared to 1.5°C of global warming (*high confidence*),<sup>76</sup> leading to potentially devastating impacts on marine life, discussed below.<sup>77</sup>

## 2. Sea-level rise

37. Global mean sea-level rise is caused by heat-induced expansion of ocean water and the melting of frozen water, such as glaciers or ice caps.<sup>78</sup> Sea-level rise has an impact on organisms like coral reefs and coastal habitats that are sensitive to light availability,

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<sup>69</sup> Special Report on 1.5°C, **Exhibit 23**, Section 3.3.8, p. 205.

<sup>70</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Summary for Policy Makers, Section A.2.4. *See also* Sections 5.2.2.5 and 5.2.2.6, pp. 473-476.

<sup>71</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.2, p. 12.

<sup>72</sup> *See below*, Chapter 2, Section III.B.4.

<sup>73</sup> AR6 WGI Report, **Exhibit 20**, Technical Summary, TS 2.4, p. 74 (“Ocean warming will continue over the 21st century (*virtually certain*), and will likely continue until at least to 2300 even for low CO2 emissions scenarios. Ocean warming is irreversible over centuries to millennia (*medium confidence*), but the magnitude of warming is scenario-dependent from about the mid-21st century (*medium confidence*).”); Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 5.2.2.2.1, p. 460.

<sup>74</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 5.2.2.2.2, p. 460.

<sup>75</sup> Special Report on 1.5°C, **Exhibit 23**, Sections 3.3.8 and 3.3.11, pp. 205–206, 212.

<sup>76</sup> Special Report on 1.5°C, **Exhibit 23**, Sections 3.3.7 and 3.3.11, pp. 204-205, 212.

<sup>77</sup> *See below*, Chapter 2, Section III.B.4.

<sup>78</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Sections, 1.4, 4.2.3 and 5.2.2.2.1, pp. 83-86, 344-367, 457.

which decreases with depth (and thus with sea level rise), since these organisms may not be able to adapt quickly enough to changing conditions. Sea-level rise can occur at different rates regionally, for example, where a particular region suffers from significant glacial melting, or where a particular region is characterized by changes to topography from human development.<sup>79</sup>

38. **Observed impacts:** Global sea-level has increased by 0.2m between 1901 and 2018,<sup>80</sup> with the rate of sea-level rise increasing over that period: between 1971 and 2006, sea-level rose at a rate of approximately 1.9mm/a, while between 2006 and 2018 sea-level rose at a rate of approximately 3.7 mm/a (*high confidence*).<sup>81</sup> This rate of increase has been greater than the average rate of the previous two millennia (*high confidence*).<sup>82</sup> The acceleration of sea-level rise in recent years is in part due to increasing ice-loss from glaciers and sea ice (*extremely likely*).<sup>83</sup> Sea-level rise is not homogenous across the globe: for example, between 1993 to 2012, the western Pacific Ocean exhibited a rate of sea-level rise three times higher than the global mean, while the west coast of the Americas exhibited a sea-level reduction.<sup>84</sup>

39. **Projected impacts:** Global mean sea level rise will continue in the 21<sup>st</sup> century (*virtually certain*) and sea-levels are projected to remain elevated for thousands of years because of the time lag between increases in GHG emissions and the impacts of global warming on the oceans (*high confidence*).<sup>85</sup> The difference in global sea-level rise in a 1.5°C warming scenario and a 2°C warming scenario is around 0.1m (*medium confidence*).<sup>86</sup> Projected sea-level rise will, however, significantly increase by multiple metres, in the event that the Greenland and Antarctic sheets destabilize and melt, and there is *medium confidence* that these instabilities could be triggered at around 1.5°C to

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<sup>79</sup> Special Report on 1.5°C, **Exhibit 23**, Section 4.2.2, pp. 322-323.

<sup>80</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.2, p. 11.

<sup>81</sup> IPCC, 2023: *Summary for Policymakers*, In: *Climate Change 2023: Synthesis Report. A Report of the Intergovernmental Panel on Climate Change, Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, H. Lee and J. Romero (eds.), **Exhibit 32**, Section A.2.1, p. 5 and AR6 Synthesis Report, **Exhibit 26**, Section 2.1.2, p. 11; UNEP, 2019: *Global Environment Outlook – GEO-6: Healthy Planet, Healthy People*, P. Ekins, J. Gupta, and P. Boileau (eds.), **Exhibit 33**, p. 87, Section 4.3.2. *See also* Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section A.3.1, p. 10; IPBES 2019: *Global Assessment Report*, **Exhibit 31**, Section 2.1.17.1, p. 127.

<sup>82</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 1.4.1, p. 83.

<sup>83</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Sections 3.3.1 and 4.2.3, pp. 236-240, 344-367.

<sup>84</sup> IPBES 2019: *Global Assessment Report*, **Exhibit 31**, Section 2.1.17.1, p. 127.

<sup>85</sup> AR6 Synthesis Report, **Exhibit 26**, Section 3.1.3, p. 42.

<sup>86</sup> Special Report on 1.5°C, **Exhibit 23**, Section 3.3.9, p. 207.

2°C of warming.<sup>87</sup> Furthermore, the rate at which sea levels change affects the resulting impacts. A slower rate of sea-level rise, corresponding to a slower increase in global atmospheric temperatures and a slower increase in GHG emissions, would enable greater opportunities for organisms and ecosystems to adapt (*medium confidence*).<sup>88</sup>

### 3. Ocean chemistry and acidification

40. Ocean warming affects the chemistry of the ocean water. Since less oxygen is dissolved in warmer water, ocean warming reduces the amount of oxygen available to marine life at different depths of the ocean. In addition, oceans absorb CO<sub>2</sub> from the atmosphere, which reacts and releases hydrogen ions that increase the acidity of the oceans.<sup>89</sup> As described in more detail below, loss of ocean oxygen and ocean acidification can have significant impacts on marine organisms.<sup>90</sup>

41. **Observed impacts:** Scientists estimate that the ocean has absorbed 30 to 40% of all CO<sub>2</sub> emissions since 1750, causing changes to the ocean’s chemistry that are unprecedented for at least the last 65 million years (*high confidence*).<sup>91</sup> By 2011, ocean acidity increased by 26% compared to pre-industrial levels.<sup>92</sup> It is *virtually certain* that anthropogenic CO<sub>2</sub> emissions have been the main driver of ocean acidification.<sup>93</sup> There is also a growing consensus that oceans are losing their overall oxygen concentration,<sup>94</sup> with some scientists reporting that surface water temperatures have reduced oxygen in the ocean by 2% since 1960 (*medium confidence*).<sup>95</sup> Ocean salinity is also changing, with some regions, such as northern oceans and the Arctic, decreasing in salinity due to melting glaciers and ice sheets, while others have increased in salinity due to higher sea surface

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<sup>87</sup> Special Report on 1.5°C, **Exhibit 23**, Chapter 3, p. 178.

<sup>88</sup> Special Report on 1.5°C, **Exhibit 23**, Chapter 3, p. 178.

<sup>89</sup> Special Report on 1.5°C, **Exhibit 23**, Section 3.3.10 and Annex 1, pp. 209-210, 556; Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 1.4.1, p. 83.

<sup>90</sup> See below, Chapter 2, Section III.B.4. See also IPBES 2019: Global Assessment Report, **Exhibit 31**, Section 2.1.17.2, p. 127.

<sup>91</sup> Special Report on 1.5°C, **Exhibit 23**, Sections 3.3.10 and 3.4.4.12, pp. 209, 227 (“About 30% of CO<sub>2</sub> emitted by human activities, for example, has been absorbed by the upper layers of the ocean, where it has combined with water to produce a dilute acid that dissociates and drives ocean acidification”); UNEP, 2019: *Global Environment Outlook – GEO-6: Healthy Planet, Healthy People*, P. Ekins, J. Gupta, and P. Boileau (eds.), **Exhibit 33**, pp. 85-86, Section 4.3.1; IPBES 2019 Global Assessment Report, **Exhibit 31**, Section 2.1.17.2, p. 127.

<sup>92</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 1.4.1, p. 83.

<sup>93</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.2, p. 11.

<sup>94</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 5.2.2.4, p. 471.

<sup>95</sup> Special Report on 1.5°C, **Exhibit 23**, Section 3.3.10, p. 210; Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 5.2.2.4, p. 471.

temperatures and evaporation.<sup>96</sup> These changes in salinity are also potentially contributing to large-scale changes in water movement that impact the circulation of nutrients and oxygen to different parts of the ocean.<sup>97</sup>

42. **Projected impacts:** Changes to ocean chemistry, and in particular ocean acidification, are projected to continue in the future under all scenarios of GHG emissions (*virtually certain*).<sup>98</sup> As discussed further below, these changes to ocean chemistry will have impacts for the marine environment. For example, in a high-emissions scenario, it is *very likely* that the changes to the acidity of several of the world's oceans will be corrosive for organisms with shells and skeletons, and it is *virtually certain* that this will be avoided in a low-emissions scenario.<sup>99</sup>

#### 4. *Impacts on marine biological diversity and ecosystems*

43. Impacts on marine biological diversity and ecosystems occur where physical changes to the environment, described above, lead to changes in the number and composition of organisms globally or in a particular region. Compositional changes can reflect loss of life, where organisms fail to survive physical change to their environment, such as rapid sea-level rise or marine heatwaves. Alterations to the composition of organisms in a particular ecosystem can have a consequent impact on that ecosystem's structure and functioning, for example: reduced biodiversity can change the ability of a marine ecosystem to withstand other external pressures, such as localized pollution or disease not directly linked to climate change; and changes to coastal ecosystems that act as nurseries for juvenile fish can affect the availability of fish stocks in the open water.

44. **Observed impacts:** Climate change has caused substantial damage and irreversible losses to ecosystems around the world, including coastal and ocean ecosystems (*high confidence*).<sup>100</sup> Notable examples include the following:

- (a) Approximately half of the species assessed globally by the IPCC in its Sixth Assessment Report have shifted pole-wards, including marine organisms (*very high confidence*).<sup>101</sup> These changes are altering the

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<sup>96</sup> Special Report on 1.5°C, **Exhibit 23**, Section 3.3.10, p. 210.

<sup>97</sup> Special Report on 1.5°C, **Exhibit 23**, Section 3.3.10, p. 210.

<sup>98</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 5.2.2.3, p. 469.

<sup>99</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Sections 5.2.2.3, p. 469.

<sup>100</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.2, p. 15.

<sup>101</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.1.2, p. 15.

composition of species in different locations (*high confidence*) and in some cases altering interactions between organisms (*medium confidence*).<sup>102</sup> Large-scale mangrove mortality has been linked to global warming since the 1960s.<sup>103</sup> Mangroves are, where possible, moving pole-ward, encroaching and contracting habitats in salt-marshes (*high confidence*), and the distribution of seagrass meadows and kelp forests are contracting at low-latitudes (*high confidence*).<sup>104</sup> Habitats like seagrass, kelp forests, and mangroves are critical for other organisms, and so their migration or contraction has a corresponding impact on fish, birds, and other species that depend on them.<sup>105</sup> Similarly, organisms in polar regions, particularly mammals and seabirds, have experienced habitat-contraction linked to sea-ice melting (*high confidence*).<sup>106</sup>

- (b) Fisheries catches and their composition in many regions are already impacted by the effects of warming and show changes in growth, reproduction and survival (*high confidence*).<sup>107</sup> This has created challenges for populations and communities that depend on fisheries for their livelihood or as a food source.<sup>108</sup>
- (c) Marine heatwaves have caused large-scale, regional coral bleaching events, and they are increasing in frequency (*very high confidence*) causing worldwide reef degradation.<sup>109</sup> Reef recovery is slow (taking more than 15 years) if it occurs at all (*high confidence*).<sup>110</sup> Many tropical coral reefs have suffered such extensive chronic bleaching that they are unlikely to recover.<sup>111</sup>

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<sup>102</sup> See e.g., the discussion at Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 5.2.3, pp. 478-486 (describing changes to interactions between organisms in the upper part of the ocean due to the physical impacts of climate change and their effects on marine organisms).

<sup>103</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section A.6.1, p. 13.

<sup>104</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 5.3.2, p. 496.

<sup>105</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 5.4.1.3, p. 508; Special Report on 1.5°C, **Exhibit 23**, Section 3.4.4.10, pp. 225-226.

<sup>106</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 3.2.3.1.4, pp. 229-230.

<sup>107</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 5.4.1, pp. 502-509.

<sup>108</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 5.4.2, pp. 509-520. See, in particular, Section 5.4.2.1.3, pp. 512-513 and Section 5.4.2.3.1, pp. 515-517.

<sup>109</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 6.4.2.1, p. 610.

<sup>110</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section A.6.4, p. 13; FAQ 5.1, p. 545.

<sup>111</sup> UNEP, 2019: *Global Environment Outlook – GEO-6: Healthy Planet, Healthy People*, P. Ekins, J. Gupta, and P. Boileau (eds.), **Exhibit 33**, Section 7.3.1, p. 181.

- (d) Ocean acidification has affected organisms that form shells and skeletons, because the acidity of the water surrounding these organisms can make it difficult to create the chemical compounds needed to form shell structures.<sup>112</sup> These effects are particularly acute on coral reefs or in intertidal rocky shores, where shelled-organisms, like molluscs and shellfish, are sensitive to extreme temperature events and ocean acidification (*high confidence*).<sup>113</sup>

45. It is important to note that the above observed climate change impacts may affect ecosystems and species that are already under stress from other human actions. For example, more than 60% of the world’s coral reefs already face immediate direct threats from overfishing,<sup>114</sup> impacting the ability of these ecosystems to withstand the physical changes to the marine environment caused by climate change.

46. **Projected impacts:** Scientists expect continued global warming to increase the scope and severity of impacts on marine biological diversity and coastal or open-ocean ecosystems. Scientists agree that these impacts are projected to be substantially lower when global warming is limited to 1.5°C, compared with a 2°C warming-scenario (*high confidence*).<sup>115</sup> More specifically:

- (a) Even in the transition to 1.5°C of warming, changes to water temperatures are expected to drive some species (*e.g.*, plankton, fish) to relocate to higher latitudes and cause novel ecosystems to assemble (*high confidence*).<sup>116</sup> Other ecosystems (such as coral reefs and kelp forests) are less mobile and are projected to experience high rates of mortality and loss as a result (*very high confidence*).<sup>117</sup> These impacts will worsen in high-emissions scenarios. For example: coastal wetlands are expected to lose between 20 to 90% of their area depending on which emissions scenario eventualizes (*high confidence*);<sup>118</sup> and intertidal rocky shores are likely to transition towards algae-dominated habitats, as shelled-organism

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<sup>112</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 3.2.1.2.4, pp. 218-219.

<sup>113</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Sections 5.3.5, pp. 498-499.

<sup>114</sup> IPBES 2019: Global Assessment Report, **Exhibit 31**, Section 3.2.1, p. 415.

<sup>115</sup> Special Report on 1.5°C, **Exhibit 23**, Technical Summary TS.3, p. 37.

<sup>116</sup> Special Report on 1.5°C, **Exhibit 23**, Section 3.4.4.2, p. 222.

<sup>117</sup> Special Report on 1.5°C, **Exhibit 23**, Section 3.4.4.2, p. 222.

<sup>118</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Sections 5.3.2, pp. 453, 495-496.



populations become increasingly stressed due to warming and ocean acidification (*high confidence*).<sup>119</sup> Projected shifts in the distribution of marine organisms are also expected to result in further habitat contraction and changes in abundance for polar species, including marine mammals, birds, fish, and krill (*medium confidence*).<sup>120</sup>

- (b) Net primary productivity will *very likely* decline by 2100 relative to pre-industrial levels, particularly under high-emissions scenarios.<sup>121</sup> Simulated ocean-warming and changes in net primary productivity during the 21<sup>st</sup> century are projected to reduce the maximum potential catches of fish-stocks (*medium confidence*) with regional differences in the direction and magnitude of change (*high confidence*).<sup>122</sup> These impacts have repercussions for global food security.<sup>123</sup> Small-scale fisheries in tropical regions, which are very dependent on habitats provided by coastal ecosystems, are expected to face growing risks at 1.5°C of warming, due to habitat loss (*medium confidence*).<sup>124</sup> Risks of impacts and decreasing food security are projected to become greater as global warming reaches beyond 1.5°C, leading to losses for coastal livelihoods and industries (*medium to high confidence*).<sup>125</sup>
- (c) Almost all coral reefs will degrade from their current state, even if global warming remains below 2°C (*very high confidence*), and the remaining shallow coral reef communities will differ in species composition and diversity from present reefs (*very high confidence*).<sup>126</sup> Coral reefs are

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<sup>119</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Sections Technical Summary, TS.5, p. 65, Chapter 5, p. 453. *See also* IPBES 2019: Global Assessment Report, **Exhibit 31**, Section 4.2.2.2.2, pp. 637-640.

<sup>120</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Sections Technical Summary, TS.5, p. 53.

<sup>121</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Sections 5.2.2.6, p. 475. and 5.2.4.2, pp. 474-476, 486-488.

<sup>122</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Chapter 5, p. 452. *See also* Section 5.4.1, p. 505.

<sup>123</sup> Special Report on 1.5°C, **Exhibit 23**, Sections 3.4.4 and 3.4.6.3, pp. 226, 237-240.

<sup>124</sup> Special Report on 1.5°C, **Exhibit 23**, Technical Summary, TS.5, p 38; Section 3.4.6.3, pp. 237-238.

<sup>125</sup> Special Report on 1.5°C, **Exhibit 23**, Chapter 3, p. 180.

<sup>126</sup> Special Report on 1.5°C, **Exhibit 23**, Section 3.4.4, pp. 179, 225-226; Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 5.4.1, p. 498 (“coral reefs are projected to decline by a further 70–90% at 1.5°C (*very high confidence*) with larger losses (>99%) at 2°C (*very high confidence*).”).

projected to decline to 10 to 30% of their former cover at 1.5 °C and to less than 1% of their former cover at 2°C.<sup>127</sup> These declines in coral reef health will greatly diminish the services that coral reefs provide to society, such as food provision (*high confidence*), coastal protection (*high confidence*) and tourism (*medium confidence*),<sup>128</sup> with projected economic damage estimated to be between US\$500 to US\$870 billion by 2100.<sup>129</sup> An increase in global warming beyond 2°C could result in potentially catastrophic losses for coral reefs.<sup>130</sup> Experts agree that the coral reefs that survive to the end of the 21<sup>st</sup> century will bear little resemblance to those alive today.<sup>131</sup>

- (d) Changes to ocean chemistry, particularly ocean acidification, under all future emissions scenarios, pose risks for the survival, calcification (*i.e.*, development of shells and skeletons), growth, development, and abundance of a broad range of marine organisms, ranging from algae to fish (*high confidence*).<sup>132</sup>

C. Emissions trajectories and timelines consistent with preventing, reducing, or controlling the impacts of climate change

47. States can prevent, reduce, and control the impacts of climate change, and can protect and preserve the marine environment from these impacts, by addressing the causes of climate change, *i.e.*, by reducing GHG emissions and enhancing means to draw down CO<sub>2</sub> from the atmosphere (known as “mitigation”). States can also make adjustments to adapt to actual and expected climate impacts (known as climate change “adaptation”).

48. States Parties to the Paris Agreement have announced individual Nationally Determined Contributions (or “NDCs”) that set out their respective mitigation and adaptation ambitions for the period up to and including 2030. For mitigation, global GHG

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<sup>127</sup> IPBES 2019: Global Assessment Report, **Exhibit 31**, Section 4.2.2.2.2, pp. 637-640.

<sup>128</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Chapter 5, p. 453.

<sup>129</sup> IPBES 2019 Global Assessment Report, **Exhibit 31**, Section 2.3.5, Table 234, pp. 339-341.

<sup>130</sup> UNEP, 2019: *Global Environment Outlook – GEO-6: Healthy Planet, Healthy People*, P. Ekins, J. Gupta, and P. Boileau (eds.), **Exhibit 33**, Section 7.3.1, p. 181.

<sup>131</sup> UNEP, 2019: *Global Environment Outlook – GEO-6: Healthy Planet, Healthy People*, P. Ekins, J. Gupta, and P. Boileau (eds.), **Exhibit 33**, Section 7.3.1, p. 181. *See also* IPBES 2019 Global Assessment Report, **Exhibit 31**, Section 2.1.17.2, p. 127 (“If current rates of GHG emissions are not mitigated, oceans will be vastly different places by the mid-to-late 21st century”).

<sup>132</sup> Special Report on 1.5°C, **Exhibit 23**, Sections 3.3.10 and 3.4.4, pp. 178, 209-210, 223-224.

emissions in 2030 implied by current NDCs would make it *likely* that global warming will exceed 1.5°C during the 21<sup>st</sup> century and would require an unprecedented acceleration of mitigation efforts after 2050 to limit warming to below 2°C by 2100.<sup>133</sup> Furthermore, the policies that States implemented by the end of 2020 are projected to result in higher global GHG emissions in 2030 than those implied by current NDCs, indicating that States are not on course to achieve their NDCs (*high confidence*).<sup>134</sup> Without further steps taken to enhance and implement NDCs, the world is on course to achieve global warming of 2.2°C to 3.5°C (*very likely*) by 2100 (*medium confidence*).<sup>135</sup>

49. Scientists have identified steps that States must take in order to achieve the objective of the Paris Agreement to hold the increase in the global average temperature to “well below 2°C above pre-industrial levels” and to “pursu[e] efforts to limit temperature increase to 1.5°C above pre-industrial levels” by 2100:

- (a) **States must keep within a defined carbon “budget” of 500 GtCO<sub>2</sub>.** For every 1000 GtCO<sub>2</sub> emitted by human activity, global mean temperature rises by 0.27°C to 0.63°C (*likely*).<sup>136</sup> This relationship implies that there is a finite carbon budget that cannot be exceeded, in order to limit warming to any given level.<sup>137</sup> The best estimates of the remaining carbon budget from the beginning of 2020 for limiting warming to 1.5°C (with a 50% likelihood of success) is estimated to be 500 GtCO<sub>2</sub>; for 2°C (with a 67% likelihood of success) this is 1150 GtCO<sub>2</sub>.<sup>138</sup> If the annual CO<sub>2</sub> emissions between 2020 to 2030 stayed at the same level as 2019, the resulting cumulative emissions would almost exhaust the remaining carbon budget for 1.5°C, and exhaust more than a third of the remaining carbon budget

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<sup>133</sup> AR6 Synthesis Report, **Exhibit 26**, Section, 2.3.1, p. 24. *See also* Emissions Gap Report, **Exhibit 30**, Section 4.3, p. 33 (“NDCs are highly insufficient to put the world on a path to meeting the temperature goal of the Paris Agreement.”).

<sup>134</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.3.1, pp. 23-27. *See also* Emissions Gap Report, **Exhibit 30**, Section 4.3, p. 33 (“Countries are off track to achieve even these globally highly insufficient NDCs.”).

<sup>135</sup> AR6 Synthesis Report, **Exhibit 26**, Section 2.3.1, p. 24. *See also* Emissions Gap Report, **Exhibit 30**, Section 4.4, p. 35 (“a continuation of current policies would result in about 0.2°C higher estimates of 2.8°C (range: 1.9–3.3°C) for a 66 per cent chance.”).

<sup>136</sup> AR6 Synthesis Report, **Exhibit 26**, Section, 3.3.1, p. 46.

<sup>137</sup> AR6 Synthesis Report, **Exhibit 26**, Section, 3.3.1, p. 46.

<sup>138</sup> AR6 Synthesis Report, **Exhibit 26**, Section, 3.3.1, p. 46.

for 2°C.<sup>139</sup> States therefore need to drastically reduce global CO<sub>2</sub> emissions, to keep within estimated carbon budgets for a 1.5°C or 2°C scenario.<sup>140</sup>

(b) **To achieve this budget by 2100, the annual net volume of global GHG emissions must “peak” and then fall to stabilize at “net zero” by 2050.**

Net zero CO<sub>2</sub> emissions are achieved when anthropogenic CO<sub>2</sub> emissions are balanced globally by anthropogenic CO<sub>2</sub> removals (such as through natural carbon sinks, like the Amazon rainforest, or man-made technology, like carbon capture and storage) over a specific period.<sup>141</sup> In order to limit global warming to 1.5°C by 2100, States need to achieve global net zero CO<sub>2</sub> emissions by around 2050. To limit global warming to 2°C, net zero CO<sub>2</sub> emissions need to be achieved by around 2070.<sup>142</sup>

(c) **States’ emissions must not overshoot the carbon budget.**

States need to take action to avoid “overshooting” the defined carbon “budget”. An “overshoot” occurs where global GHG emissions temporarily exceed, before being brought back to, a volume consistent with a carbon budget for a 1.5°C or 2°C global warming limit. Where overshooting occurs, States will need to achieve and sustain “net negative” global CO<sub>2</sub> emissions.<sup>143</sup> An overshoot is concerning, because it may result in adverse impacts associated with high-emissions scenarios, some of which may be irreversible (*high confidence*).<sup>144</sup> The extent and duration of an overshoot affect the magnitude and seriousness of potential damage to natural and

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<sup>139</sup> AR6 Synthesis Report, **Exhibit 26**, Section 3.3.1, p. 47. *See also* Emissions Gap Report, **Exhibit 30**, Section 4.4, p. 36 (“Current policy projections globally lead to about a 20 per cent chance of global warming exceeding 3°C.”).

<sup>140</sup> *See* Emissions Gap Report, **Exhibit 30**, p. xvi (“To get on track for limiting global warming to 1.5°C, global annual GHG emissions must be reduced by 45 per cent compared with emissions projections under policies currently in place in just eight years, and they must continue to decline rapidly after 2030, to avoid exhausting the limited remaining atmospheric carbon budget.”).

<sup>141</sup> Special Report on 1.5°C, **Exhibit 23**, Annex 1 (Glossary), p. 555. *See also* Emissions Gap Report, **Exhibit 30**, Section 3.2.2, p. 13 (“As at 23 September 2022, 88 parties covering approximately 79 per cent of global GHG emissions have adopted net-zero pledges.”).

<sup>142</sup> AR6 Synthesis Report, **Exhibit 26**, Section 3.3.2, pp. 50-51.

<sup>143</sup> AR6 Synthesis Report, **Exhibit 26**, Section 3.3.4, p. 53.

<sup>144</sup> AR6 Synthesis Report, **Exhibit 26**, Section 3.3.4, p. 53.

human systems (*high confidence*), as does the rate of change, with rapid overshooting posing larger risks (*medium confidence*).<sup>145</sup>

- (d) **States need to take ambitious action in the near term.** If States delay action to address the causes and impacts of climate change, they may face future barriers that make it more difficult to act, for example: delaying action now may make future action more costly, particularly where infrastructure has been “locked in” and cannot easily be changed; and delaying action now may make future action less feasible or less effective (*high confidence*).<sup>146</sup>

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50. Having set out the best available climate science, UNEP turns next to identifying certain principles and rules of international environmental law relevant to the role and treatment of climate science by the Tribunal.

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<sup>145</sup> Special Report on 1.5°C, **Exhibit 23**, Technical Summary, TS.3, pp. 35-36.

<sup>146</sup> AR6 Synthesis Report, **Exhibit 26**, Section 4.2, p. 60; Emissions Gap Report, **Exhibit 30**, Section 5.2, pp. 38-40.

## CHAPTER 3

### INTERNATIONAL LAW PRINCIPLES AND APPROACHES

51. The Convention, by its own terms, is intended to be interpreted and applied by reference to “other relevant rules of international law”,<sup>147</sup> consistent with article 31 of the Vienna Convention on the Law of Treaties, pursuant to which a treaty shall be interpreted taking into account, *inter alia*, “any relevant rules of international law applicable in the relations between the parties” to the treaty in question.<sup>148</sup>

52. Relevant rules of international law may include not only general principles of international environmental law, but also the rules and approaches reflected in special agreements between States on the protection and preservation of the marine environment,<sup>149</sup> as well as other norms that have developed since the Convention was concluded, such as human rights. These more recent developments may be relevant to the Tribunal’s analysis in the present instance, to the extent the Tribunal views the Convention to reflect terms and concepts that should be subject to dynamic interpretation, in order to give effect to the Convention’s object and purpose.<sup>150</sup>

53. To assist the Tribunal in its analysis of the terms of the Convention in the context of other relevant rules of international law, UNEP identifies in this Chapter a selection of provisions of: the Convention, other MEAs and RSCAPs administered by UNEP or established under its auspices<sup>151</sup> (*I*); and human rights norms, including the General

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<sup>147</sup> UNCLOS, Article 293(1); *see also Request for an Advisory Opinion Submitted by the Sub-Regional Fisheries Commission (SRFC)*, Advisory Opinion, 2 April 2015, *ITLOS Reports 2015*, p. 4, paras. 80-84 (confirming that the law applicable to advisory opinion proceedings includes Article 293(1)); ITLOS Rules, Article 130(1); ITLOS Statute, Article 23.

<sup>148</sup> Vienna Convention on the Law of Treaties 1969, Article 31. *See*, in particular, Article 31(3)(c).

<sup>149</sup> UNCLOS, Article 237(2).

<sup>150</sup> For authority on the “evolutive interpretation” of treaties, *see e.g. Case concerning the Gabčíkovo-Nagymaros Project (Hungary/Slovakia)*, Judgment, *ICJ Reports 1997*, p. 7, para. 112 (“the Treaty is not static, and is open to adapt to emerging norms of international law”); *Arbitration regarding the Iron Rhine (“Ijzeren Rijn”) Railway between the Kingdom of Belgium and the Kingdom of the Netherlands*, Award, 24 May 2005, PCA Award Series (2007), p. 37, paras. 80-84; *Indus Waters Arbitration*, Partial Award, 18 February 2013, para. 452.

<sup>151</sup> RSCAPs have been agreed under the framework of UNEP’s Regional Seas Programme. The Regional Seas Programme was initiated by UNEP in 1974. It includes thirteen regions and has nearly 140 States participating in it. It is conceived as an action-oriented programme having concern not only for the consequences but also for the causes of environmental degradation and encompassing a comprehensive approach to combating environmental problems through the management of marine and coastal areas. Each regional action plan is formulated according to the needs of the region as perceived by the Governments concerned. The regions covered by the Regional Seas Programme include: Mediterranean, Kuwait Action Plan Region, Black Sea, West and Central Africa, Wider Caribbean, East Asian Seas, South Asian Seas, South-East Pacific,

Assembly's recent recognition of a right to a clean, healthy and sustainable environment (**II**).

### **I. Principles and approaches of international environmental law**

54. The following principles and approaches are addressed in this Section: prevention of transboundary harm (**A**); protection and preservation of the marine environment (**B**); the precautionary principle or approach (**C**); cooperation (**D**); and the polluter pays principle (**E**).

#### **A. Prevention of transboundary harm**

55. The prohibition of transboundary harm, also referred to as the “no harm rule”, requires States to ensure that activities within their own jurisdiction do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction. The tribunal in the *Trail Smelter* arbitration articulated the rule as follows:

[N]o State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.<sup>152</sup>

56. The rule is reflected in broader terms in Principle 21 of the 1972 Declaration of the United Nations Conference on the Environment held in Stockholm (the ***Stockholm Declaration***), as well as article 194(2) of the Convention, article 3 of the CBD and the preamble of the UNFCCC.<sup>153</sup> This principle “is now part of the corpus of international law relating to the environment”,<sup>154</sup> and has been described by the International Court as an obligation on a State “to use all the means at its disposal in order to avoid activities

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South-West Pacific, North-West Pacific, Red Sea and Gulf of Aden, East Africa and South-West Atlantic.

<sup>152</sup> *Trail Smelter Arbitration*, Award 16 April 1938 and 11 March 1941, *RIAA*, p. 1965. This approach was reaffirmed in subsequent decisions including the *Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion, ICJ Reports 1996*, p. 242.

<sup>153</sup> Declaration on the Human Environment, adopted by the United Nations Conference on the Human Environment, 16 June 1972, Principle 21; UNCLOS, Articles 193 and 194(2); CBD, Article 3; UNFCCC, preamble para. 8.

<sup>154</sup> *Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion, ICJ Reports 1996*, p. 226, paras. 27-29.

which take place in its territory, or in any area under its jurisdiction, causing significant damage to the environment of another State.”<sup>155</sup>

## B. Protection and preservation of the marine environment

57. The Convention refers to both a generalized duty incumbent on States to “protect and preserve the marine environment”,<sup>156</sup> and a more specific, affirmative duty to take “all measures . . . necessary to prevent, reduce and control pollution of the marine environment from any source”,<sup>157</sup> including “from land-based sources”<sup>158</sup> and “from or through the atmosphere”.<sup>159</sup> The Convention also requires States to take all measures “necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life.”<sup>160</sup>

58. By virtue of the principle of systemic integration in the Vienna Convention on the Law of Treaties, as well as in light of the requirement to interpret the Convention with reference to “other relevant rules of international law”,<sup>161</sup> it is important to have regard to the RSCAPs enacted to implement Part XII of the Convention. This is additionally important, given the significant number of States that are parties to RSCAPs, including high-emitting States, as well as States that are not parties to the Convention. In interpreting the Convention’s obligations under Articles 192 and 194, the Tribunal may therefore wish to note the following:

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<sup>155</sup> *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)*, Judgment, *ICJ Reports 2010*, para. 101; *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua) and Construction in Costa Rica along the San Juan River (Nicaragua v. Costa Rica)*, Judgment, *ICJ Reports 2015*, para. 104; see also *Arbitration Regarding the Iron Rhine (“Ijzeren Rijn”) Railway between the Kingdom of Belgium and the Kingdom of the Netherlands*, Award, 24 May 2005, PCA Award Series (2007), paras. 59, 222.

<sup>156</sup> UNCLOS, Article 192.

<sup>157</sup> UNCLOS, Article 194.

<sup>158</sup> UNCLOS, Article 207.

<sup>159</sup> UNCLOS, Article 212.

<sup>160</sup> UNCLOS, Article 194(5).

<sup>161</sup> UNCLOS, Article 293(1); see also *Request for an Advisory Opinion Submitted by the Sub-Regional Fisheries Commission (SRFC)*, Advisory Opinion, 2 April 2015, *ITLOS Reports 2015*, p. 4, paras. 80-84 (confirming that the law applicable to advisory opinion proceedings includes Article 293(1)); ITLOS Rules, Article 130(1); ITLOS Statute, Article 23.



- (a) RSCAPs requires States to “prevent, reduce and *combat* pollution”,<sup>162</sup> or to “prevent, reduce, *mitigate* and control pollution”,<sup>163</sup> or to “prevent, *abate [and] combat* pollution”,<sup>164</sup> or “to prevent *and eliminate* pollution”.<sup>165</sup>
- (b) Some RSCAPs require States to take “*all possible* steps” to achieve this objective.<sup>166</sup>
- (c) Some RSCAPs require States to undertake “Environmental Impact Assessment” as one such step.<sup>167</sup>

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<sup>162</sup> See, e.g., 1985 Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Western Indian Ocean (*Nairobi Convention*), Articles 4(1) and 7 (emphasis added). The Nairobi Convention has been in force since 1996 and has 10 contracting parties, including Comoros, France, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, Tanzania, and the South Africa.

<sup>163</sup> See, e.g., 2012 Protocol to the Abidjan Convention concerning cooperation in the protection and development of marine and coastal environment from land-based sources and activities in the Western, Central and Southern African Region (*Abidjan Protocol*), Articles 1, 2, 8(1) (emphasis added). The Abidjan Protocol has been in force since 2012. See also 1981 Convention for Cooperation in the Protection and Development of the Marine and Coastal environment of the West and Central African Region and (*Abidjan Convention*). The Abidjan Convention has been in force since 1984 and has 19 contracting parties, including Angola, Benin, Cameroon, Cape Verde, the Republic of the Congo, Côte d’Ivoire, Democratic Republic of the Congo, Gabon, Gambia, Ghana, Guinea, Liberia, Namibia, Nigeria, Mauritania, Senegal, Sierra Leone, South Africa, and Togo.

<sup>164</sup> See, e.g., 1978 Kuwait Regional Convention for Cooperation on the Protection of the Marine Environment from Pollution (*Kuwait Convention*), Articles III(a) and VI (emphasis added). The Kuwait Convention has been in force since 1979 and has 8 contracting parties, including Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. See also Abidjan Protocol, Articles 1, 2, 8(1).

<sup>165</sup> See, e.g., 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic (*OSPAR Convention*), Article 2(1)(a) (emphasis added). The OSPAR Convention has been in force since 1998 and has 15 contracting parties, including Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and United Kingdom. See also 1976 Convention for the Protection of the Mediterranean Sea Against Pollution (*Barcelona Convention*), Articles 4(1) and 8; 1996 Protocol to the Barcelona Convention for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources (*Barcelona Pollution Protocol*), Article 1. The Barcelona Convention has been in force since 1976 and has 22 contracting parties, including Albania, Algeria, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Montenegro, Morocco, Slovenia, Spain, Syrian Arab Republic, Tunisia, Turkey, and the European Union. The Protocol to the Barcelona Convention for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources (as amended) has been in force since 2006. See also 1992 Convention on the Protection of the Marine Environment of the Baltic Sea Area (*Helsinki Convention*), Articles 3(1) and 6(8). The original Helsinki Convention was in force from 1974; it was replaced by a new convention in 1992. It has 10 contracting parties, including Denmark, Estonia, European Union, Finland, Germany, Latvia, Lithuania, Poland, Russia, and Sweden.

<sup>166</sup> See, e.g., OSPAR Convention, Articles 2(1)(a) and 3 (emphasis added).

<sup>167</sup> See, e.g., Nairobi Convention, Article 14; Barcelona Convention, Article 4(d); and 2018 Protocol on Environment Impact Assessment in a Transboundary Context (the *Tehran EIA Protocol*).

- (d) Several RSCAPs specifically address the prevention of pollution resulting from discharge of substances into the atmosphere.<sup>168</sup>
- (e) Many RSCAPs refer to or address the protection and conservation of marine biological diversity, including rare or fragile ecosystems and threatened species.<sup>169</sup>
- (f) To this end, some RSCAPs state a general obligation to “conserve biological diversity and protect” threatened and fragile ecosystems and species;<sup>170</sup> others require States to designate specially protected areas;<sup>171</sup> and others prescribe specific measures that need to be undertaken by State Parties.<sup>172</sup>

<sup>168</sup> See, e.g., 1983 Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (*Cartagena Convention*), Article 9. The Cartagena Convention has been in force since 1986 and has been ratified by 28 contracting parties, including Antigua and Barbuda, the Bahamas, Barbados, Belize, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, France, Granada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Netherlands, Nicaragua, Panama, St. Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, United Kingdom, the United States of America, and Venezuela. See also Nairobi Convention, Article 10; Abidjan Convention, Article 9; 1986 Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (*Noumea Convention*), Article 9. The Noumea Convention has been in force since 1986 and has 14 contracting parties including Australia, Cook Islands, Federated States of Micronesia, Fiji, France, the Marshall Islands, Nauru, New Zealand, Papua New Guinea, Samoa, Solomon Islands, the United States of America, Vanuatu, and Wallis and Futuna. See also 2003 Framework Convention for the Protection of the Marine Environment of the Caspian Sea (*Tehran Convention*), Article 11(1). The Tehran Convention has been in force since 2003 and has 5 contracting parties, including Azerbaijan, the Iran, Kazakhstan, the Russian Federation, and Turkmenistan. See also 1992 Convention on the Protection of the Black Sea Against Pollution (*Bucharest Convention*), Article XII. The Bucharest Convention has been in force since 1994 and has 6 contracting parties, including Bulgaria, Georgia, Romania, the Russian Federation, Turkey, and Ukraine. See also 2003 Convention for Cooperation in the Protection and Sustainable Development of the Marine and Coastal Environment of the North-East Pacific (*Antigua Convention*), Article 6(1)(a). The Antigua Convention has been in force since 2010 and has 8 contracting parties, including Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama

<sup>169</sup> See, e.g., Barcelona Convention, Article 10; 1995 Protocol to the Barcelona Convention concerning Specially Protected Areas and Biological Diversity in the Mediterranean (*Barcelona Biodiversity Protocol*), Article 3(1); Cartagena Convention, Article 10; Nairobi Convention, Article 11; Tehran Convention, Article 14(1); Bucharest Convention, Article XIII; Abidjan Convention, Article 11; OSPAR Convention, Article 2(1)(a); Helsinki Convention, Article 15. See also 2005 Protocol to the Jeddah Convention concerning the Protection of the Marine Environment from Land-Based Activities in the Red Sea and Gulf of Aden (*Jeddah Pollution Protocol*), Article 1; 1982 Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment (*Jeddah Convention*). The Jeddah Convention has been in force since 1985 and has 7 contracting parties, including Djibouti, Egypt, Jordan, Saudi Arabia, Somalia, Sudan, and Yemen.

<sup>170</sup> See, e.g., Nairobi Convention, Article 11(1); Tehran Convention, Article 15(1); Noumea Convention, Article 14.

<sup>171</sup> See, e.g., Cartagena Convention, Article 10; Abidjan Convention, Article 11; Noumea Convention, Article 14.

<sup>172</sup> See e.g., Barcelona Biodiversity Protocol, Article 6(h).

### C. The precautionary principle or approach

59. The precautionary principle or approach requires States to take action to prevent serious harm to the marine environment, that is, even if it is not scientifically certain that the harm will eventuate.<sup>173</sup> The rationale is compellingly straightforward: harm which is serious in nature, if it materializes, will be extremely difficult to undo – if it can be undone at all. This is reflected in Principle 15 of the Rio Declaration, which provides that “[w]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”<sup>174</sup> The precautionary principle / approach has been referred to by numerous international courts and tribunals,<sup>175</sup> and it appears in numerous environmental treaties, including the UNFCCC<sup>176</sup> and the CBD.<sup>177</sup>

60. As noted above, the precautionary principle / approach may be particularly relevant in the context of climate change, where there may be different degrees of scientific certainty (*i.e.*, confidence levels and/or probabilities) as to whether a particular harm will eventualize, and, if it does, whether it will be possible at all to undo that harm.<sup>178</sup> Some of these harms, while subject to a degree of uncertainty, are nevertheless significant – potentially devastating – in nature.

61. Although the Convention does not expressly refer to precaution, the Tribunal has previously noted that the precautionary principle / approach is reflected in implementing

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<sup>173</sup> For further discussion of scientific “confidence” or “probability” assessments in the climate change context, *see* paras. 22-23 above.

<sup>174</sup> Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992 (United Nations publication, Sales No E.93.I.8 and corrigenda), vol. I, resolution 1, annex I, Principle 15.

<sup>175</sup> *See, e.g., Responsibilities and obligations of States sponsoring persons and entities with respect to activities in the Area*, Advisory Opinion, 1 February 2011, *ITLOS Reports 2011*, p. 10, paras. 131-132; *Request for an Advisory Opinion submitted by the Sub-Regional Fisheries Commission (SRFC)*, Advisory Opinion, 2 April 2015, *ITLOS Reports 2015*, p. 4, para. 208 (ii); *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)*, Judgment, 20 April 2010, *ICJ Reports 2010*, para. 164; *Southern Bluefin Tuna Cases (New Zealand v. Japan; Australia v. Japan)*, Order, 27 August 1999, *ITLOS Reports 1999*, paras. 77-80.

<sup>176</sup> UNFCCC, Article 3(3) (“The Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects”).

<sup>177</sup> CBD, preamble (“where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat.”).

<sup>178</sup> *See* Sections II.B and II.C, above.

Regulations.<sup>179</sup> It is also expressly referred to in many RSCAPs. Some RSCAPs mandate that States Parties “shall apply” the precautionary principle,<sup>180</sup> or that States Parties shall “be guided by”<sup>181</sup> or to “endeavour to apply” the principle.<sup>182</sup> In addition, while some RSCAPs require the application of the precautionary principle in circumstances of “threats of serious or irreversible damage” to the marine environment,<sup>183</sup> other RSCAPs require States Parties to apply the principle in a broader set of circumstances. For example, the OSPAR and Helsinki Conventions require States Parties to apply the precautionary principle in circumstances even where there are “reasonable grounds for concern” or “reasons to assume” that pollution “may create hazards” to human health and ecosystems.<sup>184</sup>

#### D. Cooperation

62. The duty to cooperate is essential to achieving environmental protection. Principle 24 of the Stockholm Declaration reflects a general political commitment to international cooperation in matters concerning the protection of the environment, and Principle 27 of the Rio Declaration states that “States and people shall cooperate in good faith and in a spirit of partnership in the fulfilment of the principles embodied in this Declaration and in the further development of international law in the field of sustainable development.”<sup>185</sup>

63. The Convention repeatedly calls for cooperation among States Parties. For example, the duty is reflected in Articles 117 and 118 of the Convention, which require States to cooperate “in the conservation and management of living resources”.<sup>186</sup> In *Land*

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<sup>179</sup> *Responsibilities and obligations of States sponsoring persons and entities with respect to activities in the Area*, Advisory Opinion, 1 February 2011, *ITLOS Reports 2011*, paras. 121-127 (referring to the Nodules Regulations and the Sulphides Regulations).

<sup>180</sup> See, e.g., Barcelona Convention, Article 4(3)(a); Bucharest Convention, Article 4(2)(a); Antigua Convention, Article 5(6)(a); OSPAR Convention, Article 2(2)(a); Helsinki Convention, Article 3(2). See also Barcelona Biodiversity Protocol, preamble; 2012 Protocol to the Tehran Convention for the Protection of the Caspian Sea Against Pollution from Land-Based Sources (*Moscow Protocol*), Article 4(2)(a) (“The Contracting Parties shall, in particular: (a) Apply the precautionary principle . . .”) and 2014 Protocol to the Tehran Convention for the Conservation of Biological Diversity (*Ashgabat Protocol*), Article 4(2)(a) (repeating the same language).

<sup>181</sup> See, e.g., Tehran Convention, Article 5(a).

<sup>182</sup> See, e.g., Nairobi Convention, Article 4.5.

<sup>183</sup> See, e.g., Barcelona Convention, Article 4(3)(a); Moscow Protocol, Article 4(2)(a); Ashgabat Protocol, Article 4(2)(a); Bucharest Convention, Article 4(2)(a); Antigua Convention, Article 5(6)(a).

<sup>184</sup> OSPAR Convention, Article 2(2)(a); Helsinki Convention, Article 3(2).

<sup>185</sup> Stockholm Declaration, Article 24; Rio Declaration, **Exhibit 3**, Principle 27.

<sup>186</sup> UNCLOS, Articles 117 and 118. See also UNCLOS, Articles 242-244.

*Reclamation by Singapore in and around the Straits of Johor (Malaysia v. Singapore)*, the Tribunal held that “the duty to cooperate is a fundamental principle in the prevention of pollution of the marine environment under Part XII of the Convention and general international law.”<sup>187</sup> The duty of cooperation plays a particularly important role in the context of protection of biological diversity and in addressing climate change. The CBD emphasizes “the importance of, and the need to promote, international, regional and global cooperation . . . for the conservation of biological diversity and the sustainable use of its components”.<sup>188</sup> The UNFCCC acknowledges that “the global nature of climate change calls for the widest possible cooperation by all countries and their participation in an effective and appropriate international response”,<sup>189</sup> and both the UNFCCC and Paris Agreement contain multiple references to the need for cooperation among States.<sup>190</sup>

64. RSCAPs are themselves frameworks for cooperation among States on a regional basis, and RSCAPs recognize cooperation among States Parties as necessary to achieve the objectives of protecting the marine environment.<sup>191</sup> RSCAPs also specify the particular contexts in which cooperation is important. These include: cooperation in the formulation of implementing protocols and procedures;<sup>192</sup> cooperation in dealing with pollution emergencies;<sup>193</sup> cooperation in the exchange of scientific information and technology, including monitoring and assessment of pollution;<sup>194</sup> cooperation in the

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<sup>187</sup> *Land Reclamation by Singapore in and around the Straits of Johor (Malaysia v. Singapore)*, Provisional Measures, Order of 8 October 2003, *ITLOS Reports 2003*, p. 10, para. 92.

<sup>188</sup> CBD, preamble, para. 14; Articles 5, 18, 123, 143, 150, 266, 278.

<sup>189</sup> UNFCCC, preamble, para. 6. *See also* Paris Agreement, **Exhibit 6**, preamble, para. 14.

<sup>190</sup> *See, e.g.*, UNFCCC, Articles 3(3), 3(5), 4(1) ((c)-(e) and (g)-(i)), 5(c), 6(b); Paris Agreement, **Exhibit 6**, Articles 6(1), 6(2), 7(6), 7(7), 8(3), 8(4), 10(2), 10(6), 11(3), 12, 14(3).

<sup>191</sup> *See, e.g.*, Barcelona Convention, Article 4(3)(d); Cartagena Convention, Articles 4(3) and 4(5); Nairobi Convention, Article 4(2) and 4(4); Tehran Convention, Article 4(d) and 6; Antigua Convention, Article 5(6)(c); Helsinki Convention, Article 11.

<sup>192</sup> *See, e.g.*, Abidjan Convention, Article 4(2)(4); Abidjan Protocol, Article 5(2); Jeddah Convention, Article 3(2); Noumea Convention, Article 5(3). *See also* 1981 Convention for the Protection of the Marine Environment and Coastal Zones of the South-East Pacific (*Lima Convention*), Article 3(1). The Lima Convention has been in force since 1986 and has 5 contracting parties, including Chile, Colombia, Ecuador, Panama, and Peru.

<sup>193</sup> *See, e.g.*, Barcelona Convention, Article 9; Cartagena Convention, Article 11; Lima Convention, Article 6(3); Jeddah Convention, Article 9(3); Noumea Convention, Article 15.

<sup>194</sup> *See, e.g.*, Barcelona Convention, Article 13; Cartagena Convention, Article 13; Nairobi Convention, Article 15; Kuwait Convention, Article 3(b) and 10; Abidjan Convention, Article 14; Lima Convention, Article 10; Jeddah Convention, Article 10(1); Noumea Convention, Article 17; Bucharest Convention, Article 15(1); Antigua Convention, Article 12; Helsinki Convention, Article 16.

conservation and sustainable use of biological diversity;<sup>195</sup> and cooperation in the selection and management of specially protected areas.<sup>196</sup>

#### E. Polluter pays principle

65. The tribunal in the *Rhine Chlorides Arbitration concerning the Auditing of Accounts (The Netherlands/France)* noted that the polluter pays principle “features in several international instruments, bilateral as well as multilateral and . . . operates at various levels of effectiveness.”<sup>197</sup>

66. The principle is reflected in article 235(2) of the Convention, which requires States to ensure the availability of “prompt and adequate compensation or other relief” in circumstances of “damage caused by pollution of the marine environment” in their jurisdiction.<sup>198</sup> It is also expressly referred to in numerous RSCAPs: some RSCAPs require States to apply the polluter pays principle in order to achieve the objectives of the relevant treaty,<sup>199</sup> and call on States to formulate rules and procedures for determining liability and compensation for harm caused by pollution of the marine environment;<sup>200</sup> other RSCAPs call on States to “be guided by”<sup>201</sup> or to “promote the application of”<sup>202</sup> the polluter pays principle.

## II. Human rights and the marine environment

67. Human rights, like RSCAPs, may provide a further source of “relevant rules of international law” in reference to which the Tribunal should interpret Part XII of the Convention.<sup>203</sup> Indeed, as discussed further in this Section, the Convention and its objectives are intertwined with human rights, and multiple international courts and

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<sup>195</sup> See, e.g., Barcelona Biodiversity Protocol, Article 3(2).

<sup>196</sup> See, e.g., Barcelona Biodiversity Protocol, Article 21(1).

<sup>197</sup> *The Rhine Chlorides Arbitration concerning the Auditing of Accounts (The Netherlands/France)*, PCA Case No. 2000-02, Award, 13 May 2014, para. 103.

<sup>198</sup> UNCLOS, Article 235(2).

<sup>199</sup> See, e.g., Barcelona Convention, Article 4(3)(b); Nairobi Convention, Article 4(5); OSPAR Convention, Article 2(2); Protocol for the Protection of the Caspian Sea Against Pollution from Land-Based Sources and Activities to the Framework Convention for the Protection of the Marine Environment of the Caspian Sea, Article 4(2)(b).

<sup>200</sup> See, e.g., Barcelona Convention, Article 16.

<sup>201</sup> See, e.g., Tehran Convention, Article 5(b).

<sup>202</sup> See, e.g., Antigua Convention, Article 5(6)(b).

<sup>203</sup> UNCLOS, Article 293(1); see also *Request for an Advisory Opinion Submitted by the Sub-Regional Fisheries Commission (SRFC)*, Advisory Opinion, 2 April 2015, *ITLOS Reports 2015*, p. 4, paras. 80-84 (confirming that the law applicable to advisory opinion proceedings includes Article 293(1)); ITLOS Rules, Article 130(1); ITLOS Statute, Article 23.

tribunals have had regard to human rights in the interpretation and application of the Convention (A). UNEP respectfully submits that, in the context of considering States' obligations under the Convention to address the causes and impacts of climate change, human rights and, in particular, the General Assembly's recognition of the right to a clean, healthy and sustainable environment, may be of particular relevance to the Tribunal (B).

A. Relevance of human rights considerations under the Convention

68. The IPCC has referred to the way in which humans depend on the world's oceans and are therefore affected by climate change impacts on the world's oceans:

Nearly two billion people live near the coast, and around 800 million on land less than 10 m above sea level. The ocean directly supports the food, economies, cultures and well-being of coastal populations. The livelihoods of many more are tied closely to the ocean through food, trade, and transportation. Fish and shellfish contribute about 17% of the non-grain protein in human diets and shipping transports at least 80% of international imports and exports.<sup>204</sup>

Human communities heavily depend on the ocean through the goods and services provided by marine ecosystems. The values of ocean-based economic activities are estimated to be trillions of USD, generating hundreds of millions of jobs. As climate change is impacting marine biodiversity and ecosystem services, human communities and their well-being will also be affected.<sup>205</sup>

69. In addition, the IPCC reports that progress on the United Nations Sustainable Development Goals (the **SDGs**) will be affected by the impact of climate change on the oceans. For example, the IPCC observes that:

Climate change is already causing pervasive changes in Earth's ocean and cryosphere. These changes are impacting food, water and health securities, with consequences for achieving SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-Being), SDG 6 (Clean Water and Sanitation), and SDG 1 (No Poverty). Climate change impacts on Earth's ocean and cryosphere also affect the environmental goals for SDG 14

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<sup>204</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Chapter 1, FAQ 1.1, p. 112 (internal citations omitted).

<sup>205</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Section 5.4.2, p. 509 (internal citations omitted).

(Life below Water) and SDG 15 (Life on Land), with additional implications for many of the other SDGs.<sup>206</sup>

70. The IPCC also notes the particular difficulties facing SIDS and coastal cities and communities:

Ocean changes are of concern for small island developing states and coastal cities and communities. Beyond possible reductions in marine food supply and related risks for SDG 2 (Zero Hunger), their lives, livelihoods and well-being are also threatened in ways that are linked to several SDGs, including SDG 3 (Good Health and Wellbeing), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 11 (Sustainable Cities and Communities). For example, sea level rise and warming oceans can cause inundation of coastal homes and infrastructure, more powerful tropical storms, declines in established economies such as tourism and losses of cultural heritage and identity. Improved community and coastal infrastructure can help to adapt to these changes, and more effective and faster disaster responses from health sectors and other emergency services can assist the populations who experience these impacts. In some situations, the most appropriate responses may involve relocation of critical services and, in some cases, communities; and for some populations, migration away from their homeland may become the only viable response.<sup>207</sup>

71. The inextricable link between humans and the oceans is recognized in the Convention, which contains several provisions linking the protection of the marine environment with human rights (most notably the right to life, health, and adequate food), and recognizes the “needs”, “interests”, and “benefit of mankind” as the compass guiding the application of several of its provisions. In particular:

- (a) The Convention provides for States’ obligations to take measures “necessary to prevent, reduce and control pollution of the marine environment from any source”.<sup>208</sup> Article 1(4) in turn defines “pollution of the marine environment” as “the introduction by man, directly or

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<sup>206</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Chapter 1, FAQ 1.2, p. 114 and Section 5.4.2.5, pp. 218-520 (internal citations omitted). *See also* AR6 Synthesis Report, **Exhibit 26**, Section 2.1.2, p. 15 (internal citations omitted).

<sup>207</sup> Special Report on the Ocean and Cryosphere, **Exhibit 24**, Chapter 1, FAQ 1.2, p. 114 (internal citations omitted); Chapter 1, FAQ 1.1, p. 112 (noting also that “the ocean also brings hazards to coastal populations and infrastructure, and particularly to low-lying coasts. These populations are increasingly exposed to tropical cyclones, marine heat waves, sea level rise, coastal flooding and saltwater incursion into groundwater resources”) (internal citations omitted).

<sup>208</sup> UNCLOS, Article 194(1). *See also* Articles 195-196, 207-217, and 222.



indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, *hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities*".<sup>209</sup>

- (b) In its preamble, the Convention refers to the States Parties' intention that the international economic order realized through the Convention be "just and equitable" and "takes into account the *interests and needs of mankind as a whole*".<sup>210</sup> Furthermore, the Convention's provisions on principles governing the area beyond national jurisdiction (the *Area*) further link the natural environment and resources of the ocean to development and human life and dependence on the oceans. Articles 136 and 140(1) thus state that "[t]he Area and its resources are *the common heritage of mankind*"<sup>211</sup> and that all activities in the Area "shall . . . be carried out *for the benefit of mankind as a whole*".<sup>212</sup> Notably, article 146 provides that "[w]ith respect to activities in the Area, necessary measures shall be taken to *ensure effective protection of human life*".<sup>213</sup>
- (c) The Convention also includes considerations of equitable access to adequate food and food security when articulating State obligations and rights over marine resources. Articles 63 and 64 of the Convention refer to the sustainable management and conservation of fish stocks, while Articles

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<sup>209</sup> UNCLOS, Article 1(4) (emphasis added).

<sup>210</sup> UNCLOS, preamble (emphasis added).

<sup>211</sup> UNCLOS, Article 136 (emphasis added). *See also* preamble ("the area of the seabed and ocean floor and the subsoil thereof, beyond the limits of national jurisdiction, as well as its resources, are the common heritage of mankind, the exploration and exploitation of which shall be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States"). *See also* Article 311(6) ("States Parties agree that there shall be no amendments to the basic principle relating to the common heritage of mankind set forth in article 136 and that they shall not be party to any agreement in derogation thereof").

<sup>212</sup> UNCLOS, Article 140(1) (emphasis added). *See also* Article 143(1) ("Marine scientific research in the Area shall be carried out exclusively for peaceful purposes and for the benefit of mankind as a whole, in accordance with Part XIII.") and Article 150(i) ("Activities in the Area shall . . . be carried out in such a manner as to foster healthy development of the world economy and balanced growth of international trade, and to promote international cooperation for the over-all development of all countries, especially developing States, and with a view to ensuring: . . . (i) the development of the common heritage for the benefit of mankind as a whole").

<sup>213</sup> UNCLOS, Article 146 (emphasis added).

62, 69, and 70 concern obligations and rights with respect to surplus of living resources in States' exclusive economic zone. Article 70, for instance, provides that “[g]eographically disadvantaged states shall have the right to participate, on an equitable basis, in the exploitation of an appropriate part of the surplus of the living resources of the exclusive economic zones of coastal states of the same subregion or region”,<sup>214</sup> and one of the relevant factors for consideration to give such access is “the *nutritional needs of the populations* of the respective States”.<sup>215</sup>

- (d) In addition, the Convention provides for obligations of States to take and enforce “measures necessary to implement applicable *international rules and standards established through competent international organizations or diplomatic conference* to prevent, reduce and control pollution of the marine environment” from various sources.<sup>216</sup> Such international rules and standards may also include human rights obligations.

72. The close link between the protection of the environment and human rights can also be found in the other environmental instruments, including those enacted in order to implement the Convention. Several RSCAPs, for example, stipulate objectives to meet the needs of present and future generations and to protect human health threatened by pollution.<sup>217</sup> The OSPAR Convention, for instance, requires the prevention of pollution of the marine environment, both for the purposes of conserving marine ecosystems, but also “*so as to safeguard human health*”.<sup>218</sup> In a similar vein, the preamble of the Paris

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<sup>214</sup> UNCLOS, Article 70(1).

<sup>215</sup> UNCLOS, Article 70(3)(d) (emphasis added).

<sup>216</sup> UNCLOS, Articles 213-214 (emphasis added); *see also* Articles 197, 216-218, and 222.

<sup>217</sup> *See, e.g.*, Moscow Protocol, preamble (referring to the “the protection and conservation of the marine environment and coastal areas and sustainable use of natural resources of the Caspian Sea as an integral part of the development process, meeting the needs of present and future generations in an equitable manner”) Article 4(2)(a) (requiring contracting parties to “[a]pply the precautionary principle, by virtue of which where there are threats of serious or irreversible damage to the marine environment *or to public health*, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent such damage”); Article 4(2)(d) (requiring contracting parties to “[e]nsure that environmental factors, *including health aspects*, are thoroughly taken into account in the development of relevant plans and programmes”). *See also* Barcelona Convention, preamble (referring to “the economic, social, health and cultural value of the marine environment” and contracting parties’ “responsibility to preserve this common heritage for the benefit and enjoyment of present and future generations”); Cartagena Convention, preamble (referring to parties’ “responsibility to protect the marine environment of the wider Caribbean region for the benefit and enjoyment of present and future generations”);

<sup>218</sup> OSPAR Convention, Annex V, Article 1.

Agreement provides that “Parties should, when taking action to address climate change, respect, promote and consider their respective obligations on human rights, the right to health, the rights of indigenous peoples, local communities, migrants, children, persons with disabilities and people in vulnerable situations and the right to development”.<sup>219</sup>

73. In light of all the above, UNEP observes that States’ obligations to protect and preserve the marine environment under the Convention are intertwined with human rights considerations, and, as such, relevant human rights norms may be taken into account in interpreting and applying the provisions under Part XII of the Convention. While the Tribunal has recognized that UNCLOS is not a human rights treaty, it has also stated that “[c]onsiderations of humanity must apply in the law of the sea, as they do in other areas of international law”.<sup>220</sup>

B. The right to a clean, healthy and sustainable environment and other relevant human rights

74. On 28 July 2022, the General Assembly recognized the right to a clean, healthy and sustainable environment as a human right.<sup>221</sup> This followed recognition by the Human Rights Council of the same right in October 2021.<sup>222</sup> The decisions of both bodies build upon the recognition of the right – in some form – in the national legal orders of most UN Member States.<sup>223</sup> The right is also recognized in almost all regions of the world. The recognition of the right is found in regional human rights treaties and instruments, including: the African Charter on Human and Peoples’ Rights;<sup>224</sup> the Additional Protocol to the American Convention on Human Rights in the Area of

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<sup>219</sup> Paris Agreement to the United Nations Framework Convention on Climate Change, **Exhibit 6**, preamble.

<sup>220</sup> *M/V Saiga (No 2) (St. Vincent v. Guinea)*, Judgment, *ITLOS Reports 1999*, p. 62, para. 155. See also *The Arctic Sunrise Arbitration (Netherlands v. Russia)*, PCA Case No. 2014-02, Award on the Merits, 14 August 2015, p. 46, para. 197 (the Annex VII tribunal “may have regard to general international law in relation to human rights . . . to interpret the relevant Convention provisions by reference to relevant context”).

<sup>221</sup> See United Nations General Assembly, Resolution A/RES/76/300, 1 August 2022, **Exhibit 34**.

<sup>222</sup> United Nations Human Rights Council, Resolution A/HRC/RES/48/13, 18 October 2021, **Exhibit 35**.

<sup>223</sup> More than 80 per cent of UN Member States (156 of 193) legally recognize some form of the right to a clean, healthy and sustainable environment, establishing binding duties for Governments, in, *inter alia*, international agreements, their constitution or legislation; see Report of the Special Rapporteur on human rights and environment, UN Doc. A/77/284, 10 August 2022, **Exhibit 36**, paras. 23-26.

<sup>224</sup> See, e.g., African Charter on Human and Peoples’ Rights, Articles 16, 24.

Economic, Social and Cultural Rights (*San Salvador Protocol*);<sup>225</sup> the Arab Charter on Human Rights;<sup>226</sup> the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (*Aarhus Convention*);<sup>227</sup> the Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean (*Escazú Agreement*);<sup>228</sup> and the ASEAN Human Rights Declaration.<sup>229</sup>

75. The content of the right is reflected in a series of thematic reports prepared by the UN Special Rapporteur on human rights and the environment, which describe and analyze the purported substantive elements of the right, including clean air,<sup>230</sup> a safe climate,<sup>231</sup> healthy ecosystems and biodiversity,<sup>232</sup> safe and sufficient water,<sup>233</sup> healthy and sustainable food,<sup>234</sup> and non-toxic environments.<sup>235</sup> The General Assembly and the Human Rights Council have affirmed that the promotion of the right requires “the full implementation of the multilateral environmental agreements under the principles of international environmental law”.<sup>236</sup> Thus, UN Member States have affirmed that compliance with the obligations in the Convention provides a means by which States can protect the human right to a clean, healthy and sustainable environment.

76. While the status of the human right to a clean, healthy and sustainable environment under international law may not be definitively clarified, there is little

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<sup>225</sup> Additional Protocol to the American Convention on Human Rights in the Area of Economic, Social and Cultural Rights, Article 11.

<sup>226</sup> Arab Charter on Human Rights, Article 38.

<sup>227</sup> Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, preamble, Article 1. States outside the European region also may ratify the Aarhus Convention.

<sup>228</sup> See, e.g., Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean, Articles 1, 4(1).

<sup>229</sup> ASEAN Human Rights Declaration, Article 28(f).

<sup>230</sup> Report of the Special Rapporteur on human rights and environment, UN Doc. A/HRC/40/55, 8 January 2019, **Exhibit 37**.

<sup>231</sup> Report of the Special Rapporteur on human rights and environment, UN Doc. A/74/161, 15 July 2019, **Exhibit 38**.

<sup>232</sup> Report of the Special Rapporteur on human rights and environment, UN Doc. A/75/161, 15 July 2020, **Exhibit 39**.

<sup>233</sup> Report of the Special Rapporteur on human rights and environment, UN Doc. A/HRC/46/28, 19 January 2021, **Exhibit 40**.

<sup>234</sup> Report of the Special Rapporteur on human rights and environment, UN Doc. A/76/179, 19 July 2021, **Exhibit 41**.

<sup>235</sup> Report of the Special Rapporteur on human rights and environment, UN Doc. A/HRC/49/53, 12 January 2022, **Exhibit 42**.

<sup>236</sup> United Nations General Assembly, Resolution A/RES/76/300, 1 August 2022, **Exhibit 34**, para. 3; United Nations Human Rights Council, Resolution A/HRC/RES/48/13, 18 October 2021, **Exhibit 35**, para. 3.

disagreement among States that human rights are impacted by harm to and pollution of the environment, including the marine environment. The General Assembly and Human Rights Council have recognized that environmental degradation, climate change, biodiversity loss, and unsustainable development threaten the ability of present and future generations to effectively enjoy all human rights.<sup>237</sup> UN human rights bodies and experts have also clarified the interlinkages between the environment and a wide range of human rights,<sup>238</sup> including the rights to life,<sup>239</sup> health,<sup>240</sup> adequate standard of living,<sup>241</sup> food,<sup>242</sup> water and sanitation,<sup>243</sup> cultural rights,<sup>244</sup> as well as the rights of indigenous peoples.<sup>245</sup>

77. In light of the close connection between the protection and preservation of the marine environment and human rights, the Tribunal may wish to take into consideration the right to a clean, healthy and sustainable environment, as well as other relevant human rights norms, in its interpretation and application of Part XII of the Convention in the course of its consideration of the issues raised by the questions before the Tribunal.

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<sup>237</sup> See, e.g., United Nations Human Rights Council, Resolution A/HRC/RES/52/23, 13 April 2023, **Exhibit 43**, preamble; United Nations General Assembly, Resolution A/RES/76/300, 1 August 2022, **Exhibit 34**, preamble; United Nations Human Rights Council, Resolution A/HRC/RES/48/13, 18 October 2021, **Exhibit 35**, preamble; HRC Resolution A/HRC/RES/7/23, 28 March 2008.

<sup>238</sup> Report of the Special Rapporteur on human rights and environment, UN Doc. A/HRC/37/59, A/HRC/37/59, 24 January 2018, **Exhibit 44**, Annex.

<sup>239</sup> See, e.g., ICCPR, Human Rights Committee, General Comment No. 36 (Article 6: right to life), CCPR/C/GC/36, 3 September 2019, **Exhibit 45**.

<sup>240</sup> See, e.g., Report of the Office of the United Nations High Commissioner for Human Rights, UN Doc. A/HRC/32/23, 6 May 2016, **Exhibit 46**.

<sup>241</sup> See, e.g., Report of the Special Rapporteur on Adequate Housing, UN Doc. A/64/255, 6 August 2009, **Exhibit 47**, paras. 13-34.

<sup>242</sup> See, e.g., Report of the Special Rapporteur on human rights and environment, UN Doc. A/76/179, 19 July 2021, **Exhibit 41**; United Nations Human Rights Council, Resolution A/RES/10/4, 25 March 2009, **Exhibit 48**.

<sup>243</sup> See, e.g., Report of the Special Rapporteur on human rights and environment, UN Doc. A/HRC/46/28, 19 January 2021, **Exhibit 40**.

<sup>244</sup> See, e.g., United Nations Human Rights Council, Resolution A/RES/10/4, 10 August 2021, **Exhibit 49**.

<sup>245</sup> See, e.g., United Nations Economic and Social Council, Draft Report of the Permanent Forum on Indigenous Issues, E/C.19/2023/L.2, 24 April 2023, **Exhibit 50**.