Bringing Climate Adaptation into International Fisheries Law

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Declaration of Authenticity and Author's Rights

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

Signed:

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Abstract

Most marine species respond to ocean warming and acidification caused by climate change by moving towards higher latitudes or deeper waters where their preferred environmental conditions exist. This leads to a redistribution of species from their historical locations, resulting in jurisdictional issues and complications for managing and conserving fish populations. As fish stocks shift, conflicts between fisheries can worsen and new conflicts can arise. This also undermines management tools like marine protected areas and can lead to the loss of ecosystem goods and services, impacting food security and the rights of communities dependent on the ocean. This problem reflects the challenges faced by the law of the sea and ocean governance framework in the 21st century, particularly in the high seas beyond national jurisdiction. Regional fisheries management organizations or arrangements (RFMO/As), which are the intergovernmental bodies responsible for managing fisheries in these areas, are generally unprepared to address the issues caused by shifting fish stocks. Despite a growing body of scientific literature highlighting the global governance implications of climate-driven shifts in marine species, legal research on these challenges is lagging. Existing legal research on the ocean/climate nexus primarily focuses on climate mitigation, highlighting the need for a more integrated and systemic legal approach within the law of the sea and ocean governance. To address these challenges, this thesis aims to explore the extent to which states have an international legal obligation to adapt international fisheries management and conservation to the effects of climate change. It begins with a scientific summary of the causes and consequences of shifting fish stocks under climate change, emphasizing the need for adaptive management practices. Chapter two analyses the existing legal framework applicable to fisheries (international fisheries law) and argues that despite its silence on climate adaptation, there is a positive general international legal obligation on states to adapt fisheries management and conservation to climate change effects. Chapter three examines climate adaptation law within the international climate regime, particularly recent ocean-related developments within the United Nations Framework Convention on Climate Change, to provide normative clarity on adapting high seas fisheries to climate change. Chapter four explores the practical aspect of this obligation by examining climate adaptive practices within RFMO/As, and their legal basis, proposing suggestions for improved practices, including the use of climate adaptation finance. The conclusion summarises the key findings of the thesis and suggests future research priorities.

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INTRODUCTION

Climate change is a global crisis.[1] It is the 'largest, most pervasive threat to the natural environment and human societies the world has ever experienced'.[2] Climate change is altering the physical and chemical makeup of the ocean. These changes and their impacts are well documented.[3] Warming, acidification, deoxygenation, and loss of sea ice are already affecting the productivity and stability of ocean ecosystems, and in some cases causing fish and other marine species to change their migratory patterns and distributional range.[4]

Generally, the response of marine species to climate-induced changes is to shift location towards their preferred environmental conditions poleward to higher latitudes, or into deeper waters.[5] This results in the redistribution of species from their historical locations and across geopolitical boundaries, causing complications for conservation, management, and exploitation of marine living resources.[6] Complications include species leaving areas where they have been habitually and historically fished or designated conservation areas, inter-State conflicts over allocation of fish stocks, and intra-State conflicts between users of fish stocks as they move into deeper waters. [7] These conflicts can lead to overexploitation of marine resources

[1] All websites referenced in this thesis were last accessed on 20 October 2022.
[2] United Nations General Assembly (UNGA), 'Promotion and protection of human rights in the context of climate change mitigation, loss and damage and participation' *Report of the Special Rapporteur on the promotion and protection of human rights in the context of climate change* (26 July 2022) UN Doc. A/77/226 3.
[3] Intergovernmental Planet on Climate Change (IPCC), *The Ocean and Cryosphere in a Changing Climate: Special Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press 2022).
[4] See generally, Nathaniel L Bindoff and others, 'Chapter 5: Changing Ocean, Marine Ecosystems and Dependent Communities' in ibid., 447; Manuel Barange and others, *Impacts of Climate Change on Fisheries and Aquaculture: Synthesis of Current Knowledge, Adaptation and Mitigation Options* (FAO 2018).
[5] Martin J Genner and others, 'Temperature-Driven Phenological Changes within a Marine Larval Fish Assemblage' (2010) 32 Journal of Plankton Research 699; Jennifer M Sunday, Amanda E Bates and Nicholas K Dulvy, 'Thermal Tolerance and the Global Redistribution of Animals' (2012) 2 Nature Climate Change 686; Elvira S Poloczanska and others, 'Global Imprint of Climate Change on Marine Life' (2013) 3 Nature Climate Change 919; Malin L Pinsky and others, 'Marine Taxa Track Local Climate Velocities' (2013) 341 Science 1239; Rebecca G Asch, 'Climate Change and Decadal Shifts in the Phenology of Larval Fishes in the California Current Ecosystem' (2015) 112 Proceedings of the National Academy of Sciences E4065; Kristin M Kleisner and others, 'The Effects of Sub-Regional Climate Velocity on the Distribution and Spatial Extent of Marine Species Assemblages' (2016) 11 PLOS ONE e0149220.
[6] Scott R Loarie and others, 'The Velocity of Climate Change' (2009) 462 Nature 1052; see also IPCC, 'Carbon and other biogeochemical cycles' in *Climate Change 2013: The Physical Science Basis*; UNGA, 'Oceans and law of the sea' *Report of the Secretary General* (6 September 2017) UN Doc. A/72/70, para. 11; U Rashid Sumaila and others, 'Climate Change Impacts on the Biophysics and Economics of World Fisheries' (2011) 1 Nature Climate Change 449; Richard Caddell, 'Precautionary Management and the Development of Future Fishing Opportunities: The International Regulation of New and Exploratory Fisheries' (2018) 33 The International Journal of Marine and Coastal Law 199; Malin L Pinsky and others, 'Preparing Ocean Governance for Species on the Move' (2018) 360 Science 1189.
[7] See Elizabeth Mendenhall and others, 'Climate Change Increases the Risk of Fisheries Conflict' (2020) 117 Marine Policy 103954. For a comprehensive list of bi- and multilateral fisheries conflicts, see Jessica Spijkers and others, 'Marine Fisheries and Future Ocean Conflict' (2018) 19 Fish and Fisheries 798.

and damage to the environment. It is estimated that fish and other marine species are shifting into new areas at an average rate of 70km per decade.[8] Scientists predict these shifts will at least persist at current rates or accelerate, depending on levels of future planetary warming.[9] Controlling the severity of that warming is in the hands of the international community only in part. The inertia of the global climate system, in conjunction with historical greenhouse gas (GHG) emissions, means that all adverse changes to the climate cannot be prevented by emission reductions alone.[10] The Intergovernmental Panel on Climate Change (IPCC) explains that for some impacts, 'adaptation is the only available and appropriate response'.[11] Based on reasoning explained in chapter three, the working definition of adaptation used throughout this thesis is '[a]daptation that is the result of deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is requires to return to, maintain, or achieve a desired state'.[12]

Considering the above impacts alongside the reported general decline in global fish stocks, along with biodiversity and habitat loss,[13] this is cause for concern. The impacts of climate change disrupt the ocean governance framework, and present unprecedented challenges to the stability, predictability, and general efficacy of the international legal framework for the regulation of the ocean and sustainable use of its biodiversity. The institutions that form part of this framework are also affected. For example, it has been argued that the intergovernmental bodies responsible for conserving and managing fisheries on the high seas, known as regional fisheries management organisations or arrangements (RFMO/As)

[8] Poloczanska and others (n 5); note that this global average does not account for regional extremes, and range shifts are happening at faster or slower rates in different parts of the world – see chapter 1, sections 3 and 4 of this thesis.
[9] William WL Cheung, Gabriel Reygondeau and Thomas L Frölicher, 'Large Benefits to Marine Fisheries of Meeting the 1.5°C Global Warming Target' (2016) 354 Science 1591.
[10] IPCC and World Meteorological Organization (eds), *Climate Change: The 1990 and 1992 IPCC Assessments, IPCC First Assessment Report Overview and Policymaker Summaries and 1992 IPPC Supplement* (IPCC 1992) ix; Mohan Munasinghe and Rob Swart, *Primer on Climate Change and Sustainable Development: Facts, Policy Analysis, and Applications* (Cambridge University Press 2005) 172.
[11] Rajendra K Pachauri and IPCC (eds), *Climate Change 2007: Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. 4: Synthesis Report* (IPCC 2008) 19; IPCC and World Meteorological Organization (eds), *Climate Change: The 1990 and 1992 IPCC Assessments, IPCC First Assessment Report Overview and Policymaker Summaries and 1992 IPPC Supplement* (IPCC 1992) ix; Mohan Munasinghe and Rob Swart, *Primer on Climate Change and Sustainable Development: Facts, Policy Analysis, and Applications* (Cambridge University Press 2005) 172.
[12] Martin L Parry and others (eds), *Climate Change 2007: Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press 2007) 896.
[13] Eduardo Sonnewend Brondízio and others (eds), *The Global Assessment Report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services* (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) 2019).

appear unprepared for dealing with the issues caused by shifting fish stocks, and climate change generally.[14] Since the issues and challenges brought about by climate change are vast and complex, it is apparent that no single legal instrument, framework, or approach will be able to respond in a fully adequate manner. It has been argued that an integrated approach to existing legal frameworks is necessary to respond to the challenges of climate change and to achieve transformational change in ocean governance.[15]

Global marine capture fisheries are subject to the international legal framework for the oceans, specifically, the domain or rule-complex understood as international fisheries law.[16] International fisheries law is a complex and non-hierarchical web of "hard" and "soft" legal instruments and policies which have evolved and adapted over time to new challenges and issues. International fisheries law is made up of a collection of multilateral agreements, stemming from the 1982 United Nations Convention on Law of the Sea Convention (UNCLOS or Convention),[17] and the 1995 United Nations Agreement on Straddling and Highly Migratory Fish Stocks (UNFSA).[18] These are both products of their time insofar as they do not refer explicitly to climate change. International fisheries law also benefits from a number of binding and non-binding subject-specific instruments, many of which have been established by the Food and Agriculture Organization of the United Nations (FAO) and its Committee on Fisheries,[19] as well as components of UN General Assembly (UNGA) Resolutions.[20]

[14] Brian Pentz and Nicole Klenk, 'The "Responsiveness Gap" in RFMOs: The Critical Role of Decision-Making Policies in the Fisheries Management Response to Climate Change' (2017) 145 Ocean & Coastal Management 44; Brian Pentz and others, 'Can Regional Fisheries Management Organizations (RFMOs) Manage Resources Effectively during Climate Change?' (2018) 92 Marine Policy 13.

[15] Bolanle Erinosho and others, 'Transformative Governance for Ocean Biodiversity' in Ingrid J Visseren-Hamakers and Marcel T J Kok (eds), *Transforming Biodiversity Governance* (Cambridge University Press 2022). 313; Mitchell Lennan, 'Fisheries redistribution under climate change: Rethinking the law to address the "governance gap"' in Froukje M Platjouw and Alla Pozdnakova (eds) *The Environmental Rule of Law for the Oceans – Designing Legal Solutions*, (Cambridge University Press 2023) 163.

[16] See generally, Richard Caddell and Erik Molenaar (eds), *Strengthening International Fisheries Law in an Era of Changing Oceans* (Hart 2019).

[17] United Nations Convention on the Law of the Sea, Montego Bay, 10 December 1982, in force 16 November 1994, 1833 UNTS 397 (UNCLOS).

[18] Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, New York, 4 August 1995, in force 11 December 2001, 2167 UNTS 3 (UNFSA).

[19] For example, Food and Agriculture Organization of the United Nations (FAO), *Code of Conduct for Responsible Fisheries* (FAO 1995); Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing, 22 November 2009, in force 5 June 2016, 55 ILM 1157; Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas 24 November 1993, in force 24 April 2003, 2221 UNTS 92 (Compliance Agreement).

[20] E.g., UNGA, *Large-scale pelagic driftnet fishing and its impact on the living and marine resources of the world's oceans and seas*, Resolution adopted by the General Assembly (22 December 1989), UN Doc. A/RES/44/225; UNGA, *Sustainable fisheries, including through the 1995 Agreement for the Implementation of*

International fisheries law is also informed by other multilateral environmental agreements (MEAs), including those concerning the conservation or protection of specific species,[21] or biodiversity as a whole.[22] This facilitates progressive development of standards for the management and conservation of international fish stocks and marine biodiversity in the face of new and emerging challenges.

Despite the challenges presented by climate change to the international fisheries governance framework, the integration of international climate law and fisheries is so far rather nascent. For example, formal intergovernmental discussion about the ocean within the fora of the United Nations Framework Convention on Climate Change (UNFCCC),[23] and the Paris Agreement,[24] with the view to make decisions on, support and implement ocean-based climate action, has only just begun after over a decade of advocacy.[25] Global fisheries support the livelihoods of millions and contribute to food security of billions of people.[26] Climate change threatens this security. Sustainably exploited fisheries are a key component of a healthy ocean, and therefore vital for achieving the necessary conditions for the enjoyment of human rights, including the rights to life, food, health, water, culture, as well as the right to a clean, healthy and sustainable environment,[27] as recently recognised by the UNGA as a universal human

the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and Related Instruments Resolution adopted by the General Assembly (9 December 2021), UN Doc. A/RES/76/71; James Harrison, *Making the Law of the Sea: A Study in the Development of International Law* (Cambridge University Press 2013) 201–204.

[21] Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington DC, 3 March 1973, in force 1 July 1975, 993 UNTS 243 (CITES).

[22] Convention on Biological Diversity, Rio de Janeiro, 5 June 1993, in force 29 December 1993, 1760 UNTS 79 (CBD).

[23] United Nations Framework Convention on Climate Change, New York, 9 May 1992, in force 21 March 1994 1771 UNTS 107 (UNFCCC).

[24] Paris Agreement, Paris, 12 December 2015, in force 4 November 2016, UN Doc. FCCC/CP2015/L.9/Rev/1.

[25] See, UNFCCC Decision 1/CP.26, *Glasgow Climate Pact*, UN Doc. FCCC/CP/2021/12/Add.1, paras. 58, 60–61; Mitchell Lennan and Elisa Morgera, 'The Glasgow Climate Conference (COP26)' (2022) 37 The International Journal of Marine and Coastal Law 137.

[26] See Barange and others (n 4); Kevern L Cochrane and others (eds), *Climate Change Implications for Fisheries and Aquaculture: Overview of Current Scientific Knowledge* (Food and Agriculture Organization of the United Nations (FAO) (2009); FAO *Code of Conduct for Responsible Fisheries*, Art. 6(2) 'Fisheries management should promote the maintenance of the quality, diversity and availability of fisheries resources in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development'; Richard Barnes and Mercedes Rosello, 'Fisheries and Maritime Security: Understanding and Enhancing the Connection' in Malcolm Evans and Sofia Galani, *Maritime Security and the Law of the Sea* (Edward Elgar Publishing 2020) 48, 57–62.

[27] Mitchell Lennan, 'Integrated and Inclusive Ocean Governance Is Essential to Tackling Climate Change' (2021) One Ocean Hub Policy Brief 4, available at <https://oneoceanhub.org/publications/integrated-and-inclusive-ocean-governance-is-essential-to-tackling-climate-change/>.

right.[28] Considering that safeguarding food security in the face of climate change is a key objective of the Paris Agreement,[29] integrating climate change mitigation, adaptation and finance obligations into fisheries management can contribute to ensuring the human right to food, and the whole spectrum of internationally recognised human rights. Further, shifts in location of fish populations due to climate change have several human rights implications, including for the rights to food and health, cultural rights, children's rights, and intergenerational equity issues due to loss of fishing opportunities traditionally undertaken by indigenous peoples and local communities, for example. These issues support the argument of better integration of both climate change law into international fisheries law, to inform climate-adaptive fisheries management and help secure the various human rights identified above. However, like international climate law, there is limited integration of international fisheries law and human rights, as illustrated particularly by the issues surrounding implementing and enforcing human rights at sea.[30] For reasons of space, however, the focus of this thesis is primarily on the integration of climate change law – specifically climate change adaptation – into international fisheries law.

For international fisheries law to remain relevant and enhance its effectiveness maintain its regulatory function and achieve its desired objectives in the face of climate change impacts 'far-sighted legal and management solutions to mitigate these impacts, in a context of scientific and political uncertainty, and demands for increased flexibility in the regulation of marine living resources' must be developed.[31] That said, international fisheries law is only one piece of this regulatory puzzle, and is unable to comprehensively address climate change mitigation, adaptation or finance relevant to international fisheries.[32] Nevertheless, international fisheries law deserves specific attention in this context since it is the primary legal framework through which climate adaptive international fisheries management and conservation can be

[28] UNGA, *The human right to a clean, healthy and sustainable environment*, Resolution adopted by the General Assembly on 28 July 2022 UN Doc. A/RES/76/300.
[29] Paris Agreement, Preamble and Art. 2(b).
[30] See generally, Irini Papanicolopulu, *International Law and the Protection of People at Sea* (Oxford University Press 2018); Vasco Becker-Weinberg, 'Time to Get Serious about Combating Forced Labour and Human Trafficking in Fisheries' (2020) 36 The International Journal of Marine and Coastal Law 88.
[31] Richard Caddell, 'Where's the Catch? Shifting Stocks, International Fisheries Management and the Climate Change Conundrum' in Jacques Hartmann and Urfan Khaliq (eds), *The Achievements of International Law: Essays in Honour of Robin Churchill* (Hart 2021) 285.
[32] Daniel Bodansky, 'The Ocean and Climate Change Law Exploring the Relationships' in Richard Barnes and Ronán Long (eds), *Frontiers in International Environmental Law: Oceans and Climate Challenges* (2021) 316; Erik Molenaar, 'Integrating Climate Change in International Fisheries Law' in Elise Johansen, Ingvild Ulrikke Jakobsen and Signe Veierud Busch (eds), *The Law of the Sea and Climate Change: Solutions and Constraints* (Cambridge University Press 2020) 263.

implemented at the international level. As discussed in more detail below, it is also a necessary exercise to demonstrate how systemic integration of climate change and biodiversity law can strengthen and progressively develop international fisheries law via treaty interpretation to adapt and respond to the effects of climate change and promote integrated and inclusive ocean governance to address climate change more generally.[33]

While the scientific evidence of range shifts in marine, terrestrial and freshwater environments is every growing, the law and governance arrangements these range shifts have received little attention from academic or policy research.[34] Some scientific publications on this topic have made law and policy recommendations on species range shifts. Including: the need for international fisheries agreements to be 'adjusted' to account for shifting fish stocks, including those establishing RFMO/As and the practice of those organisations or arrangements;[35] for management and policy frameworks to be in place prior to species arriving in new areas;[36] and even a call for a 'Climate Change Redistribution Treaty' that would 'acknowledge the transnational redistribution of all species from climate change and establish shared governance agreements for their establishment, ownership, protection, exploitation and/or management', with the acknowledgement that this would likely take decades to come to fruition.[37] These recommendations indicate that to address this problem, there is a need to make use of existing international legal instruments, bolstered with evolutive and systemic interpretation as well as the potential for guidance on State practice through new "soft" law.

Generally, the international legal literature on law of the sea vis-à-vis climate change has focused on topics other than fisheries.[38] For example, there is substantial literature on the

[33] Lennan, (n 27).
[34] Gretta T Pecl and others, 'Biodiversity Redistribution under Climate Change: Impacts on Ecosystems and Human Well-Being' (2017) 355 Science eaai9214; Timothy C Bonebrake and others, 'Managing Consequences of Climate-Driven Species Redistribution Requires Integration of Ecology, Conservation and Social Science' (2018) 93 Biological Reviews 284; Brett R Scheffers and Gretta Pecl, 'Persecuting, Protecting or Ignoring Biodiversity under Climate Change' (2019) 9 Nature Climate Change 581; Juliano Palacios-Abrantes and others, 'Timing and Magnitude of Climate-Driven Range Shifts in Transboundary Fish Stocks Challenge Their Management' (2022) 28 Global Change Biology 2312.
[35] Pinsky and others, (n 6); Palacios-Abrantes and others, ibid.
[36] Scheffers and Pecl, (n 34); Pinsky and others (n 6).
[37] Scheffers and Pecl, ibid., 584.
[38] See generally, Tim Stephens, 'Warming Waters and Souring Seas: Climate Change and Ocean Acidification' in Donald Rothwell and others (eds), *The Oxford Handbook of the Law of the Sea* (Oxford University Press 2015) 777.

international legal consequences of sea level rise,[39] and climate change mitigation obligations of States under Part XII of UNCLOS and the climate regime.[40] While there is no doubt that these issues are important, it is nonetheless disappointing that the international legal issues surrounding fisheries and climate change have received less attention.[41] Indeed, on the disproportionate scholarly attention paid to sea level rise, such as changing baselines from where State's maritime entitlements are measured, Caddell has argued that 'the most significant and contested implications on maritime entitlements will involve shifting marine living resources rather than a subtle reconfiguration of jurisdictional waters'.[42] On that note, when a fish or other marine creature shifts its location and becomes transboundary, national concerns regarding its conservation and management become international ones.[43] This merits addressing this problem through an international legal lens. However, the scant international-[44] and regional-focused,[45] legal literature on marine species range shifts has been narrow in scope. It has focused on the potential and limitations of the "hard" international fisheries law instruments (i.e., obligations found in the provisions of UNCLOS and UNFSA) for adaptation to shifting fish stocks. Scholarly analysis has not yet taken a systemic approach and considered the potential for the integration of international climate, biodiversity, human rights, or trade law in clarifying what obligations States have (if any) under international fisheries law *and*

[39] See for example, Sarra Sefrioui, 'Adapting to Sea Level Rise: A Law of the Sea Perspective' in Gemma Andreone (ed), *The Future of the Law of the Sea: Bridging Gaps Between National, Individual and Common Interests* (Springer International Publishing 2017); Snjólaug Árnadóttir, 'Ecological Changes Justifying Termination or Revision of EEZ and EFZ Boundaries' (2017) 84 Marine Policy 287; Clive Schofield, *A New Frontier in the Law of the Sea? Responding to the Implications of Sea Level Rise for Baselines, Limits and Boundaries* (Brill Nijhoff 2021); Snjólaug Árnadóttir, *Climate Change and Maritime Boundaries: Legal Consequences of Sea Level Rise* (Cambridge University Press 2021); Roberto Virzo, 'Sea-Level Rise and State of Necessity: Maintaining Current Baselines and Outer Limits of National Maritime Zones' (2022) 2 The Italian Review of International and Comparative Law 21.

[40] See Alan Boyle, 'Protecting the Marine Environment from Climate Change: The LOSC Part XII Regime' in Elise Johansen, Ingvild Ulrikke Jakobsen and Signe Veierud Busch (eds), *The Law of the Sea and Climate Change: Solutions and Constraints* (Cambridge University Press 2020) 81; Catherine Redgwell, 'Treaty Evolution, Adaptation and Change: Is the LOSC "Enough" to Address Climate Change Impacts on the Marine Environment?' (2019) 34 The International Journal of Marine and Coastal Law 440; Alan Boyle, 'Litigating Climate Change under Part XII of the LOSC' (2019) 34 The International Journal of Marine and Coastal Law 458.

[41] See generally Rosemary Rayfuse, 'Addressing Climate Change Impacts in Regional Fisheries Management Organizations' in Caddell and Molenaar (n 16) 247; Molenaar, 'Integrating Climate Change in International Fisheries Law' (n 32); Yoshinobu Takei, 'Climate Change and High Seas Fisheries' in Jan McDonald, Jeffrey McGee and Richard Barnes, *Research Handbook on Climate Change, Oceans and Coasts* (Edward Elgar Publishing 2020) 114.

[42] Caddell, (n 31) 312.

[43] See *Bering Fur Seals Arbitration (Great Britain v. USA)* (1893), RIAA XXVIII.

[44] Caddell, (n 31).

[45] Jan McDonald and Shannon M Torrens, 'Governing Pacific Fisheries under Climate Change' in Jan McDonald, Jeffrey McGee and Richard Barnes, *Research Handbook on Climate Change, Oceans and Coasts* (Edward Elgar Publishing 2020) 287.

these various instruments frameworks to adapt to climate impacts on fisheries and marine biodiversity.

Considering this cross-cutting issue it can be argued that it is necessary take a systemic approach to treaty interpretation in this context. This approach is codified in the 1969 Vienna Convention on the Law of Treaties (VCLT),[46] Article 31(3)(c) of which stipulates that in the process of interpreting a treaty, 'any relevant rules of international law applicable in the relations between the Parties' shall be taken into account.[47] This approach is broadly understood as 'the principle of systemic integration' as propagated by McLachlan.[48] Although other terminology has been used,[49] this thesis will refer to 'systemic integration' throughout. However, systemic integration sits within the basket of 'rules' for the practice of treaty interpretation, mostly found within Articles 31–33 of the VCLT, and prior to discussion of the principle, it must be understood within this broader context.[50] These rules 'do not dictate the outcome of any act of interpretation, but rather serve as a structure for the argumentation'.[51] This includes the 'basic' or 'general' rule in Article 31(1), which states '[a] treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in light of its object and purpose.'[52] The elements of this provision are applicable as a whole.[53] The provision mirrors customary international law and is applicable to non-Parties to the VCLT.[54] This provision allows for international courts and tribunals to

[46] Vienna Convention on the Law of Treaties, 23 May 1969, in force 27 January 1980 1155 UNTS 331 (VCLT).
[47] ibid., Art. 31(3)(c); See *Oil Platforms (Islamic Republic of Iran v. United States of America) Merits, Judgment* ICJ Reports 2003, 161, para. 41.
[48] See Campbell McLachlan, 'The Principle of Systemic Integration and Article 31(3)(C) of the Vienna Convention' (2005) 54 International & Comparative Law Quarterly 279.
[49] Including 'systemic interpretation' *Ioan Micula and Others v Romania*, Final Award, 11 December 2013, ICSID Case No ARB/05/20, paras. 307 and 310, 'harmonious interpretation' Vattenfall AB and Others v Germany, Decision on the Achmea Issue, 31 August 2018, ICSID Case No ARB/12/12, paras. 158 and 167. For an extensive list, see Panos Merkouris, 'Principle of Systemic Integration' *Max Planck Encylopedia of International Procedural Law* (2020), available at: <https://opil.ouplaw.com/display/10.1093/law-mpeipro/e2866.013.2866/law-mpeipro-e2866>.
[50] See for example Joshua Paine, 'The Judicial Dimension of Regime Interaction beyond Systemic Integration' in Seline Trevisanut, Nikolaos Giannopoulos and Rozemarijn Roland Holst (eds), *Regime Interaction in Ocean Governance* (Brill | Nijhoff 2020) 184.
[51] Rozemarijn J Roland Holst, *Change in the Law of the Sea: Context, Mechanisms and Practice* (Brill Nijhoff 2022) 168–264, 173.
[52] VCLT, Art. 31(1).
[53] Richard Gardiner, *Treaty Interpretation* (Oxford University Press 2015), 8.
[54] Roland Holst (n 51) 173; Gardiner ibid., 12–15; See also *Oil Platforms (Islamic Republic of Iran v. United States of America) Preliminary Objection,* Judgment 1CJ Reports 1996, 803, para. 23; *Kasikili/Sedudu Island (Botswana v. Namibia)* Judgment ICJ Reports 1999, 1045, para. 18; *Certain Questions of Mutual Assistance in Criminal Matters (Djibouti v. France)* Judgment ICJ Reports 2008, 177, para.112; *Responsibilities and obligations of States sponsoring persons and entities with respect to activities in the Area* (2011) Advisory Opinion ITLOS Reports 2011, 10, para. 57 (*Seabed Advisory Opinion*).

rely on external treaties not in force between the Parties to interpret the meaning of provisions to the treaty under interpretation as an 'elaborate law dictionary'.[55] Roland Holst indicates the term 'object and purpose' as an entry point for evolutionary interpretation, noting that interpretation is dependent and specific to the case at hand,[56] and 'the application of international law rules on interpretation of treaties to identical or similar provisions of different treaties may not yield the same results, having regard to *inter alia*, differences in the respective contexts objects and purposes, subsequent practise of parties and *travaux préparatoires*'.[57] Indeed, it requires careful consideration of the object and purpose of the treaty provision in question and the treaty itself 'in accordance with the intentions of the parties at the time of its conclusion.'[58] As mentioned above, UNCLOS, the UNFSA and other binding instruments in international fisheries law are silent on climate change. However, the objectives of UNCLOS and the UNFSA are the peaceful use of the seas and oceans; equitable and efficient utilisation of its resources; conservation of (marine) living resources; protection and preservation of the marine environment;[59] and the 'long-term conservation and sustainable use of' transboundary fish stocks 'through effective implementation of the relevant provisions of [UNCLOS]', respectively.[60] However, relying on the object and purpose of a treaty can be argued to be rather thin since it raises questions of 'intention' of the Parties negotiating and the drafters of the treaty text,[61] which, given the time that UNCLOS was adopted, limits the importance of its changing context and the strength of the argument that climate change and subsequent treaties which address that topic directly or indirectly. Nevertheless, the VCLT specifies 'context' to include not just the treaty text, its preamble and annexes, but also 'any agreement relating to the treaty which was made between all the parties in connection with the conclusion of the treaty' and 'any instrument which was made by one or more parties in connection with the conclusion of the treaty and accepted by the other parties as an instrument related to the treaty.'[62] Together with this context, and any relevant rules of international law applicable in the relations between the Parties, the VCLT also stipulates that 'any subsequent agreement

[55] McLachlan, (n 48) 315.
[56] Roland Holst, (n 51) 181.
[57] *The MOX Plant Case (Ireland v. United Kingdom)*, Order of 3 December 2001, ITLOS Reports 2001, 95, para. 51.
[58] *Legal Consequences for States of the Continued Presence of South Africa in Namibia (South West Africa) notwithstanding Security Council Resolution 276* (1970), Advisory Opinion, ICJ Reports 1971, 31, para. 53; Mclachlan, (n 48) 279.
[59] UNCLOS, Preamble.
[60] UNFSA, Art. 2.
[61] Roland Holst, (n 51) 182–3.
[62] VCLT, Art. 31(2).

between the parties regarding the interpretation of the treaty or the application of its provisions',[63] and 'any subsequent practice in the application of the treaty which establishes the agreement of the parties regarding its interpretation' shall be taken into account.[64] On the former provision, this could indicate implementing agreements adopted under UNCLOS. These are the UNFSA, the Part XI Implementing Agreement and the Agreement on the Conservation and Sustainable Use of Marine Biodiversity Beyond National Jurisdiction (not yet in force).[65] While the Part XI implementing Agreement can be said to formally amend the provisions of UNLCOS, UNFSA instead clarifies, modernises and at points implements the high seas fisheries provisions of UNCLOS, but does not amend them (discussed in detail in chapter 2). In addition, UNFSA has limited participation with only 91 Parties in comparison to 169 with UNCLOS, and unlike the Part XI Implementing Agreement, is a treaty in its own right with States holding the freedom to become a Party to UNFSA but not UNCLOS (as is the case with the United States). This limited overlap challenges the argument that UNFSA is a 'subsequent agreement' under VCLT Article 31(3)(a),[66] although it has been argued that this is the case.[67] Another more agreeable view is that the UNFSA modifies the interpretation of the high seas fisheries provisions of UNCLOS through subsequent practice.[68]

Against this background of the broader rules of treaty interpretation, it is appropriate now to turn to the principle of systemic integration as found in VCLT Article 31(3)(c). To reiterate, this provision stipulates that along with the context of a treaty, 'any relevant rules of international law applicable in the relations between the parties' must be taken into account.[69] It is necessary to address what is meant by certain terms in this provision. The context of 'relevant rules' is flexible; in that it applies to both rules at the time of the conclusion of the treaty and those concluded afterwards. This is supported by the fact that during the discussions of the text of the VCLT, the International Law Commission omitted the term 'at the time of

[63] ibid., Art. 31(3)(a).
[64] ibid., Art. 31(3)(b).
[65] Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, adopted 28 July 1994, 33 ILM 1309; Agreement under the United Natons Convention on the Law of the Sea on the Conservation and Sustainable use of Marine Biological Diversity of Areas beyond National Jurisdiction, New York, 19 June 2023, UN Doc. A/CONF.232/2023/4*.
[66] See Alan Boyle, 'Further Development of The Law of The Sea Convention: Mechanisms for Change' (2005) 54 International and Comparative Law Quarterly 563, 567–572.
[67] David H Anderson, 'The Straddling Stocks Agreement of 1995: An Initial Assessment' (1996) 45 International and Comparative Law Quarterly 463, 468.
[68] See Harrison, (n 20) 106; Richard Barnes, 'Flexibility and Innovation in the Law of the Sea – Will the LOS Convention Amendment Procedure Every be Used? – Commentary' in Alex Oude Elferink (ed), *Stability and Change in the Law of the Sea: The Role of the LOS Convention* (Martinus Nijhoff Publishers 2005), 203.
[69] VCLT, Art. 31(3)(c).

the conclusion of the treaty' from the draft text of the provision and established the relevance of other rules on a case- and subject-dependent basis.[70] Turning to 'applicable between the parties', there are contrasting views on this point. As alluded to above, the treaties to be analysed in this thesis do not have complete overlap in terms of their membership. The CBD and the Paris Agreement, for example, boast near-universal participation with 192 and 196 Parties respectively, while UNCLOS has 169 Parties and the UNFSA has 91. This issue of partial overlap is important since it is contentious as to whether 'applicable between the parties' is understood to mean that *all* Parties to the treaty being interpreted must also be Party to the other relevant treaty, or if it is the case that this provision applies only to 'the parties' to the dispute.[71] Moreover, it has been argued that an applicable rule must be shown to be a customary one, or that the rule must have been (implicitly) accepted or at least tolerated by all parties to the treaty under interpretation..[72] The International Law Commission has offered guidance which supports the case-by-case or subject specific mode of interpretation, stating:

> Article 31, paragraph 3 (c), also requires the interpreter to consider other treaty-based rules so as to arrive at a consistent meaning. Such other rules are of particular relevance where parties to the treaty under interpretation are also parties to the other treaty, where the treaty rule has passed into or expresses customary international law or where they provide evidence of the common understanding of the parties as to the object and purpose of the treaty under interpretation or as to the meaning of a particular term.[73]

In terms of overlap in treaty membership, it has been argued that the need for complete overlap is restrictive and 'not in line with practical reality'.[74] Indeed, such a restrictive approach would isolate the treaties considered in this thesis which boast a large number of Parties from the broader general international legal framework.[75] Gardiner argues that parties can modify the rules applicable to them through use of reservations to particular provisions in particular

[70] Gardiner, (n 53) 256–259; Panos Merkouris, *Article 31(3)(c) VCLT and the Principle of Systemic Integration: Normative Shadows in Plato's Cave* (Brill Nijhoff 2015) especially 13–101 and 102–162.
[71] McLachlan, (n 48) 314–315; Gardiner, (n 53) 269–275; Roland Holst, (n 51) 190–193; Note that there is also discussion on what is meant by 'the parties' see Gardiner, (n 53) 263–265.
[72] McLacglan, ibid.; Gardiner ibid., 274–275.
[73] International Law Commission (ILC), Fragmentation of International Law: Difficulties Arising from the Diversification and expansion of International Law (2006) A/CN.4/L.682 Report of the Study Group of the International Law Commission, finalized by Mr Martti Koskenniemi, available at <https://legal.un.org/ilc/documentation/english/a_cn4_l682.pdf>, 106, para. 21.
[74] Roland Holst, (n 51) 191; see Duncan French, 'Treaty Interpretation and the Incorporation of Extraneous Legal Rules' (2006) 55 International & Comparative Law Quarterly 281, 306–307.
[75] McLachlan, (n 48) 314; Roland Holst, (n 51) 191.

treaties.[76] However this is not relevant in the context of this thesis since the treaties at hand prohibit reservations.[77] It can be argued that a flexible and holistic approach is therefore necessary here,[78] and will be taken throughout this thesis. The primary conclusion here that complete overlap is not totally necessary since the UN climate and biodiversity treaties boast near-universal participation and the fisheries provisions of UNCLOS are considered customary international law. This point will be further developed later in the thesis.

The various benefits and pitfalls of systemic integration have been discussed in the literature.[79] A key benefit is that treaties 'of their time' can be reinterpreted in an evolutive fashion to take account of more recent environmental norms, including agreements on transboundary resources such as a river for example, a practice already utilised by international courts and tribunals.[80] This considered, one can argue that systemic integration of climate and biodiversity MEAs into international fisheries law would primarily support these treaty objectives, rather than seek to alter them beyond recognition, or create new obligations on States who had not consented to them. A second point of caution is that 'interpretation should not be a cloak for the revision of a treaty',[81] however successful revision of UNCLOS provisions through the long-winded and untested revision procedure in Article 312 to account for the issues described above seems an unlikely possibility.[82] This is particularly pertinent since the treaties to address climate change impacts, biodiversity loss and cooperation in international fisheries management already exist and thus begs the question of what exactly would be updated in the text of UNCLOS to modernise it. It is argued there that an evolutive and systemic interpretation of relevant provisions of international fisheries law is necessary.

[76] Gardiner, (n 53) 265.
[77] UNCLOS, Art. 309; UNFSA, Art. 52; CBD, Art. 37; UNFCCC, Art. 24; Paris Agreement, Art. 27.
[78] Merkouris, (n 70) 22–24, 92–93, 95–100.
[79] See, for example Joost Pauwelyn, 'The Role of Public International Law in the WTO: How Far Can We Go?' (2001) 95 American Journal of International Law 535, 575–6; McLachlan, (n 48) 'The Principle of Systemic Integration and Article 31(3)(C) of the Vienna Convention' (2005) 54 International & Comparative Law Quarterly 279; ILC. (73) 84–98; French, (74) 'Treaty Interpretation and the Incorporation of Extraneous Legal Rules' (2006) 55 International & Comparative Law Quarterly 281, 300–307; Boyle, (n 66) 567–572; *Whaling in the Antarctic (Australia v. Japan: New Zealand intervening)* Public sitting held on Wednesday 3 July 2013, at 10 am, Verbatim Record CR 2013/13, 45–48, paras. 20–29; See generally Merkouris, (n 70).
[80] *Pulp Mills on the River Uruguay (Argentina v. Uruguay),* Judgment, (2010) ICJ Reports 2010, 14; *Gabčíkovo-Nagymaros Project (Hungary/Slovakia),* Judgment, (1997) ICJ Reports 1997, 78, para. 141; *Iron Rhine Railway Arbitration (Belgium/Netherlands),* Award, 2005 PCA Award Series 2005, para. 59; *Indus Waters Kishenganga Arbitration (Pakistan v. India)* Partial Award, (2013), PCA Award Series 2013, para. 452.
[81] James Harrison, 'Judicial Law-Making and the Developing Order of the Oceans' (2007) 22 The International Journal of Marine and Coastal Law 283, 302.
[82] On this topic see Boyle, (n 66); Patrick Vracknen, 'Article 312' in Alexander Proelß and others (eds), *United Nations Convention on the Law of the Sea: A Commentary* (CH Beck 2017) 2019–2025; Roland Holst, (n 51) 168–264.

That said, there is uncertainty whether an international court or tribunal interpreting the fisheries provisions of UNCLOS would make use of VCLT Article 31(3)(c) since UNCLOS Article 239(1) allows for judicial bodies interpreting UNCLOS to apply 'any other rules of international law not incompatible with the convention.' This point is rather pertinent for the context of this thesis, since it does not support the explicit use of systemic integration by way of VCLT Article 31(3)(c), however it does identify other avenues to interpretation of the fisheries provisions of UNCLOS which support the central argument of this thesis.

Drawing upon the possibilities inherent in the rules of treaty interpretation set out above, interpretation from systemic integration, evolutive interpretation or mutual supportiveness in the context of this thesis to interpret obligations under international fisheries law while making use the major MEAs relevant to (marine) biodiversity and climate change. This includes looking beyond the law of the sea and biodiversity treaties to the obligations found within the United Nations climate change treaties, as well as the practices of their established institutions, processes, and work programmes. This approach seeks to clarify the scope and content of the international legal obligation to adapt fisheries management to climate change. This undertaking is one of the key original contributions of this thesis. As is a deep exploration of international climate change adaptation law and the extent to which the obligation to adapt under the international climate change law apply to State's conduct in international fisheries.

To that end, the thesis seeks to answer the question 'to what extent do States have an international legal obligation to adapt international fisheries management and conservation to the effects of climate change?'. The thesis takes the following outline: Chapter one contains a detailed scientific summary of the causes and consequences of shifting fish stocks under climate change, concluding that the need for adaptive management practices to respond to species shifts, and introduces the research question. Chapter two, after an analysis of the of the existing legal framework applicable to fisheries, the thesis argues that, despite international fisheries law being largely silent on climate change, there is a positive general international legal obligation on States to adapt national and international fisheries management and conservation to the effects of climate change. Chapter three, as a dedicated chapter on international climate law, goes on to explore climate adaptation law as it is found in the international climate regime and the extent to which this supplies any normative content to the obligation to adapt, and then focuses on recent ocean-related developments within the

UNFCCC, exploring to what extent this can provide any normative clarity to inform the obligation to adapt high seas fisheries to climate change. Chapter four then explores the practical component of this obligation by examining various climate adaptive practices within RFMO/As and their legal basis and makes suggestions for improved practices including utilisation of climate adaptation finance. The conclusion (chapter five) summarises the key findings of the thesis and suggests research priorities moving forward.

CHAPTER ONE: Marine Biodiversity Redistribution under Climate Change

Causes and Consequences for Fisheries

Ocean temperatures vary from about 28°F in Polar seas to 96°F in the Persian Gulf, which contains the hottest ocean water in the world. To creatures of the sea, which with few exceptions must match in their own bodies the temperature of the surrounding water, this range is tremendous, and change of temperature is probably the most important single condition that controls the distribution of marine animals.[83]

– Rachel Carson, 1951.

[83] Rachel Carson, *The Sea Around Us* (Oxford University Press 2018) 21.

1. Introduction

The ocean is an integrated physical and biological system which provides a multitude of services for life on the planet. It provides us with half of the oxygen we breathe and absorbs 26% of anthropogenic carbon dioxide (CO_2) emissions from the atmosphere.[84] The vital role that the ocean plays in regulating the global climate is understood as the ocean/climate nexus. In addition, the ocean also exists as 97% of habitable physical space for the Earth's biodiversity.[85] As a consequence, life within the ocean is diverse and rich, and despite gaps on the ocean's biodiversity and functionality, there is enough knowledge that the ocean and its life are at being impacted by, and are at further risk from, climate change. There is scientific consensus that anthropogenic climate change caused by the release of GHGs into the atmosphere, primarily through the consumption of fossil fuels, is unequivocally altering the physical and chemical makeup of the ocean.[86] This is causing profound changes to the physical and biochemical state of the ocean, which are well documented.[87] Warming, acidification, deoxygenation, loss of sea ice, and sea-level rise are already affecting the productivity and stability of ocean ecosystems, and causing changes in the migratory patterns and distribution of fish and other marine species poleward or in to deeper waters.[88] When one considers these impacts alongside the general decline in global fish stocks,[89] and biodiversity and habitat loss,[90] this is alarming, and it is not hyperbole to state that global society is now living through a climate emergency.[91]

The focus of this thesis concerns the international legal consequences of, and potential solutions to, the changes in distribution of global fish stocks and other marine species as they shift in location in response to the effects of climate change. The overarching research question

[84] United Nations, Summary of the first global integrated marine assessment (UN 2016), available at: <https://www.un.org/Depts/los/globalreporting/WOARPROC/Summary.pdf > para. 12.
[85] See, UNGA, *First Global Integrated Marine Assessment* (2016) <https://www.un.org/Depts/los/global_reporting/WOA_RegProcess.htm>.
[86] Thomas Stocker and Dahe Qin, (eds), *Climate Change 2013: The Physical Science Basis: Summary for Policymakers, a Report of Working Group I of the IPCC: Technical Summary, a Report Accepted by Working Group I of the IPCC but Not Approved in Detail: And Frequently Asked Questions: Part of the Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (WMO, UNEP 2013).
[87] IPCC, (n 3).
[88] See generally, Bindoff and others, (n 4) 447; Manuel Barange and others (n 4); Poloczanska and others (n 5).
[89] Daniel Pauly and David Zeller, 'Catch Reconstructions Reveal That Global Marine Fisheries Catches Are Higher than Reported and Declining' (2016) 7 Nature Communications 10244
[90] Brondízio and others, (n 13).
[91] William J Ripple and others, 'World Scientists' Warning of a Climate Emergency 2021' (2021) 71 BioScience 894.

of the thesis is 'to what extent do States have an international legal obligation to adapt international fisheries management practices to the effects of climate change?'. The introduction of the thesis has highlighted the disruptive nature of climate change to the international regulatory framework for the oceans, and the need for an integrated approach to address the problem of marine species redistribution under climate change. However, prior to undertaking the task of international legal analysis, the problem itself, and its causes and consequences must be introduced and merit detailed discussion. The purpose of this first substantive chapter therefore is to provide the necessary factual background to answer the research question of the thesis in further chapters. This is done by providing, on the basis of an extensive scientific literature review, a clear and precise sense of the physical context of the legal problem this thesis has identified and seeks to address. This chapter first outlines climate impacts on the ocean (section 2), then introduces the pervasive global phenomenon of marine species redistribution (section 3) and, distilled from sections 2 and 3, its consequences (section 4), before concluding and framing the research question to be answered in the chapters that follow (section 5).

2. Climate Change Impacts on the Ocean

Anthropogenic climate change has, and continues to, alter the physical and chemical makeup of the ocean through warming, acidification and other stressors. These oceanographic changes are expected to worsen and persist this century with levels of atmospheric CO_2 increasing to those unrecorded in living memory.[92] These changes affect the distribution, productivity growth and overall abundance of marine species. This section introduces the key impacts that climate change has on the ocean, and the extent to which they cause marine biodiversity redistribution and shifts in fish stocks. This is based primarily on the climate scientific synthesis reports periodically produced by the IPCC.[93] It first introduces the IPCC and its relationship with the ocean, then outlines key facts on warming, acidification, and deoxygenation (section 2.1), it then focuses on these impacts individually (sections 2.2, 2.3, and 2.4) along with other climate stressors (section 2.5) and explains how and why they cause

[92] Jean-Pierre Gattuso and others, 'Contrasting Futures for Ocean and Society from Different Anthropogenic CO2 Emissions Scenarios' (2015) 349 Science aac4722.
[93] Please note: At the time of finalisation of this thesis the IPCC's AR6 Synthesis Report had not been published, see <https://www.ipcc.ch/report/sixth-assessment-report-cycle/>.

shift in distribution in marine species. It then focuses on compounding non-climatic pressures on marine biodiversity (section 2.6) before concluding (2.7).

2.1 The IPCC and the Ocean

The IPCC is the most important source of scientific and technical information on climate change for the work of the UNFCCC.[94] It was founded in 1987 by way of joint decisions by the World Meteorological Organization (WMO) and the UN Environment Programme (UNEP) with the aim to 'establish an *ad hoc* intergovernmental mechanism to carry out internationally co-ordinated scientific assessments of the magnitude, timing, and potential impact of climate change',[95] and subsequently endorsed by the international community through UNGA Resolution 43/53 in 1988.[96] According to the agreed principles governing its work, the role of the IPCC is to 'assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation.'[97] The IPCC regularly releases reports that synthesise the global research on the available scientific, technical, and socio-economic literature on climate change through a period of assessment cycles, with its first synthesis report published in 1990.[98] Reports are also produced on specific themes, including the much welcomed Special Report on Oceans and the Cryosphere in a Changing Climate (SROCC) published in 2019.[99]

[94] CBD Secretariat, *Working Relationship Between the United Nations Framework Convention on Climate Change and the Intergovernmental Panel on Climate Change*, (17 September 2012) UN Doc. UNEP/CBD/COP/11/INF, para. 6; Navraj Singh Ghaleigh, 'Science and Climate Change Law—The Role of the IPCC in International Decision-Making' in Kevin R Gray, Richard Tarasofsky and Cinnamon P Carlarne (eds), *The Oxford Handbook of International Climate Change Law* (Oxford University Press 2016).
[95] WMO, Thirty-Ninth Session of the Executive Council General Summary 3.4, 1–5 June 1987; United Nations Environment Programme Governing Council Decision 14/20, 17 June 1987
[96] UNGA Resolution 43/53, *Protection of global climate for present and future generations of mankind* Resolution adopted by the General Assembly 6 December 1988 UN Doc. A/43/755.
[97] IPCC, *Principles Governing IPCC Work*, Approved at the Fourteenth Session (Vienna, 1–3 October 1998) on 1 October 1998, amended at the Twenty-First Session (Vienna, 3 and 6–7 November 2003), the Twenty-Fifth Session (Mauritius, 26–28 April 2006), the Thirty-Fifth Session (Geneva, 6–9 June 2012) and the Thirty-Seventh Session (Batumi, 14–18 October 2013), available at <https://www.ipcc.ch/site/assets/uploads/2018/09/ipcc-principles.pdf>, para. 2.
[98] IPCC and WMO (eds), *Climate Change: The 1990 and 1992 IPCC Assessments, IPCC First Assessment Report Overview and Policymaker Summaries and 1992 IPPC Supplement* (IPCC 1992).
[99] IPCC, (n 3).

The IPCC Fifth Assessment Report, published in 2013 confirmed that 'warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased'.[100] In a Special Report on the potential impacts of average global warming of 1.5ºC above pre-industrial levels released in 2018, the IPCC stated with high confidence that human activities are estimated to have caused approximately 1ºC of global warming above pre-industrial levels; and global warming is likely to reach 1.5ºC between 2030 and 2052 if it continues at the present rate. [101] The Special Report acknowledges with high confidence that many terrestrial and ocean ecosystems and the services they provide have been negatively altered due to climate change.[102] Depending on average increase in temperature (from 1.5ºC, between 1.5ºC, and 2ºC), future projections predict increases in mean temperature in most land and ocean regions with high confidence.[103]

It was not until AR5 that the IPCC had focused specifically on climate impacts on the ocean. Which, for the first time in an IPCC report contained a dedicated chapter on that topic warning of the physical, chemical, and biological impacts of climate change on ocean systems.[104] The Sixth Assessment Report (AR6) has followed suit and included a dedicated chapter on the ocean.[105] The IPCC Special Report on Oceans and the Cryosphere in a Changing Climate has noted that:

> [l]imiting global warming to 1.5ºC compared to 2ºC is projected to reduce increases in ocean temperature as well as associated increased in ocean acidity and decreases in ocean oxygen levels (*high confidence*). Consequently, limiting global warming to 1.5C is projected to reduce risks to marine biodiversity, fisheries, and ecosystems, and their functions and services to humans, as illustrated by recent changes to Arctic Sea ice and warm water coral reef ecosystems (*high confidence*).[106]

[100] Stocker and Qin, (n 86) 4.
[101] IPCC, *Global Warming of 1.5°C: IPCC Special Report on Impacts of Global Warming of 1.5°C above Pre-Industrial Levels in Context of Strengthening Response to Climate Change, Sustainable Development, and Efforts to Eradicate Poverty* (Cambridge University Press 2022) para. A1 4.
[102] ibid., para. A3 8.
[103] ibid., para. B1 8.
[104] Stocker and Qin, (n 86) 255–2.
[105] Baylor Fox-Kemper and others, 'Ocean, cryosphere and sea level change' in *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Valerie Masson-Delmotte and others (eds) (Cambridge University Press 2021) 1211.
[106] IPCC, (n 3) para. B4 10.

The consequences of climate change on fisheries and aquaculture are broad and complex. Generally, these have been listed as 'impacts on the physiology, survivorship, habitat, reproduction, disease incidence, and risk of invasive species.'[107] In terms of climate induced range shifts of marine species, the IPCC had this to say:

> Global warming of 1.5ºC is projected to shift the ranges of many marine species, to higher latitudes as well as increasing the amount of damage to marine ecosystems. It is also expected to drive the loss of coastal resources, and reduce the productivity of fisheries and aquaculture (especially at low latitudes). The risks of climate-induced impacts are projected to be higher at 2ºC than those at global warming of 1.5ºC (*high confidence*). Coral reefs, for example, are projected to decline by a further 70–90% at 1.5ºC (*high confidence*) with larger losses (>99%) at 2ºC (*very high confidence*). The risk of irreversible loss of many marine and coastal ecosystems increases with global warming, especially at 2ºC or more (*high confidence*).[108]

The next subsections examine the impacts of climate change on the ocean as outlined by the IPCC in detail, focusing on warming (2.2), acidification (2.3), and deoxygenation (2.4).

2.2 Ocean Warming

The ocean is a global heat sink. The IPCC AR5 Report highlighted that, the ocean plays an important role in climate regulation, as its ability to take up and retain heat is around 1,000 times greater than that of the atmosphere.[109] Of the additional heat created by anthropogenic climate change since 1950, 1% has been retained in the planet's atmosphere, while 91% has been absorbed by the ocean.[110] This is causing a rapid rise in global ocean temperatures, Though recent studies using improved methodologies indicate that the ocean is warming faster than previously estimated.[111] The SROCC confirmed that the rate of ocean warming has more than doubled since 1993.[112] The AR6 stated that '[a]t the ocean's surface, temperature has, on average, increased by 0.88[0.68 to 1.01]ºC between 1850–1990 and 2011–2020, with 0.60[0.44 to 0.74]ºC of this warming having occurred since 1980'.[113] Ocean warming is also causing a

[107] ibid. para. B4.4 11; See also Barange and others, (n 4).
[108] ibid.
[109] Stocker and Qin, (n 86) 260–263.
[110] ibid at 260; Fox-Kemper and others, (n 105) 1228.
[111] Lijing Cheng and others, 'How Fast Are the Oceans Warming?' (2019) 363 Science 128.
[112] IPCC, (n 4) 8.
[113] Fox-Kemper and others, (n 105) 1214.

reduction of sea ice at the Poles, which negatively affects primary production and consequently the ability of the ocean to uptake and store CO_2.[114]

Marine species such as fish and invertebrates are particularly sensitive to changes in ocean conditions because they are *poikilotherms*. In other words, they cannot regulate their own body temperature apart from through behavioural means such as burrowing or moving towards their preferred environmental conditions.[115] This means that their body temperature and biological performance changes with their external environment.[116] Changes in ocean temperatures affect marine fish and invertebrates by altering the rate at which an array of metabolic processes that influence *inter alia* vital rates such as growth and energy demand.[117] Generally, the thermal tolerance of marine organisms is non-linear, and optimum conditions are at mid-range, with growth and fecundity (fertility) poorer at extremely high or low temperatures.[118] Warming oceans can also affect the mortality, abundance, and phenology (seasonality) of marine species.[119]

The main example of behavioural temperature regulation in mobile marine species is moving to an area with a preferred ambient temperature to achieve optimum metabolism. A formative study by Fry in 1971 found that the thermal tolerances of fish consists of three responses: i) lethal; ii) controlling; and iii) directive.[120] Meaning that if possible, a fish will respond to environmental temperature changes long before the temperature nears the lethal limit for that fish. In short, if there is a change in ambient water temperature, fish and mobile invertebrates will move to their preferred temperature if possible. This explains the

[114] IPCC, (n 4) 8.
[115] This option is of course not possible for immobile species of marine invertebrates, though for many species their larvae is mobile.
[116] Hans-Otto Pörtner, 'Climate Variations and the Physiological Basis of Temperature Dependent Biogeography: Systemic to Molecular Hierarchy of Thermal Tolerance in Animals' (2002) 132 Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology 739.
[117] Hans-Otto Pörtner and Myron A Peck, 'Climate Change Effects on Fishes and Fisheries: Towards a Cause-and-Effect Understanding' (2010) 77 Journal of Fish Biology 1745.
[118] See for example, Hans-Otto Pörtner and others, 'Climate Induced Temperature Effects on Growth Performance, Fecundity and Recruitment in Marine Fish: Developing a Hypothesis for Cause and Effect Relationships in Atlantic Cod (*Gadus morhua*) and Common Eelpout (*Zoarces viviparus*)' (2001) 21 Continental Shelf Research 1975; Akinori Takasuka, Yoshioki Oozeki and Ichiro Aoki, 'Optimal Growth Temperature Hypothesis: Why Do Anchovy Flourish and Sardine Collapse or Vice Versa under the Same Ocean Regime?' (2007) 64 Canadian Journal of Fisheries and Aquatic Sciences 768.
[119] See for example, Martin Edwards and Anthony J Richardson, 'Impact of Climate Change on Marine Pelagic Phenology and Trophic Mismatch' (2004) 430 Nature 881; Genner and others (n 5); Stephen D Simpson and others, 'Continental Shelf-Wide Response of a Fish Assemblage to Rapid Warming of the Sea' (2011) 21 Current Biology 1565; William WL Cheung and others, 'Shrinking of Fishes Exacerbates Impacts of Global Ocean Changes on Marine Ecosystems' (2013) 3 Nature Climate Change 254.
[120] Frederick Fry, 'The effect of environmental factors on the physiology of fish' 6 Fish Physiology (1971) 1.

physiological basis behind the growing body of scientific evidence of marine species moving from historical locations because of climate change.

Importantly, ocean warming is resulting in an increasingly Poleward distribution of many marine species. exposing them to multiple different pressures which could exacerbate loss in species richness and decline in fish populations. This shift in distribution primarily involves species moving out of the warmer waters of the tropics, causing local species extinctions within that region.[121] However, this does not mean that the Polar seas will increase in biodiversity *per se* as species moving Poleward and endemic Polar species face increasing ocean acidification at the Poles.[122] In addition the rapidly melting ice caused by warming at the Poles decreases the salinity of the surrounding seawater, negatively impacting species with a particular salinity tolerance. Moreover, sea ice loss removes physical and ecological barriers between ocean basins, 'affecting the range and migration patterns of some species and allowing the exchange of species previously restricted to either the Pacific or the Atlantic Ocean'.[123] Sea ice loss also opens up new fishing opportunities for States, however if these are not managed with precaution, this could lead to overexploitation of fish stocks.

Notably, the IPCC Special Report on Oceans and the Cryosphere in a Changing Climate has warned of the human rights implications of shifting fish stocks, noting that 'future shifts in fish distribution and decreases in their abundance and fisheries catch potential due to climate change are projected to affect income, livelihoods, and food security of marine resource-dependent communities (*medium confidence*)'.[124] Shifts in distribution of fishery resources are likely to increase conflicts between fisheries, communities and authorities,[125] which in turn may threaten food security and the livelihoods of ocean-dependent communities. The next subsection looks at another pervasive climate impact on the marine environment, ocean acidification.

2.3 Ocean Acidification

[121] Brondízio and others, (n 13) 41.
[122] ibid.
[123] Bindoff and others, (n 4) 480.
[124] IPCC, (n 3) 30–31.
[125] ibid.; See also Spijkers and others, (n 7); Jessica Spijkers and others, 'Global Patterns of Fisheries Conflict: Forty Years of Data' (2019) 57 Global Environmental Change 101921; Mendenhall and others (n 7).

The ocean is a carbon sink. Oceanic uptake of CO_2 helps to mitigate global warming by reducing atmospheric CO_2. However, this uptake alters the chemical makeup of the ocean and causes several negative impacts. When CO_2 from the atmosphere dissolves in the ocean, it reacts with seawater to form carbonic acid and lowers the pH through release of hydrogen ions ($[H^+]$), causing it to become more acidic. The greater quantity of dissolved atmospheric CO_2 in the ocean, the more acidic it becomes. Since 1980, the oceanic uptake of atmospheric CO_2 has been between 20–30% which has caused an increased ocean acidification.[126] Roughly half of the CO_2 released into the atmosphere by anthropogenic activities between 1800 and 1994 has been stored in the deep ocean through uptake by planktonic organisms which have either sunk to the seabed, or travelled through the marine food web ended up on the seabed and in one form of organic matter or another.[127] However, the capacity of the ocean to uptake CO_2 is sensitive to climate change and varies spatially and temporally.[128] Importantly, the increasing acidification of the ocean decreases its ability and capacity to sequester carbon from the environment.[129] There are three key impacts of ocean acidification that effect marine biodiversity:

a. Sensory perception alteration - this increases fish vulnerability to predation as their normal 'sense suite' for evading predators is inhibited and prevents some larval stages of species from finding suitable habitat to develop into adults.[130]

b. Destruction of habitat - the chemical reaction in the ocean described above decreases the availability of carbonate ions in the water which limits the ability of species to form shells and skeletons. This can have severe impacts on the immobile calcifying (shell producing) organisms found in warm water coral reefs and temperate intertidal rocky shores.[131] This is particularly problematic for coral species - unable to form their calcified skeleton structure, which creates the 3-dimensional heterogeneity that

[126] IPCC, (n 3) 9.
[127] Christopher L Sabine and others, 'The Oceanic Sink for Anthropogenic CO2' (2004) 305 Science 367; Matthew S Savoca and others, 'Baleen Whale Prey Consumption Based on High-Resolution Foraging Measurements' (2021) 599 Nature 85.
[128] Tim DeVries and others, 'Decadal Trends in the Ocean Carbon Sink' (2019) 116 Proceedings of the National Academy of Sciences 11646.
[129] Brondízio and others, (n 13) 23.
[130] Danielle L Dixson, Philip L Munday and Geoffrey P Jones, 'Ocean Acidification Disrupts the Innate Ability of Fish to Detect Predator Olfactory Cues' (2010) 13 Ecology Letters 68; Philip L Munday and others, 'Ocean Acidification Impairs Olfactory Discrimination and Homing Ability of a Marine Fish' (2009) 106 Proceedings of the National Academy of Sciences 1848.
[131] IPCC, (n 3) 14.

supports rich biodiversity on the reef. This makes these ecosystems less resilient to other stressors such as temperature increase.

c. Alteration of marine food webs - this occurs due to a combination of the two above impacts, as well as impacts on growth, calcification, mortality rates and fecundity of various marine species that exist as predators, prey and competitors within marine ecosystems.[132]

These stressors weaken the structure and function of ecosystems and their resilience to environmental change, and will persist increasingly in marine ecosystems for hundreds of years if emissions continue at present rates.[133] All of the above impacts threaten the productivity of fisheries systems.[134] Acidification, like warming, is ubiquitous but varies regionally.[135] The western Arctic and sub-Arctic Pacific are known acidification hotspots.[136] This indicates a need for regional adaptive responses to manage these impacts in these and other areas likely to be greater affected by the impacts of ocean acidification. Short-term periods of extremely high [H+] concentrations, known as 'ocean acidity extreme events' are increasing in frequency and duration and are likely to exacerbate the impacts described above.[137]

Despite explicit recognition in the UN Sustainable Development Goals (SDGs) by the international community of the need to '[m]inimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels' in 2015.[138] Historically, the limited international consideration to ocean acidification has been identified

[132] Joan A Kleypas and others, 'Geochemical Consequences of Increased Atmospheric Carbon Dioxide on Coral Reefs' (1999) 284 Science 118; Richard A Feely and others, 'Impact of Anthropogenic CO2 on the CaCO3 System in the Oceans' (2004) 305 Science 362.
[133] Hans-Otto Pörtner and others, 'Ocean Systems' in Christopher B Field and others (eds) *Climate change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press 2014) 411, 415.
[134] Philip L Munday and others, 'Replenishment of Fish Populations Is Threatened by Ocean Acidification' (2010) 107 Proceedings of the National Academy of Sciences 12930.
[135] Kristy J Kroeker and others, 'Impacts of Ocean Acidification on Marine Organisms: Quantifying Sensitivities and Interaction with Warming' (2013) 19 Global Change Biology 1884z
[136] See J T Mathis and others, 'Chapter: Sea-Air Interactions' in *Global Oceans Assessment* (UN 2016); Report on the Work of the United Nations Open-Ended Informal Consultative Process on Oceans and the Law of the Sea at its Fourteenth Meeting (Fourteenth ICP Report), UN Doc. A/68/159 (2013) para. 19.
[137] Friedrich A Burger, Jasmin G John and Thomas L Frölicher, 'Increase in Ocean Acidity Variability and Extremes under Increasing Atmospheric CO_2' (2020) 17 Biogeosciences 4633.
[138] UNGA, *Transforming our world: the 2030 Agenda for Sustainable Development* Resolution adopted by the General Assembly 25 September 2015 UN Doc. A/RES70/1, Target 14.3.

as a major issue and this continues to be the case.[139] Acidification remains a problem as CO_2 emissions proliferate.[140] This is concerning as globally it is estimated the ocean will be unable to support any coral reef growth by 2100.[141] Importantly, it has been argued that considering the impacts of ocean acidification on marine biodiversity in their own right, without the compounding effects of climate change 'is a major reason in itself for countries to agree to reduce emissions of CO_2.'[142] Acidification changes the marine environment significantly, and therefore the ecosystem goods and services provided by the ocean. Loss of coral reefs and the fisheries systems they support has profound economic, security, health, and therefore human rights implications for the communities which rely on them. While climate change and ocean acidification are distinct issues, they are linked by the common cause of CO_2. Any effort to combat ocean acidification must first and foremost involve climate mitigation efforts. In addition, since acidification causes profound negative effects on the marine environment, its biodiversity, and the livelihoods of people depend on it, it is an issue which relates to the several legal frameworks examined in this thesis. The next subsection outlines loss of oxygen in the marine environment.

2.4 Ocean Deoxygenation

Ocean deoxygenation is a pervasive yet overlooked issue. The ocean has lost around 2% (150 billion tons) of oxygen since the 1960s.[143] There has been a marked loss in oxygen from the surface to 1000m depth in the ocean in recent decades.[144] This is caused primarily by increasing stratification of the ocean which causes changes in biogeochemistry and ventilation.[145] The International Union for the Conservation of Nature (IUCN) released a comprehensive report

[139] See Ellycia R Harrould-Kolieb, 'The UN Convention on the Law of the Sea: A Governing Framework for Ocean Acidification?' (2020) 29 Review of European, Comparative & International Environmental Law 257; James Harrison, *Saving the Oceans Through Law: The International Legal Framework for the Protection of the Marine Environment* (Oxford University Press 2017) 253–255; Secretariat of the CBD, *Scientific synthesis of the impacts of ocean acidification on marine biodiversity* CBD Technical Series No. 46 (2009); UNESCO 'Implement urgent actions to mitigate and adapt to ocean acidification', available at <www.unesco.org/new/en/natural-sciences/ioc-oceans/focus-areas/rio-20-ocean/10-proposals-for-the-ocean/1a-ocean-acidification/>.
[140] IPCC, (n 3) 9.
[141] Katherine L Ricke and others, 'Risks to Coral Reefs from Ocean Carbonate Chemistry Changes in Recent Earth System Model Projections' (2013) 8 Environmental Research Letters 034003.
[142] David Freestone, 'Climate Change and the Oceans' (2009) 3 Carbon & Climate Law Review 383, 383.
[143] Deep-Ocean Stewardship Initiative (DOSI), *Ocean Deoxygenation: A Hidden Threat to Biodiversity Beyond National Jurisdiction*, Policy Brief (2019), available at <https://www.dosi-project.org/resources/publications/> 2.
[144] IPCC, (n 3) 8 and 10.
[145] ibid., 10.

on ocean deoxygenation in 2019.[146] It highlights that the primary cause of loss of oxygen in the ocean is twofold: i) Warming of ocean waters due to climate change, which limits its ability to hold oxygen, causes a reduction in ocean mixing and a change in ventilation with the overlying atmosphere and; ii) Eutrophication - a phenomenon caused by run-off of nutrients from land and deposition from the atmosphere from burning of fossil fuels.[147] Low dissolved oxygen concentrations in the ocean can cause hypoxia in marine organisms – this is a result of inadequate oxygen supply at a tissue level which has negative impacts for that organism's ability to function.[148] Species which are more tolerant of hypoxia are able to thrive in these conditions, species which cannot must change their physiology, behaviour, and distribution, in response, or die. All these consequences cause changes in ecosystem structure and function.[149]

Decreases in oxygen concentration can create oxygen minimum zones in the ocean, reducing the depth that can be occupied by fishes leading to 'habitat compression'.[150] Oxygen minimum zones in the ocean have expanded from 3–8%.[151] Such compression leads to changes in depth distribution of fishes can affect interactions between predators and prey, as well as interactions between fisheries and their target species.[152] Similar to the impacts of warming, fish may shift their geographical range or move to deeper waters, or be forced nearer to the surface due to deoxygenation where they may become vulnerable to exploitation by fishing activities and new predators.[153] This also causes 'cascading impacts on ecosystem structure and function'[154] and the adverse effects of this are exacerbated by the impacts of human activities on the marine environment, discussed in section 2.6.

Overall, the IPCC estimates that the combined projected changes in temperature, primary production, oxygen, salinity and sea ice will have a profound effect on fisheries productivity, and result in a decrease in maximum catch potential 3.9–14.2% by mid-

[146] See Dan Laffoley and John M Baxter (eds), *Ocean Deoxygenation: Everyone's Problem. Causes, Impacts, Consequences and Solutions* (International Union for Conservation of Nature 2019).
[147] ibid., 103–170.
[148] ibid., 461–484; Andreas Oschlies and others, 'Drivers and Mechanisms of Ocean Deoxygenation' (2018) 11 Nature Geoscience 467.
[149] ibid., 263–484.
[150] DOSI, (n 143) 3.
[151] IPCC, (n 3) 10.
[152] Eric D Prince and others, 'Ocean Scale Hypoxia-Based Habitat Compression of Atlantic Istiophorid Billfishes' (2010) 19 Fisheries Oceanography 448; Amanda N Netburn and J Anthony Koslow, 'Dissolved Oxygen as a Constraint on Daytime Deep Scattering Layer Depth in the Southern California Current Ecosystem' (2015) 104 Deep Sea Research Part I: Oceanographic Research Papers 149.
[153] Laffoley and Baxter, (n 146) 519–544.
[154] ibid.

century.[155] This reduction is expected to be considerably higher in the Tropics, with local extinctions of fish and invertebrates expected to reach 50% by 2100.[156] There are a number of other climate-based impacts on the marine environment that may cause marine species range shifts. These are alteration of primary productivity; extreme weather events; and marine heatwaves, discussed in the next subsection.

2.5 Other Climate Stressors

Having outlined the 'big three' climate impacts on the ocean, the next subsection outlines other climate stressors on the marine environment. These are alteration of primary productivity (section 2.5.1); extreme weather events (section 2.5.2); and marine heatwaves (section 2.5.3).

2.5.1 Alteration of Primary Productivity

Primary productivity is particularly important for sustainable fisheries because phytoplankton (microscopic plant species) sit at the base of the ocean food web and provide energy for organisms at higher trophic levels. As mentioned earlier in this chapter, phytoplankton also sequester carbon and contribute to the ocean's functioning as a carbon sink. A recent study has highlighted the intimate link between primary productivity and the economic performance of a fishery.[157] Climate change is expected to negatively affect primary productivity at lower latitude regions of the ocean as warming sea surface temperature will increase stratification – warm, nutrient deplete water sitting on top of cold, dense, nutrient rich water – which prevents nutrients in deeper water reaching the surface where they are needed by phytoplankton for photosynthesis.[158] This may cause species to move or localised extinctions at lower latitudes.

2.5.2 Extreme Weather Events

[155] Brondízio and others, (n 13) 505.
[156] ibid.
[157] Anthony R Marshak and Jason S Link, 'Primary Production Ultimately Limits Fisheries Economic Performance' (2021) 11 Scientific Reports 12154.
[158] Laurent Bopp and others, 'Multiple Stressors of Ocean Ecosystems in the 21st Century: Projections with CMIP5 Models' (2013) 10 Biogeosciences 6225.

Climate change exacerbates the natural variability of the marine environment, and consequently, is causing an increase in extreme weather events, which can have severe impacts on ecosystems. Impacts of environmental extremes on species are often stronger than those cause by gradual changes.[159] This means that the (potentially) long-term responses of marine biodiversity to these short-term events provides an indication of what can be expected for future responses to long-term climate change. Extreme weather events are likely to occur more frequently as the global average temperature rises.[160] Careful study of these events can also illustrate the kinds of unanticipated changes and opportunities to marine conservation and fisheries. As weather extremes increase, this generates uncertainty for governance. Therefore, extreme weather events can also inform management in how to adequately prepare for changes that will occur under future climate conditions, as illustrated by the IPCC above. Examples of extreme weather events include marine heatwaves along with stormy weather conditions. Climate-driven alterations in storminess have been shown to pose a 'significant threat' to global fisheries.[161] For example, extreme weather events like hurricane can have severe negative impacts on coastal ecosystems and reefs which are important fishery nursery sights and can also damage the coastal infrastructure on which fishers depend.[162] Some of the most dramatic marine ecosystem changes have been linked to marine heatwaves,[163] discussed next.

2.5.3 Marine Heatwaves

Marine heatwaves are defined by the IPCC as 'periods of extreme high sea temperature relative to the long-term mean seasonal cycle', who have indicated that since the release of the SROCC, studies have confirmed that marine heatwaves 'can lead to severe and persistent impacts on marine ecosystems'.[164] Marine heatwaves are also increasing in frequency and duration.[165] A

[159] Eric CJ Oliver and others, 'Longer and More Frequent Marine Heatwaves over the Past Century' (2018) 9 Nature Communications 1324; Steven D Gaines and Mark W Denny, 'The Largest, Smallest, Highest, Lowest, Longest, and Shortest: Extremes in Ecology' (1993) 74 Ecology 1677.
[160] See, for example Claudia Tebaldi and others, 'Going to the Extremes: An Intercomparison of Model-Simulated Historical and Future Changes in Extreme Events' (2006) 79 Climatic Change 185; James Hansen, Makiko Sato and Reto Ruedy, 'Perception of Climate Change' (2012) 109 Proceedings of the National Academy of Sciences E2415.
[161] Nigel C Sainsbury and others, 'Changing Storminess and Global Capture Fisheries' (2018) 8 Nature Climate Change 655.
[162] ibid.; Mendenhall and others, (n 7).
[163] Allison L Perry and others, 'Climate Change and Distribution Shifts in Marine Fishes' (2005) 308 Science 1912.
[164] Fox-Kemper and others, (n 105) 1227; Alistair J Hobday and others, 'A Hierarchical Approach to Defining Marine Heatwaves' (2016) 141 Progress in Oceanography 227.
[165] Oliver and others, (n 159).

recent study found that over 50% of the ocean had experienced episodes of extreme heat in 2014, with this percentage steadily increasing since then.[166] Marine heatwaves can result in dramatic ecological and economic impacts, including:

> [S]ustained loss of kelp forests, coral bleaching, reduced surface chlorophyll levels due to increases surface layer stratification, mass mortality of marine invertebrates due to heat stress, rapid long-distance species' range shifts and associated reshaping of community structure, fishery closes or quota changes, and even intensified economic tensions between nations.[167]

Understandably, the impacts above have severe widespread ecological and socioeconomic knock-on effects, and are expected to become more frequent as prevalence of marine heatwaves increases.[168] On average, marine heatwaves have increased in frequency and duration by 34% and 17% respectfully, resulting in an increase of 54% in annual marine heatwave days globally.[169] This increase is explained by the rise in average global ocean temperatures, and further increases in marine heatwave days are expected as the planet's atmosphere continues to warm.[170] It has been noted that the increase in marine heatwaves over the last century coincide with shift in species' distributions and alterations of biodiversity patterns.[171] The need for 'rapid reporting of marine heatwaves as they emerge and the ecological consequences witnessed by scientists and the broader community' has also been stressed.[172] Moreover, a recent study indicated that the combination of marine heatwaves and events of high ocean acidity can have profound negative effects on marine ecosystems.[173] The next section considers

[166] Kisei R Tanaka and Kyle S Van Houtan, 'The Recent Normalization of Historical Marine Heat Extremes' (2022) 1 PLOS Climate e0000007.
[167] Oliver and others, (n 159); Terry P Hughes and others, 'Global Warming and Recurrent Mass Bleaching of Corals' (2017) 543 Nature 373; Eric CJ Oliver and others, 'The Unprecedented 2015/16 Tasman Sea Marine Heatwave' (2017) 8 Nature Communications 16101; Thomas Wernberg and others, 'Climate-Driven Regime Shift of a Temperate Marine Ecosystem' (2016) 353 Science 169; Letícia M Cavole and others, 'Biological Impacts of the 2013–2015 Warm-Water Anomaly in the Northeast Pacific: Winners, Losers, and the Future' (2016) 29 Oceanography 273; Nick Caputi and others, 'Management Adaptation of Invertebrate Fisheries to an Extreme Marine Heat Wave Event at a Global Warming Hot Spot' (2016) 6 Ecology and Evolution 3583; Nicholas A Bond and others, 'Causes and Impacts of the 2014 Warm Anomaly in the NE Pacific' (2015) 42 Geophysical Research Letters 3414; Joaquim Garrabou and others, 'Mass Mortality in Northwestern Mediterranean Rocky Benthic Communities: Effects of the 2003 Heat Wave' (2009) 15 Global Change Biology 1090.
[168] Fox Kemper and others, (n 101) 1227.
[169] ibid.
[170] Oliver and others, (n 159).
[171] ibid; Wernberg and others, (n 167); Cavole and others, (n 167); Bond and others, (n 167); Garrabou and others, (n 167).
[172] Oliver and others, (n 159) 8.
[173] Friedrich A Burger, Jens Terhaar and Thomas L Frölicher, 'Compound Marine Heatwaves and Ocean Acidity Extremes' (2022) 13 Nature Communications 4722.

the non-climate impacts on marine fisheries and biodiversity, and how they act as compounding factors to the impacts outlines above.

2.6 Compounding, Non-Climate Impacts on Fisheries and Marine Biodiversity

As highlighted above, the combined impacts of climate change: warming, acidification and deoxygenation contribute to a multitude of negative impacts on the ocean and its biodiversity. In addition to these cumulative impacts, there are compounding, non-climate impacts which negatively effective fisheries and marine biodiversity. These are primarily habitat loss and overexploitation, outlined in sections 2.6.1 and 2.6.2 below.

2.6.1 Habitat Loss

The most recent Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Global assessment Report notes that two-thirds of the ocean is experiencing increasing cumulative impacts that cause habitat loss.[174] It goes on to say that outside of scenarios that include transformative change '[m]arine and terrestrial biodiversity in boreal, subpolar and polar regions is projected to decline mostly because of warming, sea ice retreat and advanced ocean acidification.'[175] It then outlines the loss of habitat in the marine environment, especially some of the most globally productive systems. For example, the report notes a decrease in seagrass meadows – an important carbon sink – by 10% per decade, and an acceleration in the decline of live coral cover on reefs in the past two to three decades. As above, this is due to warming, acidification and their interaction with other drivers of loss such as deoxygenation.[176] Moreover, climate change is predicted to alter deep-ocean environments and be exacerbated by extractive activities and increasing uses of the deep-sea (deep-seabed mining, oil and gas extraction, and fishing methods which disturb the seabed).[177] Fishing and other forms of exploitation of the marine environment are discussed below.

[174] Brondízio and others, (n 13) 11.
[175] ibid., 16.
[176] ibid., 24.
[177] Lisa A Levin and others, 'Climate Change Considerations Are Fundamental to Management of Deep-Sea Resource Extraction' (2020) 26 Global Change Biology 4664.

2.6.2 Overexploitation

Direct exploitation and overexploitation, primarily from fishing, often supported by government subsidies,[178] in marine ecosystems has had the largest relative impact on biodiversity since 1970.[179] The negative impacts of exploitation activities are exacerbated by the issues described above, highlighting the interconnectedness of the causes of marine biodiversity. This subsection focuses on the most impactful exploitative activity on marine biodiversity: capture fishing.

Generally, fishing has had a prominent impact on marine biodiversity over the in the past 50+ years, this includes impacts on target species, non-target species and habitats.[180] Fishing, in combination with the negative effects of climate change, is expected to worsen the state of marine biodiversity.[181] To sustain fish catch, fishing fleets have expanded geographically into areas beyond national jurisdiction, and into deeper waters.[182] This has contributed to a global decline in fish stocks. According to FAO:

> Global capture fisheries production in 2018 reached a record 96.4 million tonnes, an increase of 5.4 percent from the average of the previous three years. The increase was mostly driven by marine capture fisheries, where production increased from 81.2 million tonnes in 2017 to 84.4 million tonnes in 2018.[183]

Overfishing (fishing above the level that can produce maximum sustainable yield (MSY)) causes negative impacts on marine biodiversity, reduces fish productivity and ecosystem functioning, reducing resilience to climate change.[184] It is important to note that it is not only commercial fishing that impacts the marine environment, impacts of recreational fisheries, too, are often overlooked with catches not always recorded for inclusion in fisheries stock

[178] Anja von Moltke, *Fisheries Subsidies, Sustainable Development and the WTO* (Routledge 2011); Andrés M Cisneros-Montemayor and others, 'Changing the Narrative on Fisheries Subsidies Reform: Enabling Transitions to Achieve SDG 14.6 and Beyond' (2020) 117 Marine Policy 103970; Mitchell Lennan and Stephanie Switzer, 'The World Trade Organization Agreement on Fishery Subsidies' (2023) 38 The International Journal of Marine and Coastal Law 161.
[179] Brondízio and others, (n 13) 14 and 28.
[180] ibid., 28.
[181] ibid., 37.
[182] ibid., 28.
[183] FAO, *The State of World Fisheries and Aquaculture 2020: Sustainability in Action* (FAO 2020) 5.
[184] ibid., 54.

assessments.[185] Further, bycatch caused by unselective fishing methods too cause negative impacts on marine biodiversity. Some fishing gear, such as bottom trawls and pelagic drift nets also cause damage to habitats and biodiversity. Illegal, unreported and unregulated (IUU) fishing also undermines conservation and management efforts around the world and thus poses a threat to marine biodiversity and sustainable use of the marine environment.[186] It has been argued that in certain fisheries, overfishing and mismanagement are, at present, considerably larger threats to the status of the targeted fish stocks and their dependent ecosystems than climate change itself.[187]

Healthy fish populations are integral to the functioning of the ocean/climate nexus, and as such impacts from overexploitation in turn impact this nexus. While much research on the biogeochemical functioning of the ocean in regulating the climate has focused on phytoplankton (see section 2.5.1), the role of fish is receiving greater attention. A recent scientific study has highlighted the importance of fish in ocean carbon cycling (and therefore the ocean/climate nexus) through food web transfer.[188] Interestingly, 'because fish faecal pellets sink faster and further than smaller particles such as phytoplankton aggregates and zooplankton faecal pellets, they could account for more than 20% (considering targeted and nontargeted species) of the deep ocean respiration and carbon sequestration driven by the ocean's biological pump'.[189] It also presented the shocking finding that the measured reduction in biogeochemical functioning in the ocean due to loss of fish stocks through exploitation and other factors including climate change and habitat loss, is in fact comparable to the impacts of climate change itself.[190] This indicates that fish function as important carbon sinks for regulation of the global climate, and that healthy fish populations and marine ecosystems help maintain the functioning of the ocean/climate nexus.

[185] See European Parliament, *Report on the state of play of recreational fisheries in the European Union* 2017/2120(INI) (European Parliament 2020), available at <http://www.europarl.europa.eu/sides/getDoc.do?type=REPORT&reference=A8-2018-0191&language=EN#title2>.
[186] Brondízio and others, (n 13) 42.
[187] Rainer Froese, Eva Papaioannou and Marco Scotti, 'Climate Change or Mismanagement?' (2022) Environmental Biology of Fishes <https://doi.org/10.1007/s10641-021-01209-1>.
[188] Daniele Bianchi and others, 'Estimating Global Biomass and Biogeochemical Cycling of Marine Fish with and without Fishing' (2021) 7 Science Advances eabd7554.
[189] ibid., 5.
[190] ibid.

In addition, other impacts from exploitation of marine living resources include wasteful unselective fishing practices such as discarding and bycatch, habitat loss, pollution (including from plastics) and limited knowledge and understanding of the marine environment. It is beyond the scope of this chapter to go into detail on all of these impacts, but nevertheless they compound the effects of climate change on fisheries and marine biodiversity and limit the efficacy of legal responses discussed later in the thesis.

2.7 Preliminary Conclusions

This section has described and discussed the impacts of climate change on the ocean as they relate to its biodiversity and fisheries. This was based on the findings of successive scientific synthesis reports from the IPCC and scientific literature. The main findings of this section are i) the main climate impacts on the ocean are warming, acidification and deoxygenation; ii) these impacts cause a range of biological responses in fish and other marine species; iii) one of the key responses is the shifting of marine species Poleward to higher latitudes or in to deeper water; iv) extreme weather events such as marine heatwaves are increasing in frequency and duration; v) climate impacts are exacerbated by other, non-climate, impacts including habitat loss and overexploitation. It is important to note at this point that the internationally agreed long-term temperature goal under the Paris Agreement is to keep planetary warming well below a maximum average of 2ºC.[191] This means that even if drastic action is taken to reduce GHG emissions, the planet is guaranteed to increase in temperature and undergo unprecedented ecological change. This indicates the need for adaptive responses in fisheries conservation and management. The next section outlines key ecological responses of marine species to the impacts described in this section, with a focus specifically on the shifting of range, or redistribution of marine species.

[191] Paris Agreement, Art. 2.

3. Marine Species Redistribution

Clearly, climate change influences the physical and chemical properties of aquatic environments. Temperature, acidity, and oxygen levels play a substantial role in defining the habitat and distribution of marine biodiversity. The previous section outlined that there is scientific consensus that fish and other marine creatures will, if possible, move to preferred environmental conditions if the conditions of their present environment change unfavourably. Unfavourable conditions can be caused by the any one of the multitudes of climate change impacts on the ocean. This is supported by decades of research indicating that climatic variables primarily drive the distribution of marine biodiversity.[192] This section will explain concisely the present scientific understanding of the movement of marine species its impacts (section 3.1), including issues around the creation of novel ecosystems (section 3.2), and invasive species (section 3.3) and offers preliminary conclusions (section 3.4).

3.1 Marine Species on the Move

This chapter so far has demonstrated that generally, the first behavioural response of marine fishes and invertebrates respond to the changes described above is by shifting their distribution. If possible, they shift toward areas with the environmental conditions closest to those optimal for their survival.[193] We also know climate change alters phenological (seasonal) cycles such as migration timing and spawning.[194] Fish and other animals have so far shifted into new areas at an average rate of 70km per decade,[195] though this global average – though alarming in its own right – disguises substantial differences in the capacity for different marine species to redistribute. Scientists predict these shifts will either continue or accelerate in line with increasing global temperatures.[196] For example, a study estimated that 892 marine species of commercial importance are expected to shift their distribution in the future.[197] A more recent

[192] Julie M Roessig and others, 'Effects of Global Climate Change on Marine and Estuarine Fishes and Fisheries' (2004) 14 Reviews in Fish Biology and Fisheries 251; Graeme C Hays, Anthony J Richardson, and Carol Robinson, 'Climate Change and Marine Plankton' (2005) 20 Trends in Ecology & Evolution 337.
[193] Pinsky and others, (n 5); Miranda C Jones and William WL Cheung, 'Multi-Model Ensemble Projections of Climate Change Effects on Global Marine Biodiversity' (2015) 72 ICES Journal of Marine Science 741; Poloczanska and others, (n 5); Pecl and others, (n 34).
[194] Asch, (n 5); Genner and others, (n 5).
[195] Poloczanska and others, (n 5).
[196] Perry and others, (n 163); Cheung, Reygondeau and Frölicher, (n 9).
[197] Pinsky and others, (n 5); Christopher M Free and others, 'Impacts of Historical Warming on Marine Fisheries Production' (2019) 363 Science 979.

study indicated that by 2030, 23% of transboundary fish stocks will have undergone a shift in distribution.[198]

These shifts are biological responses. They affect biodiversity and important ecosystem services, such as fisheries, through changing species composition. Creation of novel ecosystems from, for example, species gains and local extinctions resulting from distribution shifts, present complications for implementing effective conservation measures, such as MPAs. Regional increases or decreases in fisheries catch potential due to species movement are anticipated as the climate warms.[199]

Understandably, the shift in range of commercial species is cause for concern. Recent research undertaken by the International Council for the Exploration of the Sea (ICES), an intergovernmental marine science organisation,[200] found that 16 of 21 assessed commercial fish species in the North-East Atlantic had undergone distributional change to some extent.[201] ICES also found that environmental conditions had influenced the distributional change of these 16 species, while fishing had influenced the distribution of 9 species.[202] Eight species that have shifted their distribution in relation to total allowable catch (TAC) management areas include anchovy, cod, hake, herring, mackerel, plaice, horse mackerel, and common sole, with the greatest shifts occurring for hake and mackerel.[203] The study indicated that future changes in distribution are likely, but the mechanisms that affect the spatial distribution of fish stocks are complex (e.g., interaction between fishing pressure and climate change make precise predictions of these changes difficult).[204] ICES indicates that this will 'challenge some of the assumptions underlying current management' of fisheries in the region, and that continued monitoring of spatial distribution of fish stocks is essential in supporting future management.[205]

Will this affect all fish species in the same way? The research thus far suggests it is species with migratory characteristics and greater mobility who are most likely to respond

[198] Palacios-Abrantes and others, (n 34).
[199] Cheung, Reygondeau and Frölicher, (n 9).
[200] See ICES, 'Who we are' no date, available at: <https://www.ices.dk/about-ICES/who-we-are/Pages/Who-we-are.aspx>.
[201] ICES, 'EU Request on Distributional Shifts in Fish Stocks' (ICES 2017) available at: <https://ices-library.figshare.com/articles/report/EU_request_on_distributional_shifts_in_fish_stocks/18686750>.
[202] ibid.
[203] ibid.
[204] ibid.
[205] ibid.

quickly to climate-driven changes in environment by shifting their distribution, and understandably so.[206] These, for example are small pelagic fish species (i.e., anchovy & sardine) whose habitat requirements are determined primarily by oceanic conditions such as temperature and salinity.[207] However, it is quite a different case for demersal species.[208] These species will undoubtedly alter their distributions and migration patterns in response to climate change, the issue is that they often require particular features such as physical structures (i.e., coral reefs or kelp forests) or sediment types (i.e., rocks or sand) for their habitat and are likely to alter their distribution more slowly, or not at all.[209]

It is also important to note here that species redistribution can be both spatial and temporal in nature. As well as moving their physical location, at times species are involved in complex ecosystem functions such as annual migrations or aggregations in specific locations, such as during spawning. These species may arrive earlier or later than usual, or not at all, causing an imbalance in ecosystem structure and function. For example, in the Northwest Atlantic capelin determines the marine food web dynamics in the area, acting as a link between zooplankton (copepods) and larger predators (cod).[210] A study by Buren and others found a regime shift, defined as 'rapid, pervasive, and persistent changes in system structure forced by environmental perturbation that later key energy pathways,' [211] caused both a sudden and extensive change in marine ecosystem structure and function. Copepods, the key zooplankton prey species for capelin in the North-West Atlantic,[212] were negatively affected by changes in seasonal sea ice and thus limited the available food for the capelin population. Capelin is a key food source for cod, harp seals and halibut and these predator populations then suffer negatively due to nutritional stress.[213] In simple terms, it can often be just as important *when* species move, as opposed to where. This is important as traditional fisheries management focuses on target species, rather than changes in productivity and interactions amongst ecosystems due to *inter alia* climatic factors. This has important implications for implementing

[206] Perry and others (n 163).
[207] ibid.
[208] Those fish species which live or feed near or on the bottom of the sea.
[209] Cochrane and others, (n 26) 45.
[210] Andrey V Dolgov, 'The Role of Capelin (*Mallotus villosus)* in the Foodweb of the Barents Sea' (2002) 59 ICES Journal of Marine Science 1034.
[211] Alejandro D Buren and others, 'Bottom-Up Regulation of Capelin, a Keystone Forage Species' (2014) 9 PLOS ONE e87589.
[212] Olga V Gerasimova, 'Peculiarities of Spring Feeding by Capelin (*Mallotus villosus*) on the Grand Bank in 1987–90' (1994) 17 Journal of Northwest Atlantic Fishery Science 59; Richard L O'Driscoll, Morag JD Parsons and George A Rose, 'Feeding of Capelin (Mallotus villosus) in Newfoundland Waters' (2001) 86 Sarsia 165.
[213] ibid.

the ecosystem approach to fisheries, discussed later in this thesis. The next subsection describes changes at an ecological level alluded to at the beginning of this subsection in more detail.

3.2 Creation of Novel Ecosystems

Shifting of marine species into new areas can cause the reconfiguration of existing ecosystems and the creation of novel ones. This has consequences for ecosystem structure and function, making them vulnerable to major disturbances.[214] For example, FAO indicates that changes in distribution of demersal species 'might be used as an index of persistent longer-term changes in habitat conditions.'[215] This would indicate an 'ecosystem shift' or a creation of a novel ecosystem - where components of an ecosystem of one location have moved to a new one as a result of climate impacts. Movement of species culminates 'in novel ecosystems where tropical and temperate species interact, with unknown implications.'[216] For example, in extreme temperatures (such as marine heatwaves discussed above) can exceed physiological 'tipping points' for certain marine species such as sea kelp or fleshy algae, with reinforcing feedback mechanisms (proliferation of tropical herbivore species with greater thermal tolerances) preventing their reestablishment in that area.[217]

Another example is the finding that in semi-enclosed seas such as the Mediterranean, the Baltic, and the Gulf of Mexico where landmasses prevent poleward range shift or expansion. In these cases, some species have been observed migrating to deeper (and subsequently colder) water.[218] This also fuels creation of novel ecosystems with sometimes unpredictable consequences, including the fact that they may be less resilient to other climate change impacts. This presents an enormous challenge for effective marine conservation and management of fisheries and complicates the application of the ecosystem approach to fisheries management (EAF) through undermining scientific methods of fish stock assessments, fishing gear types may have to change - at considerable cost – to target species as they move deeper,

[214] Wernberg and others, (n 167).
[215] Cochrane and others, (n 26) 45.
[216] ibid., see also Michael T Burrows and others, 'The Pace of Shifting Climate in Marine and Terrestrial Ecosystems' (2011) 334 Science 652.
[217] Wernberg and others, (n 167).
[218] Pinsky and others, (n 5).

and new 'choke species' may proliferate in areas they were not present before.[219] These issues will be discussed in more detail with examples in section 4.

As the issues described above are not exclusively limited to fishery management, they must not be considered in a narrow scope, especially in light of the EAF.[220] Widely accepted and called for in various international instruments, EAF aims to apply a holistic approach - accounting for ecosystem structure and function,[221] and interactions between humans, abiotic and biotic factors.[222] The EAF also considers transboundary species and ecosystems - an important feature in addressing the problem of climate-driven shifts. Parties to the UN Convention on Biological Diversity (CBD)[223] have indicated necessity for further implementation and improvement of EAF.[224] As climate projections indicate that marine species range shifts may become an important driver of biodiversity loss and changes in ecosystem functioning through depletion of some and arrival of new species - creating novel ecosystems and altering interspecies interactions.[225] Climate change will affect ecosystem services to humans,[226] and complicate the application of EAF, strengthening the argument for robust, responsive and adaptable marine environmental law which is discussed in subsequent chapters of the thesis.[227] The next subsection describes the proliferation of invasive marine species as a result of climate change.

[219] On the issue of choke species, see UK Parliament European Union Committee, *Fisheries: implementation and enforcement of the EU landing obligation*, 16th Report of Session 2017-19 (8 February 2019) HL Paper 276, available at <https://publications.parliament.uk/pa/ld201719/ldselect/ldeucom/276/27602.htm>.
[220] FAO, *Fisheries Management. 2: The Ecosystem Approach to Fisheries* (FAO 2003); Serge M García and FAO, *The Ecosystem Approach to Fisheries: Issues, Terminology, Principles, Institutional Foundations, Implementation and Outlook* (FAO 2003).
[221] See CBD Decision V/6.
[222] García and FAO, (n 220) 6; Joji Morishita, 'What Is the Ecosystem Approach for Fisheries Management?' (2008) 32 Marine Policy 19.
[223] (n 22).
[224] CBD, Decision X/2; CBD, Decision XI/18, para. 2; See also the OSPAR Convention Parties Statement on the EAF and the importance of managing human activities in this context, available at: <https://www.ospar.org/site/assets/files/1232/jmm_annex05_ecosystem_approach_statement.pdf>.
[225] Céline Bellard and others, 'Impacts of Climate Change on the Future of Biodiversity' (2012) 15 Ecology letters 365.
[226] Joshua J Lawler and others, 'Projected Climate-Induced Faunal Change in the Western Hemisphere' (2009) 90 Ecology 588.
[227] Elisa Morgera, 'The Ecosystem Approach and the Precautionary Principle' in Elisa Morgera and Jona Razzaque (eds), *Biodiversity and Nature Protection Law* (Edward Elgar Publishing 2017) 70.

3.3 Invasive Species

Non-native species may become invasive if conditions favour their environmental preferences, while established native species may be weakened.[228] Climate change is exacerbating this. The non-native species issue particular issue has a varied terminology. For clarity:

- *Invasive* species are those considered to have become a nuisance, usually to humans or their activities.

- *Introduced* species are those that are found outside their natural geographic range. They are those which have been transplanted with or without intent (e.g., from discharge of ballast water or through escape from aquaculture units), and which go on to reproduce and spread in their new location.

- *Vagrant* species are species which are indigenous to a geographic region as a whole but have spread into areas that were previously uncolonised due to geographic shifts in temperature conditions corresponding to the tolerance range of the species. Vagrant individuals are those which disperse farther than 90% of the population at time of recording and are viewed by some as 'pioneers' in species range expansion. [229]

- *Native invaders* are 'native' species which move out of their historical range, increase in abundance, and exert predatory or competitive pressure on other native species;[230]

Invasive marine species range shifts have been documented correlating with changes in sea surface temperature.[231] While many species become invasive as they are introduced to locations they would be unable to reach independently by anthropogenic vectors, such as through ballast water in ships, or colonising pieces of marine litter which transports them to

[228] Jones and Cheung, (n 193).
[229] Hannah E Fogarty and others, 'Are Fish Outside Their Usual Ranges Early Indicators of Climate-Driven Range Shifts?' (2017) 23 Global Change Biology 2047; Richard R Veit, 'Vagrants as the Expanding Fringe of a Growing Population' (2000) 117 The Auk 242.
[230] ibid.
[231] Marc Rius and others, 'Range Expansions across Ecoregions: Interactions of Climate Change, Physiology and Genetic Diversity' (2014) 23 Global Ecology and Biogeography 76; Michael P Carey and others, 'Native Invaders – Challenges for Science, Management, Policy, and Society' (2012) 10 Frontiers in Ecology and the Environment 373; Scheffers and Pecl, (n 34); M Ruis and others, 'Range expansions across ecoregions: Interactions of climate change, physiology and genetic physiology and genetic diversity' *Global Ecology & Biogeography* 23 (2014).

new locations.[232] There appears to be consensus that changes or shifts in community structure have the same potential negative impacts as invasive, introduced or vagrant species, and should be given the same level of attention.[233]

From a physiological perspective, the metabolic tolerance of species in a new range is often larger than in their original range. This is because native ranges are often also limited by physical and biological interactions such as predation or exploitation. When a species is introduced into a new area however, it may face fewer constraints from predators, disease and competition than in its native region, and is thus free to exploit its full physiological tolerance and become well established in a new area.[234] For example, species distribution modelling of the North Atlantic has found that the suitability of habitats will, generally, increase further north for species which have the highest potential to become problematic as they become well established.[235] The term 'problematic' is used in the sense that most of these species have been identified to pose serious conservation consequences.[236]

3.4 Preliminary Conclusions

The findings of this section are that shifts in species range from climate change and distribution (from introduction by anthropogenic vectors, climate change, or some combination of the two) alters community composition and leads to the alteration of, and creation of new, ecosystems.[237] This is because as species ranges shift, the likelihood of new interactions and interspecific competition between species increases. These new interactions are important in shaping marine ecosystem structure and function and may have unforeseen consequences for fisheries management in the future.[238] The next section showcases five illustrative regional examples of species redistribution and the consequences for conservation and management that this causes.

[232] Cascade JB Sorte, Susan L Williams and James T Carlton, 'Marine Range Shifts and Species Introductions: Comparative Spread Rates and Community Impacts' (2010) 19 Global Ecology and Biogeography 303.
[233] ibid.
[234] ibid.
[235] Bryony Townhill and others, 'Non-Native Marine Species in North-West Europe: Developing an Approach to Assess Future Spread Using Regional Downscaled Climate Projections' (2017) 27 Aquatic Conservation: Marine and Freshwater Ecosystems 1035.
[236] ibid.
[237] Scott C Doney and others, 'Climate Change Impacts on Marine Ecosystems' (2012) 4 Annual Review of Marine Science 11.
[238] See, for example Pinsky and others, (n 6).

4. Regional Examples

Marine species occupy a host of different habitats, with diverse preferences for environmental temperatures, oxygen and acidity levels, the consequences of climate change on fisheries and marine biodiversity are broad and vary in space and time. For example, biophysical changes to marine biodiversity include extinction of species, local increases and decreases of species richness, ecosystem disruption and collapse and consequential loss of ecosystem services.[239] Despite biodiversity redistribution being a ubiquitous global response, climate impacts on the ocean and the consequential shift in marine species occurs at different rates and different locations. This is especially true at lower latitudes,[240] and in semi-enclosed seas - where land barriers limit the potential for range shifts.[241] Because the climate impacts of climate change are likely to vary in their manifestation in different parts of the ocean, this section adopts a regional approach. Five regional examples are outlined below to demonstrate the regulatory and managerial challenges of marine biodiversity redistribution. It is first important to note that most studies on marine species distribution, and climate change impacts on the oceans more generally, are focused on the mid- and high latitudes in the Northern Hemisphere. An unfortunate limitation of the scientific literature review undertaken for the preparation of this thesis is the fact that available studies on changes in the Southern Hemisphere and tropical regions are rather scant.[242] This bias in research coupled with the fact that, in terms of fisheries, it appears that States in the Global North will likely benefit most from large-scale redistribution of global potential catch. Indeed, this notion is understandably problematic and could in itself be examined as a climate justice issue but is beyond the scope of this thesis. The examples outlined relate to fisheries to meet the narrower focus of this thesis. It is also important to note that chapter 4 will examine climate adaptive management practices by RFMOs which by their very nature occur on the high seas. As such, not all these examples are from the high seas due to limitations in the available literature but are nonetheless provided for illustrative purposes. The examples concern warming in the North-East Atlantic Ocean (section 4.1), the 2012 North West Atlantic Marine Heatwave (section 4.2), fish on the move in the North Sea (section 4.3),

[239] IPCC, (n 97) 11; Barange and others, (n 4).
[240] Arndt Hampe and Rémy J Petit, 'Conserving Biodiversity under Climate Change: The Rear Edge Matters' (2005) 8 Ecology Letters 461.
[241] Frida Ben Rais Lasram and others, 'The Mediterranean Sea as a "Cul-de-Sac" for Endemic Fishes Facing Climate Change' (2010) 16 Global Change Biology 3233.
[242] Parry and others, (n 12) 843–868.

oysters in the North-East Atlantic (section 4.4) and the Plaice Box (section 4.5). Preliminary conclusions are offered in section 4.6.

4.1 Warming in the North-East Atlantic Ocean

The effect of climate change on the distribution and abundance of marine species in the North-East Atlantic was covered rather extensively in a 2008 report by ICES.[243] The report was requested by the OSPAR Commission, the administrative body for the OSPAR Convention,[244] a regional seas organisation with the object and purpose of facilitating international cooperation on marine environmental protection in the North-East Atlantic region.[245] While OSPAR does not manage or regulate fisheries *per se*, it does have the competence to protect, restore and conserve the marine ecosystems and biological diversity within the OSPAR area through measures such as designation of MPAs.[246] In addition, it has entered in to a collective arrangement with the North-East Atlantic Fisheries Commission (NEAFC),[247] an RFMO with competence to regulate fishing in areas beyond national jurisdiction (ABNJ) in the North-East Atlantic which has a geographically overlapping mandate with OSPAR. The arrangement,[248] requests the Parties (OSPAR and NEAFC) to *inter alia* 'inform each other, as appropriate, of any relevant updated scientific information and environmental assessment and monitoring data'.[249] Therefore, the content of this report is relevant insofar as it informs the regulation of fisheries by NEAFC through information exchange with OSPAR through standard setting.[250] This point is discussed further in chapter 4.

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[243] Mark L Tasker (ed) 'The effect of climate change on the distribution and abundance of marine species in the OSPAR Maritime Area' *ICES Cooperative Research Report* No. 293 (ICES 2008) available at <http://eprints.uni-kiel.de/4421/1/844_Anker-Nilssen_2008_TheEffectOfClimateChange_Monogr_pubid12558.pdf>.

[244] Convention for the Protection of the Marine Environment of the North-East Atlantic, Paris, 22 September 1992, in force 15 March 1998, 2345 UNTS 67 (OSPAR Convention).

[245] See OSPAR, 'The North-East Atlantic' no date, <https://www.ospar.org/convention/the-north-east-atlantic>.

[246] OSPAR Convention, Annex V.

[247] Originally established by the North-East Atlantic Fisheries Convention, adopted 24 January 1959, in force 27 June 1963, 486 UNTS 157, replaced by the Convention on Future Multilateral Cooperation in the North-East Atlantic Fisheries, 1982 adopted 18 November 1980, in force 17 March 1982, 1285 UNTS 129.

[248] Collective arrangement between competent international organisations on cooperation and coordination regarding selected areas in areas beyond national jurisdiction in the North-East Atlantic (OSPAR Agreement 2014-09 (Update 2018 Annex 2, 2021 Annex 1b)) 2022 version, available at <https://www.ospar.org/documents?v=33030>.

[249] ibid., para. 6(a).

[250] Ellen Hey, 'The OSPAR NEAFC Collective Arrangement and Ocean Governance: Regional Seas Organisations as the Setters of Conservation Standards in ABNJ?' (2022) 37 The International Journal of Marine and Coastal Law 610.

Focusing primarily on effects potentially linked to changes in sea surface temperature in the OSPAR area, the main conclusions of the report were that oceanographic conditions do influence marine biodiversity in the North-East Atlantic, and that these conditions are changing. Effects were strongest particularly when environmental conditions were either very cold or very warm. ICES scientists demonstrated that changes in distribution, abundance, phenology of marine species were consistent with changes in climate in the OSPAR area. However, the report notes:

> This does not mean that all changes are consistent with a climate-change effect, nor that climate is the only cause, but is undoubtedly a recognizably important factor in around three-quarters of the 288 cases examined here. These cases include zooplankton (83 cases), benthos (85 cases), fish (100 cases), and seabirds (20 cases). For seabirds, only 12 of the 20 changes were consistent with a climate effect, but for other taxa, the proportion of consistent cases was much higher.[251]

Overall, the results across the OSPAR regions were consistent with a climate change effect. The report found 'ample evidence' that changes in fish distribution and abundance were consistent with i) a northward shift or deepening of their distribution; ii) an increase in abundance in the norther part and a decrease in the southern part of their range.[252] The entire assemblage of demersal fish in the North Sea has deepened by ~3.6m per decade.[253]

However, observed changes cannot be attributed to climate change unequivocally because other significant factors may be at play, such as fishing. Fishing is an important additional factor as 'heavily exploited species will have a diminished gene pool and reduced resilience to environmental change. Consequently, they may be affected more by climate change than less exploited or unexploited species.'[254] The report recommended that reduction in large scale habitat impacts, such as reducing fishing pressure, especially from trawling 'could be a key adaptation strategy in reducing the threat of climate change in marine ecosystems in the OSPAR Maritime Area.'[255] Doing so could increase the resilience of marine ecosystems by giving them greater potential to recover to marine heatwaves, for example. This

[251] Tasker, (n 243) 1.
[252] ibid., 2.
[253] Nicholas K Dulvy and others, 'Climate Change and Deepening of the North Sea Fish Assemblage: A Biotic Indicator of Warming Seas' (2008) 45 Journal of Applied Ecology 1029.
[254] ibid.
[255] ibid., 3.

illustrates the interconnectedness of the impacts of the ocean highlighted above i.e., the impacts of warming are compounded by fishing and acidification.

4.2 The 2012 Marine Heatwave in the North-West Atlantic

The North-West Atlantic has faced some of the fasted warming in the global ocean.[256] A study by Mills and others discusses the impacts observed from a marine heatwave over the region in 2012 on fisheries management. [257] The 2012 marine heatwave was the greatest in both size and intensity in the North Atlantic for 30 years, with seas surface temperature 1-3°C warmer than the 1982–2011 average.[258] This level of warming matches what is expected for the end of this century by the IPCC,[259] meaning this incident can illustrate some of the impacts of future ocean warming. This extreme event demonstrated how climate affects distribution in both space and time, the author notes that generally 'warm-water species moved northward, and some species undertook local migrations earlier in the season, both of which affect fisheries targeting those species.'[260] This is a key issue that adaptive fisheries management will need to address, therefore there must be adequate international legal and policy tools that facilitate this.

During the 2012 marine heatwave in the North-West Atlantic, warming was particularly pronounced over the continental shelf in the Gulf of Maine, with sea surface temperature 2°C above the 1982–2011 average.[261] The intense warming in the region 'triggered rapid and unprecedented changes in the marine ecosystem, revealing complex interactions among physics, ecology, economics, and policy.'[262] While species range shifts spans diverse taxonomic groups, the largest shifts in this area were commercially valuable species, such as lobsters.[263] This has happened before in the region, for example, a warm event caused a mass

[256] See Igor Belkin, 'Sea surface temperature trends in large marine ecosystems.' in IOC-UNESCO & UNEP (eds) *Large Marine ecosystems: status and trends* (UNEP 2016) 101–109 available at: <http://www.geftwap.org/publications/lmes-technical-report>; For a comprehensive review on shifts of marine species on the continental shelf of North America see James W Morley and others, 'Projecting Shifts in Thermal Habitat for 686 Species on the North American Continental Shelf' (2018) 13 PLOS ONE e0196127.
[257] Katherine Mills and others, 'Fisheries Management in a Changing Climate: Lessons from the 2012 Ocean Heat Wave in the Northwest Atlantic' (2013) 26 Oceanography 191.
[258] ibid., 191.
[259] Gerald A Meehl and Thomas F Stocker, 'Global climate projections' in Susan Solomon and others (eds) *Climate Change 2007: The Physical Science Basis.* Contribution of working group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press 2007) 747, 766.
[260] ibid.
[261] Mills and others, (n 257) 192.
[262] ibid.
[263] Silver hake, red hake, yellowtail flounder, winder flounder and Atlantic cod.

die-off of American lobsters (*Homarus americanus*) in 1999 in Long Island Sound.[264] Additionally, warming is known to increase the spread of lobster shell disease, a bacterial infection which causes lesions on the carapace of the lobster, implicating populations south of Cape Cod.[265] Further, as shifts in distribution of fish species change, lobsters are likely to face a new and diverse suite of predators which may also increase mortality.[266]

A temporal shift and increase in landings of lobsters correlated with increased sea surface temperature in 2012. In phenological terms, lobsters in the Gulf of Maine move from deep waters offshore into shallower coastal areas as waters begin to warm in the spring. This makes them more accessible to a large inshore fleet, and catch rates subsequently rise sharply.[267] During the marine heatwave, the temperatures in late spring were equivalent to temperatures normally encountered by lobsters three weeks later in early summer.[268] This resulted in the movements of lobsters inshore earlier and catches rising sharply in June and July, when the season normally peaks in August or September.[269] Further, the higher sea surface temperature in 2012 increased moulting rates in lobsters and thus the number of individuals at a legal size to be caught.

While the above would appear welcome in economic and social terms, the north-eastern United States lobster fishery is 'essentially a recruitment fishery, with 75% of annual landings from animals that moulted into legal size during the season.'[270] This is identified as problematic as increased temperatures over the long term will speed-up moulting, decrease growth variability among individual lobsters and thus 'decrease the number of year classes contributing to annual recruitment, increase the interannual catch variability, and make the population more susceptible to overfishing.'[271] With that in mind, the socio-economic impact of the heatwave is described below:

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[264] Jack Pearce and Nancy Balcom, 'The 1999 Long Island Sound Lobster Mortality Event: Findings of the Comprehensive Research Initiative' (2005) 24 Journal of Shellfish Research 691.
[265] Richard A Wahle, Mark Gibson and Michael Fogarty, 'Distinguishing Disease Impacts from Larval Supply Effects in a Lobster Fishery Collapse' (2009) 376 Marine Ecology Progress Series 185; see also NOAA, 'Lobster Shell Disease' 9 May 2018 <https://www.fisheries.noaa.gov/science-blog/lobster-shell-disease>.
[266] ibid.
[267] Daniel S Holland, 'Optimal Intra-Annual Exploitation of the Maine Lobster Fishery' (2011) 87 Land Economics 699.
[268] Mills and others, (n 257).
[269] ibid.
[270] ibid.; See also Atlantic States Marine Fisheries Commission, 'American Lobster Stock Assessment and Peer Review Report' Stock assessment Report No. 09-01, (Atlantic States Marine Fisheries Commission 2015) 316, available at: <http://www.asmfc.org/fisheries-science/stock-assessments>.
[271] ibid.

> During 2012, the extended fishing season and high landings paradoxically led to an economic crisis in the lobster fishery. Record landings outstripped the processing capacity and market demand for the product, which contributed to a price collapse. Ex-vessel prices (price received by fishermen at the dock) for lobster dropped as low as $1.25 per pound in some areas of Maine, 70% below normal. Low prices threatened the economic viability of both US and Canadian lobstermen. With an influx of US lobsters, prices offered to Canadian fishermen also plummeted, leading to demonstrations against Canadian plants processing US lobster.[272]

This example clearly indicates how climate change can influence the complex relationships among physical, biological and economic processes which in turn can rapidly affect fisheries. Mills and other's study concluded that scientific information streams will need to adapt alongside fisheries frameworks to be effective as ocean temperatures warm and become more variable.[273] They argue that the critical adaptation measures will be: i) improved capacities to detect and predict ecosystem impacts of climate change; ii) agile fishery management systems that can adapt to ecosystem changes and iii) action to ensure fisheries laws and policies ensure these changes. To achieve this, they recommend evaluating permit structures to facilitate access to new target species as species distributions shift. Preparation for a shift in management boundaries is also crucial as management authorities may not have instant authority over certain stocks. Existing policies and governance arrangements (including national jurisdictions and international agreements on transboundary stocks) will need to be modified to facilitate permitting, monitoring, and regulation of fisheries and species distributions shift.[274] Finally, management must adapt by shifting its reliance away from stationary baselines since many management frameworks are designed around previously observed biological patterns. This is explained below:

> [T]he status of commercially fished stocks is assessed against biomass levels over the past 20 to 30 years; stock boundaries and protected areas are established based on the distribution of species when they were originally designated; temporal spawning closures are timed to historical spawning periods; and fishing seasons are set to open after a certain reproductive threshold is likely to be met or when product quality is expected to be high. These baseline biological patterns and events are not stationary and are expected to change in response to climate conditions. Moving forward, adapting fisheries management to climate change will require that management tools and reference points appropriately incorporate non-stationarity due to climate-driven physical variability and biological changes.[275]

[272] ibid.
[273] ibid.
[274] ibid.
[275] Mills and others, (n 257) 30.

Though lengthily, this example is clearly helpful highlighting some of the key issues that adaptive fisheries and marine biodiversity management will have to face considering species redistribution under climate change which will be explored further through an international legal lens in the subsequent chapters of this thesis.

4.3 Fish on the Move in The North Sea

The North Sea has warmed by more than 1°C on average this past century and is a marine climate change hotspot. This region is subject to extensive fishing pressure by vessels using various gears (including trawlers) and targeting various species.[276] Highly-cited research has indicated that over the past 30 years, North Sea fish have shown an apparent northward shift in their distribution, and have moved into deeper waters where possible.[277] However, recent analysis of century-scale distribution changes in seven fish species in the North Sea show they have responded in different and confusing ways by shifting in various directions over the past thirty years.[278] This includes commercially lucrative species such as cod.[279] The study states that:

> Some fish have shifted northward (cod, plaice, [and] brill), others southward (sole), others remained surprisingly stable (whiting), whereas others again have mainly contracted or declined significantly over portions of their former range (turbot, cod). Whereas plaice has gradually shifted north and to deeper waters (as may be expected with climate warming), sole have shifted southward and 'shallowing' response (possibly attributable to better survival in shallow waters in recent, milder winters).[280]

Essentially, the study indicates that shift in distribution of fish species in the North Sea is more than just a case of 'fish moving north'.[281] In terms of causation, the distribution of cod, haddock, sole and plaice distribution could be attributed, either in whole or part to climate variables such as sea surface temperature.[282] Further, the study noted that on top of climate

[276] Georg H Engelhard and others, 'Distribution shifts in the North Sea: why is life so complicated?' (2013) ICES CM B:19, available at <http://www.ices.dk/sites/pub/CM%20Doccuments/CM-2013/Theme%20Session%20B%20contributions/B1913.pdf>.
[277] Perry and others, (n 163); Dulvy and others, (n 253).
[278] Engelhard and others, (n 276).
[279] Georg H Engelhard, David A Righton and John K Pinnegar, 'Climate Change and Fishing: A Century of Shifting Distribution in North Sea Cod' (2014) 20 Global Change Biology 2473.
[280] Engelhard and others, (n 276) 2.
[281] ibid.
[282] ibid.

change, fishing pressure was an especially important driver for distributional change for sole and cod – the two most commercially important species in the region. Another interesting finding in this study was that analysis of historical data had indicated that an area off the coast of Scotland named *Turbot Bank* had been depleted of Turbot, with the fish only being caught sporadically since the 1960s.[283]

The more famous example in this region concerns mackerel, which has been described in detail elsewhere.[284] In line with a sea temperature rise in the North Sea, mackerel stocks shifted northward to more suitable temperature waters around Iceland (which too had risen), where it has consistently spent the summer feeding.[285] Iceland was quick to take advantage of this windfall and established a fishery in 2007, 'unilaterally setting its quota on the claim that mackerel fisheries have been important for the country' the quota was also based on the controversial approach of zonal attachment.[286] The Faroe Islands too set unilateral quotas which caused upset with Norway and the EU, and resulted in the prohibition of mackerel and Atlanto-Scandian herring caught by Faroese vessels into the EU in 2013, though this ban was lifted in 2014 after an indication by Denmark (on behalf of the Faroes) to bring the dispute before the Appellate Body of the World Trade Organization.[287] Over the course of this dispute the mackerel stock numbers plummeted and lost its 'sustainable' certification from the Marine Stewardship Council.[288] At present, no multilateral management regime involving all Coastal States has been reached and the dispute remains ongoing.

[283] ibid.
[284] Andreas Østhagen, Jessica Spijkers and Olav Anders Totland, 'Collapse of Cooperation? The North-Atlantic Mackerel Dispute and Lessons for International Cooperation on Transboundary Fish Stocks' (2020) 19 Maritime Studies 155; British Sea Fishing, 'The Mackerel War' no date, available at <https://britishseafishing.co.uk/the-mackerel-wars/>; Teunis Jansen, 'Pseudocollapse and Rebuilding of North Sea Mackerel (Scomber scombrus)' (2014) 71 ICES Journal of Marine Science 299.
[285] Østhagen, Spijkers and Totland, ibid.
[286] ibid.
[287] ibid.; see also World Trade Organization 'DS469: European Union – Measures on Atlanto-Scandian Herring' no date, available at <https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds469_e.htm>.
[288] Østhagen, Spijkers and Totland (n 284); Marine Stewardship Council (MSC), 'MSC certificates suspended for all North East Atlantic mackerel fisheries' 31 January 2019, available at <https://www.msc.org/media-centre/press-releases/press-release/msc-certificates-suspended-for-all-north-east-atlantic-mackerel-fisheries>.

4.4 Oysters in the North-East Atlantic

The OSPAR report referred to above also identified a change in range of non-native 'sedentary' species in North-East Atlantic from algae, molluscs, limpets, and barnacles. An example of an introduced species in the North East Atlantic that has become established as a direct result of rising sea temperatures is the Pacific oyster (*Crassostrea gigas*), an escaped aquaculture species. *C. gigas* occurs naturally in all areas of Europe, where the species has been introduced for commercial aquaculture purposes. Establishment was unexpected because at the time of the introduction, temperatures in European waters were lower than in its native areas. Because of rising sea temperatures Extended reproductive periods are occurring along the Belgian and British coasts, in Dutch and German waters, and along the Swedish west coast, where *C. gigas* has appeared after a series of mild winters in the 1990s and early 2000s.[289] Settlements of small numbers of Pacific oysters have been found on the southern and western coasts of Ireland.[290] Replacement of one species with another due to higher-than-average water temperatures during July and August in recent years has been documented in the Wadden Sea. The study identified that since 2000 the Pacific Oyster *C. gigas* had increased considerably in abundance, causing partial disappearance of intertidal beds of blue mussel 'and at the same time creating new oyster reefs with an approximately equally biodiverse accompanying fauna.'[291] The study indicated that the higher water temperatures allowed for more successful settlement of oyster spat on the intertidal flats of the Wadden Sea.[292] While this change in community structure appears to be relatively harmless, it acts as a good indicator of other issues that may occur in the North-East Atlantic or elsewhere.

[289] Ben E Spencer and others, 'Spatfalls of the Non-Native Pacific Oyster, Crassostrea Gigas, in British Waters' (1994) 4 Aquatic Conservation: Marine and Freshwater Ecosystems 203.; Karsten Reise and others, 'Introduced species' in Karel Essink and others, 'Wadden Sea Quality Status Report 2005' (Common Wadden Sea Secretariat 2005) 155; Stephan Gollasch and others 'Status of introductions of non-indigenous marine species to the North Atlantic and adjacent waters 1992-2002: Ten-year summary of national reports considered at meetings of the Working Group on Introductions and Transfers of Marine Organisms' *ICES Cooperative Research Report No.* 284 (ICES 2018); Francis Kerckhof, 'Alien Species in the Marine and Brackish Ecosystem: The Situation in Belgian Waters' (2007) 2 Aquatic Invasions 243.
[290] Frouke Fey and others, 'Development and Distribution of the Non-Indigenous Pacific Oyster (*Crassostrea gigas*) in the Dutch Wadden Sea' (2010) 18 Aquaculture International 45.
[291] Tasker, (n 239) 37.
[292] ibid.

4.5 The Plaice Box

The OSPAR report on the North-East Atlantic report also indicates that changes in distribution of fish in response to climate change may affect the design and implementation of MPAs, or the effectiveness of existing ones. One example of this in the North Sea is the so-called 'Plaice Box'. This is a semi-enclosed MPA in the Wadden Sea,[293] where fishing was closed to large trawlers in 1995 with the objective to prevent undersized plaice being caught as bycatch by fisheries exploiting other flatfish. Prior to this closure, due to the small mesh size used to catch other flatfish such as sole, many juvenile plaice were being caught and subsequently discarded,[294] a wasteful and unsustainable practice since it reduces the number of available plaice to develop into adults. The scientific reasoning for the Plaice Box is that juvenile and adult place are spatially segregated – juvenile plaice inhabit shallow estuary waters and gradually migrate to deeper waters offshore as they mature.[295]

After implementation of the Plaice Box, beam trawl effort fell by 90% in the region while smaller trawlers for sole and shrimp increased effort. Strangely, plaice landings and biomass in the Plaice Box declined. A 2007 study indicated that shift in distribution of young place out of the Plaice Box in response to higher than average water temperatures is undermining the effectiveness of the Plaice Box as an MPA to protect under-sized plaice from discarding – this is because an increased proportion of the population of undersized plaice is moving out of the warm waters in Plaice Box and into the deeper, and more heavily exploited offshore areas.[296] This was further elaborated in 2013, with a study concluding that observed changes are more likely related to North Sea ecosystem changes such as temperature and nutrient influx, and less likely to changes in fishing pressure within the Plaice Box.[297]

This example is an indication in line with the observations of the OSPAR report that future MPAs need to be adaptive, responsive and resilient to changes in fish spatial distribution because of changes in oceanic conditions due to climate change. To do so, MPAs and closed

[293] UNESCO, 'Wadden Sea' no date, available at: <https://whc.unesco.org/en/list/1314/>.
[294] Adriaan D Rijnsdorp and Richard S Millner, 'Trends in Population Dynamics and Exploitation of North Sea Plaice (*Pleuronectes platessa* L.) since the Late 1800s' (1996) 53 ICES Journal of Marine Science 1170.
[295] Olvin A van Keeken and others, 'Changes in the Spatial Distribution of North Sea Plaice (Pleuronectes Platessa) and Implications for Fisheries Management' (2007) 57 Journal of Sea Research 187.
[296] ibid.
[297] Doug Beare and others, 'Evaluating the Effect of Fishery Closures: Lessons Learnt from the Plaice Box' (2013) 84 Journal of Sea Research 49.

areas must be set up with testable objectives, an appropriate evaluation framework that includes both ecological and socio-economic indicators.[298] Various adaptive management methodologies to account for the uncertain nature of climate change and reduce adverse impacts have been suggested in the literature.[299] One option could be 'targeted' closures of marine areas to protect species, this has been shown to be particularly effective in the case of Atlantic bluefin tuna in the Gulf of Mexico.[300] Adaptive management strategies for MPAs and other area-based management tools (ABMTs) in response to climate change variability will be discussed in detail later in this thesis.

4.6 Preliminary Conclusions

This section showcased five regional examples of marine biodiversity redistribution with the purpose of demonstrating the various the challenges they present to conventional conservation and management measures in fisheries. The examples sought to demonstrate that despite shifting species occurring as a ubiquitous global response to the impacts of climate change, these shifts will vary across species and regions and climate adaptive management measures must be specific in that context. Moreover, it indicated that climate impacts can cause several unexpected consequences from the individual species to ecosystems level. Fish are generally moving poleward or into deeper waters, however rates and direction of that of movement can vary widely. Fishing pressure exacerbates these impacts and makes fisheries and marine ecosystems less resilient to climate impacts. Extreme weather events such as marine heatwaves can cause mass mortality events, disease, as well as "boom and bust" scenarios in a fishery with long-term economic and social consequences, since many species affected are of commercial importance. In addition, influx of non-native species may have positive or negative consequences. Shifts can cause disputes between States which undermine management and conservation measures and the sustainable exploitation of the stock under dispute. In terms of fisheries management and conservation, this section demonstrated that climate change undermines the objectives of traditional management and stock assessment methodologies and approaches; and that MPAs and other ABMTs may not be fit for purpose in the face of climate

[298] ibid.
[299] Tony Prato, 'Increasing Resilience of Natural Protected Areas to Future Climate Change: A Fuzzy Adaptive Management Approach' (2012) 242 Ecological Modelling 46.
[300] Maite Pons and others, 'Trade-Offs between Bycatch and Target Catches in Static versus Dynamic Fishery Closures' (2022) 119 Proceedings of the National Academy of Sciences e2114508119.

change if they are geographically static. On that final point, the next section turns to the limitations and benefits of conservation measures in a changing climate.

5. Limitations and Benefits of Conservation Measures

This chapter so far has argued, based on the scientific literature, that the impacts of climate change on the ocean (warming, acidification and deoxygenation) undermine the effective conservation and management of marine capture fisheries and the marine environment more generally This section seeks to briefly introduce two key concepts that will be discussed throughout the rest of the thesis, and outlines the limitations and benefits of conservation and management measures as indicated in the scientific literature in responding to the issues described so far in this chapter. These are ABMTs (section 5.1) and fisheries management and quota allocation (5.2).

5.1 Area-Based Management Tools

Clearly, in light of the phenomena caused by climate change and variability described above, protected areas and the ecological goods and services they provide and were designed to protect are under threat.[301] Therefore, spatial conservation measures for marine biodiversity must be responsive to environmental changes in order to achieve their desired objectives, most importantly ABMTs. ABMTs are defined by the IUCN as 'regulations of human activity in a specific area to achieve conservation or sustainable resource management objectives', these can be adopted by a competent international organisation, such as the International Maritime Organization's Particularly Sensitive Sea Areas, or spatial or temporal closures by RFMOs including 'vulnerable marine ecosystems' (VMEs) for example.[302] Sectoral ABMTs are different to MPAs in the sense that sectoral ABMTs generally target one use of the marine environment, may be implemented for a short period of time, and/or do not protect the full features of that area.[303]

[301] Prato, (n 299).
[302] IUCN, *Measures such as area-based management tools, including marine protected areas*' no date, available at: <https://www.un.org/depts/los/biodiversity/prepcom_files/area_based_management_tools.pdf> 2.
[303] ibid.

There is a lack of a universally accepted definition of a MPA, the initial definition adopted by the IUCN as '[a]ny area of intertidal of subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment.'[304] This has been updated meaning that the MPA must fit the IUCN general definition of 'protected area', which is: 'a clearly defined geographical space, recognized, dedicated and managed through legal or other effective means to achieve the long term conservation of nature with associated ecosystem services and cultural values',[305] and that nature conservation should be the primary objective of the MPA.[306] While this does not mean that all human activities should be prohibited within a designated area, it does indicate that at the very least MPAs should:

> [H]ave a special status in comparison with the surrounding area due to their more stringent regulation of one or more human activities (e.g. shipping or fishing) or by one or more measures (e.g. the prohibition of anchoring or bottom trawling) for one or more purposes (e.g. the preservation of habitats, the conservation of target species or safeguarding the area for marine scientific research).[307]

Alagador and others have suggested that conservation areas must not be thought of as 'static geographical units' when planning for climate change adaptation.[308] This is primarily because the species that may justify the designation of the conservation area in the first place may move out of these areas in a response to climate change.[309] Following from that point, Bonebrake and others suggest that the issue of species redistribution does not adhere to normal conservation paradigms which tend to focus on restoring systems to a defined baseline.[310] Further, this issue defies 'normal' environmental management strategies, as these are 'often static and based on human-dictated boundaries drawn in the past.'[311] In light of this, legislation on MPAs at all levels should have in-built robustness to cope in some capacity with the complexities and challenges of climate change. Part of this robustness must include monitoring, as species whose

[304] Resolution 17.38 (1988) of the General Assembly of the IUCN, reconfirmed in Resolution 19.46 (1994).
[305] Nigel Dudley and others (eds), *Guidelines for Applying Protected Area Management Categories* (IUCN 2008) 8.
[306] Jon Day and others (eds), *Guidelines for applying the IUCN protected area management categories to marine protected areas* (IUCN 2019) 14–19.
[307] Erik J Molenaar and Alex G Oude Elferink, 'Marine Protected Areas in Areas beyond National Jurisdiction: The Pioneering Efforts under the OSPAR Convention' (2009) 5 Utrecht Law Review 5, 6.
[308] Diogo Alagador, Jorge Orestes Cerdeira and Miguel Bastos Araújo, 'Climate Change, Species Range Shifts and Dispersal Corridors: An Evaluation of Spatial Conservation Models' (2016) 7 Methods in Ecology and Evolution 853.
[309] ibid.
[310] Bonebrake and others, (n 34).
[311] ibid., 299.

movements are predictable in space and time are most likely to benefit from spatial protections. There are multiple different avenues to achieve robustness which will be explored in the thesis. These include time bound MPAs, a network of connected MPAs or 'ocean corridors' which can be declared unilaterally or bilaterally by States or through intuitions such as RFMOs. Whether the mechanisms in the existing international legal framework are equipped to achieve adaptive marine conservation will be explored in this thesis.

5.2 Fisheries Management and Quota Allocation

Climate change increases environmental uncertainty, which increases scientific uncertainty, and adds uncertainty to fisheries management in multiple respects: productivity, migration patterns, trophic/ecosystem interactions, and vulnerability of fish populations to fishing pressure.[312] Political factors can also exacerbate governance uncertainty. Any governance system addressing fisheries must be able to address this uncertainty - case studies indicate adaptation 'will involve more flexible fishery management regimes, schemes for capacity adjustment, catch limitations and alternative fishing livelihoods for fishers.'[313] When fishery governance systems and structures are poorly or under-developed, fisheries are less able to adapt to the impacts of climate change. Consequently, 'climate change involves addressing some of the most intractable allocation issues of fisheries management.'[314] There is a marked need for management that promotes socio-ecological resilience to ensure sustainability over the long term.[315] Socio-ecological resilience can be understood as 'the ability of a [socio-ecological systems] to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change.'[316] Socio-ecological resilience is discussed in more detail as it applies to fisheries adaptation in chapter three of this thesis.

[312] Alistair McIlgorm and others, 'How Will Climate Change Alter Fishery Governance? Insights from Seven International Case Studies' (2010) 34 Marine Policy 170.
[313] ibid.
[314] ibid.
[315] Elena Ojea and others, 'Fisheries Regulatory Regimes and Resilience to Climate Change' (2017) 46 Ambio 399; W Neil Adger and others, 'Are There Social Limits to Adaptation to Climate Change?' (2009) 93 Climatic Change 335; R Quentin Grafton, 'Adaptation to Climate Change in Marine Capture Fisheries' (2010) 34 Marine Policy 606; Julie Davidson and others, 'Toward Operationalizing Resilience Concepts in Australian Marine Sectors Coping with Climate Change' (2013) 18 Ecology and Society 4.
[316] Ojea and others, ibid., 399; IPCC 'See also, Climate change 2007: Synthesis report' in Pachauri and IPCC, (n 11).

Shifting marine species is clearly a problem that has arrived and will continue to worsen in the future. On average, exclusive economic zones (EEZs) of coastal States are predicted to contain one or more new fisheries stocks by 2100, compared to the distribution in 1950–2014 (see figures 1.1 and 1.2 below).[317] It was noted earlier in this chapter that ocean warming and loss of oxygen are greater in the tropical latitudes, and this reflects the loss of fish stocks as fish move to their preferred temperatures and/or oxygen levels as reflected in figure 1. The UN Special Rapporteur for promotion and protection of human rights in the context of climate change has identified loss of fish stocks as a climate change and human rights issue through economic losses:

> In the Pacific, it is estimated that climate change-induced migration of tuna stocks will potentially reduce total annual fishing access fees earned by the 10 Pacific small island developing States by an average of $90 million per year compared with the average annual revenue received between 2015 and 2019. The economies of the Vulnerable Twenty Group of Countries have lost on (sic) aggregate $525 billion because of the effects of climate change during the period 2000-2009.[318]

This indicates shifting fish stocks can be viewed as a climate justice and equity issue, with individuals in the global south – particularly small-scale fishers suffering the effects of a climate crisis that they did not cause.[319] This is pertinent since a very small number of States are responsible for the vast majority of GHG emissions which are causing the conditions creating these shifts.

Fisheries management and quota allocation is based generally on the dated concepts of zonal attachment, where national allocations of fish quotas are based on historical patterns of presence by species in geographical area. In the EU, a predictable percentage share of fish stocks is granted to Member States through the concept of relative stability.[320] RS exists as a

[317] Pinsky and others, (n 6).
[318] UNGA, 'Promotion and protection of human rights in the context of climate change mitigation, loss and damage and participation' *Report of the Special Rapporteur on the promotion and protection of human rights in the context of climate change* (26 July 2022) UN Doc. A/77/226, para. 57; Ojea and others, (n 315); Davidson and others, (n 315); Quentin Grafton, (n 311); Adger and others, (n 315); 55 members of the Vulnerable Twenty Group now identify as most vulnerable to climate impacts, see <www.v-20.org/members>; Vulnerable Twenty Group, 'Climate Vulnerable Economies Loss Report: 2000–2019' (2022), available at <https://www.v-20.org/resources/publications/climate-vulnerable-economies-loss-report>.
[319] Elyse N Mills, 'Implicating "Fisheries Justice" Movements in Food and Climate Politics' (2018) 39 Third World Quarterly 1270.
[320] Regulation (EU no. 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, emending Council Regulations (EC) No 1954/2003 and EC No 1224/2009 and

guarantee for states for stability in quota allocation,[321] though how this guarantee can be maintained in the face of species redistribution will prove a legislative challenge in the future. As explained in the mackerel example above (section 4.3), Iceland was (and remains) a beneficiary of utilising zonal attachment, so changing or eliminating this approach in multilateral fisheries management may prove challenging when some coastal States are reaping the fishery benefits from climate change. Unless an updated catch or effort system is implemented to follow changes in stock distribution, it is likely that conflicts between States over fisheries will worsen.[322] Pinsky and others, note that shifting fisheries drive conflicts between States that would otherwise normally cooperate:

> [A] shifting fish stock exacerbates existing fisheries challenges because it contravenes the 'clear boundaries' principle for sustainable governance of common pool resources, eroding incentives for conservation when new free riders, having no agreed-upon responsibilities for shared conservation and management, gain access to a resource. Stock shifts can incentivize regional overharvesting as actors scramble to exploit a perceived disappearing resource. A stock that upon moving straddles national boundaries may find itself in "double jeopardy", exposed to unsustainable competitive harvesting.[323]

[REDACTED]

Figure 1.1 The number of EEZs containing new transboundary stocks is expected to increase by 2100. [324]

[REDACTED]

Figure 1.2 The number of species shifting out of each EEZ by 2100 under IPCC RCP 4.5 (**a**) and RCP 8.5 (**b**).[325]

To prevent disputes over transboundary marine living resources: 'Shifting distributions of fish stocks may require negotiation or renegotiation of stock sharing agreements between

repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC. OJ 2013 L 354/22-61.

[321] José Manuel Sobrino and Marta Sobrido, 'The Common Fisheries Policy: A Difficult Compromise Between Relative Stability and the Discard Ban' in Gemma Andreone (ed), *The Future of the Law of the Sea: Bridging Gaps Between National, Individual and Common Interests* (Springer International Publishing 2017) 30.

[322] Spijkers and others, (n 7).

[323] ibid.

[324] Figure reproduced from Pinsky and others, (n 6).

[325] Figure reproduced from Kimberly L Oremus and others, 'Governance Challenges for Tropical Nations Losing Fish Species Due to Climate Change' (2020) 3 Nature Sustainability 277.

countries with fishing interests in these stocks.'[326] If reallocation of quota through negotiation fails, a dispute or conflict is likely to occur - this could have severe consequences for the stock exploited and for the livelihoods of those who exploit the stock. Considering the dire state of global fisheries,[327] overexploitation brought about by 'climate opportunism' and so-called climate 'maladaptation',[328] could be disastrous for global fish populations and livelihoods of fishers if not regulated adequately. To avoid the potential ecological and political implications of this, international law applicable to fisheries must be adaptive and responsive for marine range shifts. The consensus in the literature is that this is presently not the case.[329] Notably, fisheries systems are regulated in diverse ways, and Ojea and others point to nine climate resilience criteria within such systems, noting that rights-based fishery regimes are likely to yield more resilience benefits than open-access regimes.[330]

Turning to the open pelagic ecosystems on the high seas, or ABNJ, which are vast, dynamic and represent the largest habitable space for biodiversity.[331] On top of the climate regulatory role these ecosystems play through carbon cycling by plankton, fish and other marine creatures, pelagic ecosystems also produce over 80% of marine living resources utilised by humans in one way or another, and support almost all marine biodiversity directly or indirectly.[332] The impacts on these ecosystems are the same as described above, however, the sheer vast, open and remote nature of these ecosystems, in conjunction with the fact that the high seas are a 'commons' and do not fall under the jurisdiction of a single State make the addressing of these impacts a collective regulatory challenge (discussed in the subsequent chapters of this thesis). Further, as we will see, there is an ecological disconnect between the pelagic ecosystem and the legal conception of the high seas. However, '[t]hese two terms are not mutually exclusive; the ocean space constituting the high seas can be said to be a pelagic ecosystem, while not all pelagic ecosystems are high seas; around 64% of pelagic ecosystems

[326] Dana D Miller and others, 'Adaptation Strategies to Climate Change in Marine Systems' (2018) 24 Global Change Biology e1.
[327] FAO, (n 183); Boris Worm, 'Averting a Global Fisheries Disaster' (2016) 113 Proceedings of the National Academy of Sciences 4895; Daniel Pauly, Ray Hilborn and Trevor A Branch, 'Fisheries: Does Catch Reflect Abundance?' (2013) 494 Nature 303.
[328] Jon Barnett and Saffron O'Neill, 'Maladaptation' (2010) 20 Global Environmental Change 211; Sirkku Juhola and others, 'Redefining Maladaptation' (2016) 55 Environmental Science & Policy 135.
[329] Pinsky and others, (n 6); Guillermo Ortuño Crespo and others, 'High-Seas Fish Biodiversity is Slipping Through the Governance Net' (2019) 3 Nature Ecology & Evolution 1273.
[330] Ojea and others, (n 315).
[331] United Nations, (n 80) para. 1.
[332] Edward T Game and others, 'Pelagic Protected Areas: The Missing Dimension in Ocean Conservation' (2009) 24 Trends in Ecology & Evolution 360; Daniel Pauly and others, 'Towards Sustainability in World Fisheries' (2002) 418 Nature 689.

are outside of national jurisdiction and therefore constitute the high seas.'[333] Climate impacts are challenging to measure on the high seas primarily due to its sheer physical size. Moreover, climate impacts are difficult to comprehend, since '[w]hen compared with other components of the marine ecosystem, the impacts of human activities on pelagic systems may appear minimal'.[334] This is important considering that the high seas component of global fisheries catch has grown from 9% in 1950 to around 15%.[335] This 15% is estimated to be valued at around $16 billion US.[336] Pelagic species are in fact most vulnerable to ocean warming, as reflected in the well-known response of the commercially important Peruvian anchovy when there is an El Niño event in the Pacific Ocean off the coast of South America.[337] A recent study indicated that commercially important pelagic species such as yellowfin tuna and Pacific chub mackerel are particularly vulnerable to climate change and recommend that managers implement climate adaptation plans for those species.[338] The IPCC projects climate impacts on other internationally lucrative fish stocks:

> [W]hile temperate commercially-important tuna species (such as albacore, Atlantic and southern bluefin are projected to shift poleward and decrease in abundance in the tropics, some tropical species such as skipjack tuna are projected to remain abundant, but with changes in distribution patterns in low-latitude regions by the mid-21st century, with some models projecting subsequent decrease under RCP8.5.[339]

This point is in addition to the warning from the UN Special Rapporteur on climate change and human rights that shifting tuna stocks in the Pacific region has already led to dramatic economic losses for the coastal States in that region, for example.[340] Finally, the scientific literature expresses doubt on whether RFMO/As are prepared for dealing with issues such as shifts in fish stock distribution, or climate change generally.[341] How these different regulatory

[333] Mitchell Lennan, 'The High Seas' in Paul G Harris (ed), *Routledge Handbook of Marine Governance and Global Environmental Change* (Routledge 2022) 241; Game and others, ibid.
[334] Mark Dickey-Collas and others, 'Pelagic Habitat: Exploring the Concept of Good Environmental Status' (2017) 74 ICES Journal of Marine Science 2333; Lennan ibid., 243.
[335] Sarika Cullis-Suzuki and Daniel Pauly, 'Failing the High Seas: A Global Evaluation of Regional Fisheries Management Organizations' (2010) 34 Marine Policy 1036.
[336] U Rashid Sumaila and others, 'Winners and Losers in a World Where the High Seas Is Closed to Fishing' (2015) 5 Scientific Reports 8481.
[337] Arnaud Bertrand and others, 'From Small-Scale Habitat Loopholes to Decadal Cycles: A Habitat-Based Hypothesis Explaining Fluctuation in Pelagic Fish Populations off Peru' (2004) 5 Fish and Fisheries 296.
[338] Jorge E Ramos and others, 'Climate Vulnerability Assessment of Key Fishery Resources in the Northern Humboldt Current System' (2022) 12 Scientific Reports 4800.
[339] IPCC, (n 3) 505.
[340] UNGA, (n 2) para. 57.
[341] Pentz and Klenk, (n 14); Pentz and others, (n 14); Crespo and others, (n 329).

approaches exist, or are applied at the international level, and are suited to support resilience and adaptation will be explored throughout this thesis.

6. Conclusions

This chapter introduced the phenomenon of marine biodiversity redistribution under climate change. It is a product of a scientific literature review which demonstrated that there is scientific consensus that climate change is unequivocally altering the physical and chemical makeup of the oceans. The consequences of this as outlined by the IPCC include warming, acidification and deoxygenation and are understood to have multiple impacts on the oceans and the marine biodiversity within it. As well as impacting the role the ocean plays in regulating the global climate, known as the ocean/climate nexus. The chapter also found that fish function as important carbon sinks for regulation of the global climate, and that healthy fish populations and marine ecosystems help maintain the functioning of the ocean/climate nexus. However, based on current internationally agreed targets, the negative impacts of climate change are guaranteed to continue and worsen to some extent, which highlights the importance of the need to adapt to climate change.

This chapter has also introduced the problem of global biodiversity redistribution as one of the most pervasive impacts of climate change. In the marine environment, species dynamics are changing rapidly due to climate change. Specifically, climate change is prompting shifts in fish stocks towards the Poles and into deeper waters. This causes several issues, including undermining conservation and management measures, conflict, inequity, issues with quota allocation, and governance gaps when fish move into areas where they are no longer regulated, and are at risk of overfishing by States seeking to take advantage of the shift. Importantly, the composition commercially important fish stocks within most coastal States' EEZs are expected to undergo some degree of change. Key problems identified included the assumption that fishing areas will remain predictable and static, based on historical location, that fisheries management tends to focus on target species, rather than ecological interactions and changes in productivity within an ecosystem, and that the efficacy of ABMTs are under threat due to shifting stocks. In discussing the challenges that climate change poses to the effective conservation and management of fisheries, the chapter also noted based on the scientific literature that these problems are acute on the high seas, and that RFMOs appear by-and-large unprepared to adapt to shifting fish stocks. This indicates that the international law

and governance structure for the regulation of marine capture fisheries is generally unprepared for species on the move.[342]

However, despite this wealth of ever-growing scientific literature showcased in this chapter indicating that climate-driven shifts of marine species distribution represent an enormous global governance issue, legal scholarly attention to addressing the issues identified above is lagging considerably as identified in the introduction of this thesis. This appears to be due to a failure to engage wholeheartedly with the scientific research on this topic. Another key gap identified is the lack of a systemic approach when interpreting obligations under international fisheries law considering more recent environmental norms. The chapter has shown that there is a marked need to adapt international fisheries management to the impacts of climate change, and as such the international legal framework applicable to fisheries must be able to create the enabling conditions for this adaptation through management and conservation practices. Considering the impacts outlined in this chapter, the research question of the thesis remains the same, and asks 'to what extent do States have an international legal obligation to adapt international fisheries management and conservation to the effects of climate change?'.

This chapter has established the factual background from which the legal analysis to be undertaken in the rest of the thesis. Subsequent chapters have a legal focus but will refer to the detailed findings from this chapter throughout. The next chapter analyses the international legal framework as it applies to fisheries and marine biodiversity places an obligation on States to adapt their fisheries management practices to the effects of climate change.

[342] Pinsky and others, (n 6).

CHAPTER TWO: The International Legal Framework

Obligations under International Fisheries Law to Adapt to Climate Change

[REDACTED]

‘Marine species do not wait for lawyers or policy makers before shifting distribution.’[343]

[343] Figure reproduced from: Scheffers and Pecl, (n 34).

1. Introduction

Chapter one outlined the uncertainties and regulatory challenges that the effects of climate change causes in the marine environment, especially regarding the conservation and management of marine biodiversity and fisheries. It indicated that climate change causes ocean warming, acidification, and deoxygenation. This negatively impacts the ocean/climate nexus, and in many cases, is causing redistribution of several marine species Poleward or into deeper waters. This means that species are moving across traditionally static jurisdictional and managerial boundaries, changing the ecological composition within States' EEZs, causing complications for their conservation and management. These complications include, for example, quota allocations and designation of conservation areas (i.e., MPAs and ABMTs), as well as breakdowns in cooperation which lead to conflict and overexploitation of fish stocks and other marine living resources. The chapter concluded, based on a review of the scientific literature, that there is a marked need to adapt fisheries management and conservation practices to the impacts of climate change. Adaptive management practices must respond to shifts in the range of marine species. The findings of the chapter also indicated that scientific literature has questioned the role of international law in facilitating this adaptation, as well as the certainty and efficacy of international law in this context. Indeed, one study cited throughout the chapter argued that 'the current legal framework for the international regulation of fisheries does not directly account for fluctuating or changing distributions.'[344] Such a statement, in combination with the conclusions of chapter one, prompts further investigation from an international legal perspective.

This chapter seeks to test the above assumption that the applicable international legal framework is inadequate. It will do so through critical and original analysis of the international legal framework applicable to fisheries, understood as "international fisheries law" based on the findings of chapter one. Considering the apparent need for the implementation of adaptive fisheries management practices by States in response to climate change-induced species shifts, do States have an international legal obligation to do so? If so, what is the scope and content of this obligation? Is it a positive one? Or general? What international legal principles are applicable and in which instruments are they found? Strictly in international fisheries law, or elsewhere? To that end, the chapter seeks to clarify what obligations States have under

[344] Pinsky and others, (n 6).

international fisheries law to adapt their fisheries management and conservation practices to the effects of climate change, particularly shifting fish stocks.

The fact that these questions arise demonstrate the disruptive nature of climate change.[345] The impacts of climate change disrupt the ocean governance framework, and present unprecedented challenges to the stability, predictability, and general efficacy of the framework for the regulation of the ocean. Since the issues and challenges brought about by climate change are vast and complex, it is apparent that no single legal instrument or approach will be able to respond in an adequate manner. Indeed, it has been argued that an integrated approach to implementing existing legal frameworks is necessary to respond to the challenges of climate change and to achieve transformative change in ocean governance.[346] The case for an integrated approach through systemic integration as a method of treaty interpretation was made in the introduction of this thesis and will be followed in this chapter and throughout the rest of the thesis.

This chapter takes the following plan. Section 2 introduces and critically analyses the the legal framework of conventional international fisheries law. This includes fisheries obligations in international legal instruments (i.e., UNCLOS and UNFSA), as well as institutions and their roles, including the FAO and RFMO/As. This critical analysis assesses the limits of the framework and its institutions *vis-à-vis* the impacts of climate change outlined in chapter one. Following this analysis, the chapter continues to strengthen the case made from the outset of the thesis for the need for an integrated approach to adequately respond to the regulatory challenges brought about by climate change, particularly species redistribution across jurisdictions and conservation areas. In section 3, key principles and obligations are critically analysed in the context of marine species redistribution. This is done in the form of horizontal (non-hierarchical) obligations and principles, found within several multilateral treaties and agreements rather than a vertical treaty-by-treaty presentation. This analysis is undertaken to argue that the international legal system as it stands exists as an interacting framework and should be applied to the problems described in chapter one in an integrated manner. With the caveat that international climate change law and the actual and potential

[345] Elizabeth Fisher, Eloise Scotford and Emily Barritt, 'The Legally Disruptive Nature of Climate Change' (2017) 80 The Modern Law Review 173.
[346] Erinosho and others (n 15); Lennan, (n 27).

extent to which that regime integrates the ocean and fisheries receives a dedicated chapter within this thesis (chapter 3), before concluding in section 4.

2. International Fisheries Law

Global marine capture fisheries are subject to the international legal framework for the oceans, specifically, the domain or 'rule complex' understood as international fisheries law.[347] This legal framework prescribes rights, duties and obligations on States, as well as standards and institutional arrangements for managing, conserving and developing States' marine capture fisheries within and beyond national jurisdiction – as well as providing a framework for the peaceful settlement of disputes if and when they arise.[348] This framework is a complex and non-hierarchical web of 'hard' and 'soft' legal instruments and policies which has evolved and adapted over time to new challenges and issues. International fisheries law has its base in UNCLOS, which represents a codification of customary international law concerning the activities of States at sea.[349]

The fisheries obligations found in UNCLOS are supplemented by the UNFSA and a suite of other multilateral instruments developed under the United Nations system.[350] This includes a number of binding and non-binding instruments which have been adopted under the auspices of FAO, and components of UNGA Resolutions, both may concern specific regions, geographical areas, or subjects.[351] These supplementary instruments promote the progressive implementation of the fisheries provisions of UNCLOS and UNFSA through 'subtle evolutionary changes'.[352] On that front, the scope and content of international fisheries law is also informed by MEAs, including those regulating the conservation or protection of specific species, or biodiversity as a whole (discussed in section 3).[353] This approach facilitates progressive development of standards for the management and conservation of international fish stocks and marine biodiversity. However, the explicit inclusion of climate issues and the integration of international climate law within international fisheries law is so far rather limited. This is an issue which this thesis seeks to address in the context of climate adaptation.

[347] See generally Caddell and Molenaar, (n 16).
[348] ibid., 3–10.
[349] The customary status of UNCLOS is clarified further in the next section (2.1).
[350] Caddell and Molenaar, (n 16) 3-10.
[351] See, for example (nn 19–20).
[352] Boyle, (n 66) 572–574.
[353] See (nn 21–22).

Moreover, it is apparent that obligations at the regional, national, and local level become increasingly complex which makes effective regulation of the marine environment in time of global environmental change even more challenging.[354]

One can argue that international fisheries law is exemplar of Fisher's theory of environmental law as 'hot' law.[355] It is a legal field where multilaterally agreed frameworks are applied to facts in a constant state of flux and are influenced by external non-legal actors and forces. This is, as demonstrated in chapter one, is further disrupted by the effects of climate change.[356] Having outlined the climate impacts on the ocean and the consequential regulatory challenges for 'international' fisheries, and shared fish stocks – that is to say, fisheries exploited between the jurisdiction of two or more States, between one or more States and the high seas or ABNJ, and fisheries found exclusively on the high seas.[357] On that basis, this section seeks to assess the extent to which international fisheries law prescribes on States an international legal obligation to adapt their fisheries conservation and management practices in response to climate change, particularly the challenges associated with shifting fish stocks outlined above. To achieve this, this section first appraises the rights duties and obligations under international fisheries law (section 2.1), and institutional arrangements including RFMO/As, UNGA, and FAO (section 2.2), before concluding (section 2.3). It is relevant to add here that while international fisheries law also encompasses the dispute settlement mechanism under UNCLOS Part XV,[358] it is beyond the scope of this thesis to address questions of international dispute settlement and shifting fish stocks.[359]

[354] For an illustration of this complexity, see Suzanne J Boyes and Michael Elliott, 'Marine Legislation – The Ultimate "Horrendogram": International Law, European Directives & National Implementation' (2014) 86 Marine Pollution Bulletin 39.
[355] Elizabeth Fisher, 'Environmental Law as "Hot" Law' (2013) 25 Journal of Environmental Law 347.
[356] ibid.; See also, Fisher, Scotford and Barritt, (n 345).
[357] There is no consistent use of the term 'shared stocks' in the literature, and this term does not appear in any legally-binding international fisheries instrument, however this term broadly encompasses any stock which may, spend the whole or part of its life on the high seas. This is reflected in FAO's Code of Conduct for Responsible Fisheries (FAO 1995) para. 7.1.3. It is also worth pointing out here that fish stocks found exclusively on the high seas (so-called 'discrete' stocks) make up less than 1% of commercial fisheries at present.
[358] Although with the rather key exception that fisheries disputes in the EEZ are excluded from compulsory dispute settlement under UNCLOS Art. 297(3).
[359] On fisheries dispute settlement under Part XV of UNCLOS, see Andrew Serdy, 'Managing Transboundary Fish Stocks for Sustainability' in Øystein Jensen, *The Development of the Law of the Sea Convention* (Edward Elgar Publishing 2020) 104–138; P Chandrasekhara Rao and Philippe Gautier, *The International Tribunal for the Law of the Sea: Law, Practice and Procedure* (Edward Elgar Publishing 2018) 76–168.

2.1 Rights, Duties and Obligations

Modern international fisheries law has its foundational basis in customary international law as codified in UNCLOS. This sets out the legal framework for international ocean governance and establishes the rights, duties and obligations of States relating to all (if not most) activities that occur at sea, including fishing and fishing related activities. UNCLOS outlines the rights and duties of States whose nationals engage in such activities in waters both within and beyond national jurisdiction. This includes the obligations of States whose vessels engage in fishing or whose waters host "foreign" fishing vessels from other States. These obligations apply to all fisheries equally including subsistence or small-scale fisheries, commercial, and recreational fisheries.

Though 163 of existing United Nations Member States are Party to UNCLOS, there are a minority of non-Party States including the United States, Colombia, Israel, Peru, Turkey and Venezuela.[360] Despite the small number of non-Parties, UNCLOS codifies customary international law relating to States' activities at sea. Customary international law is understood to arise from evidence of State practice and *opinio juris*.[361] This means that the majority of UNCLOS provisions (including those relating to fisheries) are applicable to States whether they are party to UNCLOS or not.[362] This understanding that customary international law as codified in UNCLOS would constitute applicable law used by international courts and tribunals has been expressed, for instance, in a maritime boundary disputes involving States that are not party to UNCLOS.[363] Furthermore, with respect to the United States as a non-party to UNCLOS, it is important to note that the United States is party to the UNFSA, an implementing agreement to UNCLOS, that sets more stringent conservation and management measures standards than the Convention.

[360] See United Nations Treaty Collection, 'Parties to the United Nations Convention on the Law of the Sea' no date, available at: <https://treaties.un.org/pages/ViewDetailsIII.aspx?src=TREATY&mtdsg_no=XXI-6&chapter=21&Temp=mtdsg3&clang=_en>.
[361] Statute of the International Court of Justice, 18 April 1946, USTS 993, Art. 38(b): 'Evidence of a general practice accepted as law'.
[362] See Tullio Treves, 'UNCLOS and Non-Party States before the International Court of Justice' in Carlos Espósito, and others (eds), *Ocean Law and Policy: 20 Years under UNCLOS* (Brill 2016) 367–378.
[363] See, for example: *Case Concerning Maritime Delimitation and Territorial Questions between Qatar and Bahrain (Qatar v. Bahrain)*, Judgment, ICJ Reports 2001, 40, para. 167; *Territorial and Maritime Dispute (Nicaragua v. Colombia)*, Judgment, ICJ Reports 2012, 624, paras. 114–118; *Maritime Dispute (Peru v. Chile)*, Judgment, ICJ Reports 2014, 3, para. 178.

The scope of the Convention itself is vast, was negotiated by consensus and as a package deal. UNCLOS prevails over inconsistent international agreements unless otherwise stated,[364] is difficult to amend,[365] and prohibits reservations.[366] In that respect, the Convention represents a 'legal order for the seas'[367] or a 'constitution for the oceans'[368] with the objective *inter alia* to promote 'the equitable and efficient utilization of their resources, the conservation of their living resources, and the study, protection and preservation of the marine environment'.[369] UNCLOS is referred to either explicitly or implicitly by the other instruments covered in this chapter. Importantly, other instruments within this chapter must be interpreted and understood through UNCLOS. It is a 'living' constitutional instrument with a demonstrated capacity to evolve when faced with new challenges,[370] such as the inceptions of new technologies including in fisheries such as the proliferation of particular types of fishing gears.

In coherence with customary international law, UNCLOS delineates maritime spatial zones and the rights, duties, and obligations on States within them. These zones are not ecologically representative nor are the boundaries drawn by the Convention respected by fish or other marine species.[371] UNCLOS outlines the rights, duties, and obligations of States with respect to fishing in their EEZs (Part V) and on the high seas (Part VII). The 'broadly drawn and lacking in precision'[372] fishery provisions of UNCLOS are supplemented, clarified and modernised by the UNFSA which introduce key principles which apply to maritime zones both within and beyond national jurisdiction, while the remaining provisions apply exclusively to the high seas or ABNJ.[373] Considering the findings of chapter 1, particularly that stocks are shifting or are predicting to shift in or out of the EEZ of one coastal State and into that of

[364] UNCLOS, Art. 311; See also Boyle, (n 55).
[365] ibid., Art. 312: The two present exceptions are the two implementing agreements to the Convention which did not come about through the Art. 312 amendment procedure. See Part XI Implementation Agreement and UNFSA.
[366] UNCLOS, Art. 309.
[367] ibid., Preamble.
[368] Tommy Koh, 'A Constitution for the Oceans' in Tommy Koh, *Building a New Legal Order for the Oceans* (NUS Press 2019) 85.
[369] UNCLOS, Preamble.
[370] See Jill Barrett, 'The UN Convention on the Law of the Sea: A "Living" Treaty?', in Jill Barrett and Richard Barnes (eds), *Law of the Sea: UNCLOS as a Living Treaty* (British Institute of International and Comparative Law, 2016) 1.
[371] See: Surabhi Ranganathan, 'Decolonization and International Law: Putting the Ocean on the Map' (2020) 23 Journal of the History of International Law 161; Surabhi Ranganathan, 'The Law of the Sea and Natural Resources' in Eyal Benvenisti and Georg Nolte (eds), *Community Interests Across International Law* (Oxford University Press 2018). Note that the concept of the EEZ did not reflect customary international law at the time of the UNCLOS negotiations and was a new concept introduced during negotiation of the 1982 treaty.
[372] Robin Churchill, 'The Jurisprudence of the International Tribunal for the Law of the Sea Relating to Fisheries: Is There Much in the Net?' (2007) 22 The International Journal of Marine and Coastal Law 383, 387.
[373] UNFSA, Arts. 3, 5, 6, 7, and Part VII.

another, or between an EEZ and the highs seas; the international legal provisions applicable to fisheries conservation and management within these maritime zones requires careful analysis.

The following subsections critically analyse the key provisions in international fisheries law concerning the conservation and management of fish stocks. This analysis is undertaken with a view to establishing the extent to which they place an obligation on States to adapt their fisheries conservation and management to the consequences of shifting fish stocks because of climate change. This analysis is divided into the following subsections: fisheries obligations applicable to coastal States within the EEZ (section 2.1.2), fisheries obligations on the high seas (section 2.1.2) obligations under the specific provisions as they related to shared, straddling, and highly migratory fish stocks (section 2.1.3),[374] and obligations under the UNFSA (section 2.1.4).

2.1.1 Coastal State Obligations in the EEZ

UNCLOS prescribes to coastal States jurisdiction and sovereign access to all fisheries resources within their maritime areas. This includes, for example, the 12 nautical mile (nm) territorial sea, and the EEZ,[375] which extends from the outer limit of the territorial sea to no more than 200nm from the baseline.[376] In the EEZ, coastal States hold sovereign rights for the exploration and exploitation, conservation and management of marine living resources.[377] The obligations of the coastal State in its EEZ are the focus of this subsection.

Coastal States also hold the jurisdiction and responsibility for the protection and preservation of the marine environment within the EEZ.[378] UNCLOS prescribes obligations on coastal States for the conservation of living resources in the EEZ. Article 61(1) of UNCLOS obliges that the coastal State shall determine the total allowable catch (TAC) of marine living

[374] UNCLOS provisions on anadromous (i.e., salmon, and salmon-like species Art. 66) and catadromous (i.e., eels, Art. 67) are not discussed in this chapter or thesis for reasons of space.
[375] UNCLOS, Arts. 2(1), 49(1), 56(1)(a) and 77(4); See discussion on lack of imposition by UNCLOS any obligation on coastal States to impose conservation or management measures in maritime zones under *exclusive sovereignty* (i.e., the territorial sea) in Martin Tsamenyi and Quentin Hanich, 'Fisheries Jurisdiction under the Law of the Sea Convention: Rights and Obligations in Maritime Zones under the Sovereignty of Coastal States' (2012) 27 The International Journal of Marine and Coastal Law 783.
[376] UNCLOS, Art. 57.
[377] ibid., Art. 56.
[378] ibid., Art. 56(b)(iii); Part XII.

resources in its EEZ.[379] The coastal State must also, through proper conservation and management measures (CMMs) to ensure that living resources within its EEZ are not threatened with overexploitation.[380] To ensure this, the coastal State should take account of the best scientific evidence available to it, and cooperate with the relevant international organisations (for example FAO or RFMO/As).[381] It is in fact mandatory for coastal States to adopt CMMs for all living resources within their EEZs.[382] CMMs are characterised in international law by 'by reference to factual and scientific criteria'.[383] The terms 'conservation' and 'management' were clarified in the *M/V "Virginia G"* case as an exercise of sovereign rights by the coastal State to 'explore, exploit, conserve and manage the living resources of the [EEZ]', and determine access of foreign fishing vessels in the EEZ.[384] These CMMs are to be designed and implemented with the intention of maintaining or restoring populations of fish stocks at levels that can produce MSY and take into account a variety of factors including 'relevant environmental and economic factors, including the economic needs of coastal fishing communities and the special requirements of developing States' as well as 'fishing patterns, the interdependence of stocks, and any generally recommended international minimum standards, whether subregional regional or global'.[385] Coastal States must also take into consideration dependent species and consider the effects such measures may have on them,[386] as well as cooperate in the sharing of scientific information and fisheries statistics through relevant international organisations.[387]

Molenaar has assessed the above obligations in a climate change context, and concluded that the coastal State obligation to take into account the best available science in determining a TAC under UNCLOS Article 61 is a 'qualified obligation on climate change adaptation', whereas the obligation to take into account relevant environmental factors in designing and implementing CMMs does not include climate change since the drafters of UNCLOS were perhaps unaware of climate change and its impacts at the time.[388] The first

[379] UNCLOS, Art. 61(1).
[380] ibid., Art. 61(2).
[381] ibid., Art. 61(2); Discussed below.
[382] ibid.; *Request for an Advisory Opinion Submitted by the Sub-Regional Fisheries Commission (SRFC)*, Advisory Opinion, (2015), ITLOS Reports 2015, 4, para. 96 (*Fisheries Advisory Opinion*).
[383] *Fisheries Jurisdiction* (*Spain v. Canada*), Judgment ICJ Reports 1998, 432, para. 70.
[384] *M/V "Virginia G"* (*Panama/Guinea-Bissau*), Judgment, ITLOS Reports 2004, paras. 212–213; *Fisheries Advisory Opinion* para. 98.
[385] UNCLOS, Art. 61(3).
[386] ibid., Art. 61(4).
[387] ibid., Art. 61(5).
[388] Molenaar, (n 32) 271–272.

point is agreeable, and receives broader attention in this chapter in section 3.3. The second point however requires deeper analysis here vis-à-vis the findings of chapter one. First, UNCLOS is an evolutionary instrument and must be interpreted as such,[389] and considering the impacts of climate change and their effects on fish stocks outlined in the conclusions of chapter 1, both climate change and its effects may undermine the objective of this provision and the Convention as a whole. Second, the obligation to that States must take into account any 'any generally recommended international minimum standards' when establishing CMMs in Article 61(3) supports the argument for evolutionary and integrated interpretation made in this thesis. There are only two instances of the term 'generally recommended international minimum standards' found in UNCLOS, the second is in Article 119(1)(a) which concerns conservation of the living resources of the high seas. This provision shares identical wording to Article 61(3) and is discussed in section 2.1.2. However, the formulation of Article 61(3) follows the so-called rule of reference or renvoi formula found in other provisions of UNCLOS, which use the more restrictive term 'generally accepted' with regards to international rules, standards or regulations.[390] This indicates a higher threshold restricted to, for example, international standards 'established through the competent international organization' or 'general diplomatic conference'[391] which indicates instruments with legally binding force or formal negotiated decisions by a Parties to a treaty to promote that agreement's objectives specific to the subject of the relevant UNCLOS provision. The deviation in Articles 61(3) from 'generally accepted' to 'generally recommended', has been argued to 'lower [the] threshold' and provide the coastal State with greater discretion as to which standards to take into account beyond the more restrictive wording found in other provisions of UNCLOS.[392] This broader scope opens the door to include a suite of formally binding and non-binding instruments that could be considered as an international standard under Article 61(3). This begs the question of the precise meaning of an international standard for the purposes of this provision. The wording of Article 61(3) is 'broad enough to cover a wide variety of fisheries standards adopted at the international level'.[393] This includes instruments adopted under the FAO's Committee on

[389] See Barrett, (n 370); Boyle, (n 55).
[390] See, for example, UNCLOS Arts. 21(2), 21(4), 39(2)(a–b), 41(3), 53(8), 60(3), 60(5–6), 94(2)(a), 94(2(5), 211(2), 211(5), 211(6)(c), 226, 271; see also *Fisheries Advisory Opinion* Separate Opinion of Judge Paik, ITLOS Reports 2015, 102, paras. 23–27.
[391] See for example, UNCLOS, Arts. 60 and 212, respectively.
[392] Lan Ngoc Nguyen, 'Expanding the Environmental Regulatory Scope of UNCLOS Through the Rule of Reference: Potentials and Limits' (2021) 52 Ocean Development & International Law 419, 440.
[393] James Harrison and Elisa Morgera, 'Article 61 - Conservation of the Living Resources' 480, in Alexander Proelß, (n 82) 487–488.

Fisheries (discussed in section 2.2.3),[394] including "soft law" instruments such as the FAO's Code of Conduct for Responsible Fisheries (the Code),[395] and the Deep-Sea Fisheries Guidelines.[396] Despite the formally non-binding character of these instruments, a systemic interpretation of Article 61(3) indicates that they are considered mandatory standards for determining CMMs. Beyond the FAO, generally recommended international minimum standards adopted by regional fisheries bodies are applicable here as well as components of UNGA resolutions on oceans and law of the sea and sustainable fisheries. Generally recommended international minimum standards also include recommendations adopted by Conference of the Parties (COPs) to MEAs to clarify obligations under their respective treaties. This includes a whole range of decisions adopted by the Parties to the CBD, which for example, refer to integration of 'climate-change related aspects of marine and coastal biodiversity' in to national adaptation programmes and the importance of marine biodiversity in addressing climate adaptation (discussed in section 3).[397] Moreover, another consequence of the use of 'generally recommended' standards is that may come from any relevant source, including an intergovernmental fisheries science organisation such as ICES (see chapter 1, section 3.1). However, while the climate change regime lays out general obligations on climate change mitigation and adaptation, and have clarified these obligations under successive COP decisions, these have not as yet, and are highly unlikely to, produce generally recommended international minimum standards with regards to fisheries for the purpose of interpreting Article 61(3), despite the fact that the climate regime is indeed relevant for international fisheries law as will be further discussed in chapter 3. Third, although fishing patterns and interdependence of stocks are not explicitly listed as an environmental or economic factor, as chapter one clarified, spatial and temporal patterns of fishing activity have in many cases changed due to climate change (see chapter 1, sections 4.2 and 4.2 on lobster and mackerel fisheries), as have the distribution of species on which some commercial stocks depend (see capelin example in chapter 1, section 3.1). Therefore, despite the discretion of the coastal State to decide which factors should be taken in to account, chapter one has demonstrated that climate change impacts several if not all of the factors provided in the non-exhaustive list under in Article 62(3). While this may not place a hard obligation on States to adapt to climate change *per se*, the effects of climate change are having an effect on the list of factors in Article 62(3).

[394] See Harrison, (n 20) 225.
[395] FAO, (n 357); discussed in detail in section 2.2.3.
[396] FAO, *International Guidelines for the Management of Deep-Sea Fisheries in the High Seas* (FAO 2008).
[397] Harrison and Morgera, (n 393) 487–488; CBD, Decision X/29, paras. 7–9 and 77; See also UNGA, *Oceans and the law of the sea* (7 December 2020) UN Doc. A/RES/65/37, 3 and para. 130.

Considering the fact that climate change and its effects are to continue to worsen, and with developments in the climate regime discussed in chapter 3, it may become increasingly challenging for a State to argue against considering a climate change as a factor in determining measures for the conservation of living resources in the EEZ.

As well as outlining obligations for the conservation of marine living resources in the EEZ, UNCLOS also prescribes obligations on coastal States regarding their utilisation. Without prejudice to the obligations outlined and analysed in the above paragraphs, coastal States have a positive obligation to promote the objective of 'optimum utilisation' of the living resources within its EEZ.[398] Coastal States are obliged to determine their capacity to harvest living resources within the EEZ, and in the case of a surplus, grant access to that surplus to other States.[399] In granting access to vessels from other States, coastal States are provided with a non-exhaustive and non-hierarchical list of factors to take into account. One factor that could be relevant for a coastal State is the granting of access to vessels from States who had habitually fished a stock which has shifted in whole or part into its EEZ as a climate adaptive measure is including 'the need to minimize economic dislocation of States whose nationals have habitually fished in the zone or which have made substantial efforts in research and identification of stocks'.[400] The *South China Sea* Arbitral Tribunal confirmed that in the context of traditional fishing rights, including this factor in deciding to grant access is not obligatory under UNCLOS, though continuing to grant access to fish in the EEZ through national legislation, bilateral fisheries access agreements or through RFMOs would be 'commendable'.[401] The potential success of this argument for a coastal State who wishes to maintain access to a stock that has shifted out of its EEZ and in to another has been explored by Caddell.[402] His analysis indicates that success would be limited by political factors, including that the State with the windfall may decide that there is not an available surplus (e.g., the mackerel example in chapter 1, section 4.3), and that States instead should pursue bi- or multilateral 'far-sighted and adjustable allocative agreements'.[403] The laws and regulations adopted by the coastal State for the conservation and management of fisheries in the EEZ can include *inter alia* 'determining

[398] UNCLOS, Art. 62(1).
[399] ibid., Art. 62(2).
[400] ibid., Art. 62(3).
[401] *The South China Sea Arbitration (The Republic of The Philippines v. The People's Republic of China)* Award (2016) PCA Case No. 2013-19, ICGJ 49 (*South China Sea Arbitration*) para. 804.
[402] Caddell, (n 31) 291–293.
[403] ibid.

which species can be caught'[404] and 'terms and conditions relating to joint ventures or other cooperative arrangements', which provide the flexibility for the coastal State to implement climate adaptive fishery management measures, but does not place on it an obligation to do so.[405] In line with the principle of having due regard to the rights and duties of other States,[406] coastal States are obliged to give due notice of conservation and management laws and regulations to nationals of other States fishing in its EEZ, and must consider their rights and interests in the process.[407] Moreover, coastal States hold the responsibility to ensure, through monitoring and enforcement, that fishing activities in their maritime zones by local and foreign vessels are in line with both national legislation and the Convention.[408] Overall, while UNCLOS does not prescribe specific obligations on coastal States to adapt fisheries management to climate change in their EEZs, they do so implicitly through reference to use of best available science and standards (including from relevant MEAs), and taking in to account relevant environmental factors. UNCLOS also provides the framework for which adaptive CMMs can be agreed and implemented nationally and agreed multi- or bilaterally. Having critically analysed the obligations in the EEZ with regards to fisheries and climate change, the next subsection turns to obligations on the high seas.

2.1.2 Obligations on the High Seas

Generally, the legal framework of the high seas has developed over time through an ad hoc and piecemeal approach, contains regulatory gaps, and difficulties with enforcement.[409] The legal regime for the conservation and management of fisheries on the high seas is a complex and fragmented one.[410] It too has regulatory gaps, as well as issues with coordination and coherence between the instruments and institutions which constitute this framework. Putting these general issues aside for the moment, this subsection will focus on State obligations on the high seas

[404] UNCLOS, Art. 62(4)(d).
[405] ibid., Art. 62(4)(j).
[406] ibid., Art. 56(2) (coastal State) and Art. 58(3) (flag State).
[407] ibid., Art. 62(5); *Chagos Marine Protected Area Arbitration (Mauritius v. United Kingdom)*, Award (2015), PCA Case No. 2011-03, paras. 519 and 535.
[408] *Fisheries Advisory Opinion*, para. 106.
[409] See, for example, Kristina M Gjerde, 'High Seas Fisheries Management under the Convention on the Law of the Sea' in David Freestone, Richard Barnes and David Ong (eds), *The Law of the Sea: Progress and Prospects* (Oxford University Press 2006) 281; Douglas Guilfoyle, 'The High Seas' in Donald Rothwell and others (eds), *The Oxford Handbook of the Law of the Sea* (Oxford University Press 2015) 203; Crespo and others, (n 329).
[410] Richard Barnes and Carmino Massarella, 'High seas fisheries' in Elisa Morgera and Kati Kulovesi (eds), *Research Handbook on International Law and Natural Resources* (Edward Elgar Publishing 2016) 369.

with regards to the conservation and management of fish stocks and other marine living resources.

UNCLOS prescribes the rights, duties and obligations of States and their nationals regarding activities undertaken on the high seas. Part VII of the convention is dedicated to the high seas and sets out the key applicable principles for conduct there. Article 86 of UNCLOS defines the high seas through negation, indicating that Part VII of the Convention applies to 'all parts of the sea that are not included in the exclusive economic zone, in the territorial sea or in the internal waters of a State, or in the archipelagic waters of an archipelagic State'.[411] The high seas are open to all States and no State may subject them to its sovereignty.[412] Indeed, 'the notions of the invalidity of claims of sovereignty of the high seas are inherent in the legal status of the high seas being open and free'.[413] This is a rule of customary international law as codified in UNCLOS and understood as 'a cornerstone of modern international law'.[414] The dominant legal principles on the high seas are exclusive flag State jurisdiction and freedom of use to all. There are six 'freedoms' on the high seas which include *inter alia* navigation, laying of submarine cables, construction of artificial islands and of course, fishing.[415] Exercising these freedoms is subject to conditions under UNCLOS, including the obligation of exercising due 'due regard' for the interests of other States on the high seas,[416] and the general obligation to protect and preserve the marine environment, which is discussed in section 3 below.

Prior to analysing the high seas fisheries provisions of the Convention, it is prudent to first understand the legal nature of the obligations of flag States on the high seas. All vessels flying the flag of a State are under the exclusive jurisdiction of that State whilst on the high seas.[417] UNCLOS requires flag States to establish a 'genuine link' with vessels flying their flag.[418] To do so, flag States must 'effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag'.[419] The International

[411] UNCLOS, Art. 86.
[412] ibid., Arts. 87 and 89.
[413] *M/V 'Norstar' (Panama v. Italy)* Judgment, ITLOS Reports 2019, para. 218.
[414] Robin R Churchill, A Vaughan Lowe and Amy Sander, *The Law of the Sea* (Fourth edition, Manchester University Press 2022) 373.
[415] UNCLOS, Art. 87(1); Some high seas freedoms (excluding fishing) apply in the EEZ, see UNCLOS, Art. 58.
[416] ibid., Art. 87(2).
[417] ibid., Art. 92(1).
[418] ibid., Art. 91; See also *M/V "Saiga" (No. 2) (Saint Vincent and the Grenadines v. Guinea),* Judgment, ITLOS Reports 1999, para. 83.
[419] UNCLOS, Art. 94.

Tribunal for the Law of the Sea (ITLOS) held that in a fisheries context, 'effective jurisdiction or control' involves the adoption of 'necessary administrative measures to ensure that fishing vessels flying its flag are not involved in activities which will undermine the flag States responsibilities under the Convention in respect of the conservation and management of marine living resources'[420] and the protection and preservation of the marine environment, which applies to all areas of the ocean regardless of jurisdiction.[421] Importantly, ITLOS elaborated that exercising effective jurisdiction or control under UNCLOS Article 94 is an obligation of due diligence.[422] The Tribunal clarified that in exercising this obligation a State must 'deploy adequate means, to exercise best possible efforts, to do the utmost,'[423] while the ICJ specified the meaning of due diligence in *Pulp Mills on the River Uruguay* to entail 'not only the adoption of appropriate rules and measures, but also a certain level of vigilance in their enforcement'.[424] However, the content of the obligation cannot 'easily be described in precise terms'[425] as the state of things may change over time – such as the location or population size of fish stocks – this leaves the obligation open to mutually supportive interpretation with other agreed rules or standards relevant to the conduct requiring due diligence, for example the legally binding FAO Compliance Agreement,[426] or soft law instruments such as the Code. Since the ITLOS' interpretation of the flag State's due diligence obligation in the EEZ referred to Article 94, it can be inferred that for the flag State, this obligation applies both on the high seas, or in the waters under a jurisdiction of another State.[427] The principle of flag State jurisdiction, in combination with the of freedom of fishing on the high seas has been described as 'a recipe for overfishing' unless both principles can be tempered through inter-State cooperation and adopt, implement and enforce CMMs for high seas fisheries.[428]

Section 2 of UNCLOS Part VII concerns itself with the conservation and management of living resources of the high seas. Article 116 reiterates all States' freedom to fish on the high seas, however this freedom is effectively limited since it is subject to existing treaty obligations,

[420] *Fisheries Advisory Opinion*, para. 119.
[421] See generally UNCLOS, Arts. 194 and 192; *Fisheries Advisory Opinion*, paras. 118–136; *South China Sea Arbitration*, para. 944.
[422] *Fisheries Advisory Opinion*, para. 127.
[423] *Seabed Advisory Opinion*, para. 110; see also *Fisheries Advisory Opinion*, para. 129; *South China Sea Arbitration*, para. 944.
[424] *Pulp Mills on the River Uruguay*, para. 197.
[425] *Seabed Advisory Opinion*, para. 117.
[426] See (n 19).
[427] Lene Korseberg, 'The Law-Making Effects of the FAO Deep-Sea Fisheries Guidelines' (2018) 67 International & Comparative Law Quarterly 801, 808.
[428] Churchill, Lowe and Sander, (n 414) 560.

including the provisions of the Convention itself, not least the duty to protect and preserve the marine environment,[429] as well as any rules of reference and soft law used in interpreting obligations under this provision.[430] The freedom to fish on the high seas is also qualified by the rights duties and interests of coastal States with regards to shared, straddling and highly migratory fish stocks (see immediate subsections below).[431] Subsequent provisions in Part VII, section 2 further constrain this freedom. Article 117 places a duty on all States to 'take, or to cooperate with other States in taking, such measures for their respective nationals as may be necessary for the conservation of the living resources of the high seas'.[432] It is unclear exactly what the measures may contain, but the ICJ has clarified that the taking of a necessary measures is an obligation involves both the adoption of CMMs, and their enforcement.[433] This point is also supported by the analysis given in the previous in the previous paragraph, since this is also a flag State obligation, one of due diligence and therefor open to evolutive interpretation.

States who exploit fisheries on the high seas have a general obligation to cooperate in their conservation and management.[434] This general obligation is operationalised in the Convention: 'States whose nationals exploit identical living resources, or different living resources in the same area, shall enter into negotiations with a view to taking the measures necessary for the conservation of the living resources concerned. They shall, as appropriate, cooperate to establish subregional or regional fisheries organizations to this end.'[435] Regarding the obligation to negotiate in UNCLOS Article 118, the ICJ has clarified that a State must 'enter into negotiations with a view to arriving at an agreement, and not merely to go through a formal process of negotiation', and these negotiations must be meaningful insofar as a State must be willing to compromise by shifting from its original position.[436] This is an obligation of conduct, rather than result, since the achievement of agreement is not a prerequisite.[437] The

[429] UNCLOS, Part XII; See Warwick Gullett and Quentin Hanich, *Rethinking High Seas Fishing Freedoms How High Seas Duties Are Catching Up* (Brill Nijhoff 2018).
[430] UNCLOS, Art. 116(a); VCLT, Art. 31(3)(a).
[431] ibid., Art. 116.
[432] ibid., Art. 117.
[433] *Fisheries Jurisdiction*, para. 84; See also Rosemary Rayfuse, 'Article 117' in Proelß and others, (n 82) 803, 809.
[434] UNCLOS, Art. 118.
[435] ibid.
[436] *North Sea Continental Shelf (Germany/Denmark; Germany/Netherlands)* Judgment, ICJ Reports 1969, paras. 85 and 87; See also UNCLOS, Art. 300 obliging States Parties to 'fulfil in good faith the obligations assumed under this Convention'.
[437] ibid; see for example, *Railway Traffic Between Lithuania and Poland*, Advisory Opinion of 1931 PCIJ Series AB No. 42 116; *Pulp Mills on the River Uruguay*, para. 150; *Application of the International Convention on the Elimination of All Forms of Racial Discrimination (Georgia v. Russian Federation)* Preliminary Objections Judgment, ICJ Reports 2011, paras. 157–161.

obligation to negotiate applies to all States involved 'including past exploiters and new entrants into any fishery',[438] and should be conducted taking into account the rights and interests of all Parties,[439] with the objective of achieving 'an equitable apportionment of the fishing resources based on the facts of the particular situation, and having regard to the interests of other States which have established fishing rights in the area' and that equitable solution must be 'derived from the applicable law'.[440] With the findings of chapter one in mind, the obligation to cooperate through negotiation can be informed by a changing factual situation – such as the location of fish stocks – and the ICJ's reference to applicable law is broad enough to allow integration of other relevant treaties (including the climate change regime - discussed in chapter 3) and soft law.

The final high seas fisheries provision analysed in this subsection is Article 119. This concerns the '[c]onservation and management of the living resources of the high seas' and is worded near-identically to Article 61(3), and so the majority of the substantial analysis in section 2.1.1 will not be repeated here but also applies to this provision. The key points to repeat for the context of the thesis is that States are obliged to take measures based on the best scientific evidence available to them to them and to take into account 'any generally recommended international minimum standards, whether subregional, regional or global'.[441] An important omission from Article 119 compared to Article 61(3) is no explicit reference to the obligation to ensure that fish stocks are not overexploited, 'though such an obligation is probably implicit in the general duty of conservation that permeates articles 117–119'.[442]

In closing this subsection, the conclusions are similar to those of section 2.1.1. This includes the obvious point that that UNCLOS do not provide specific obligations on States to adapt high seas fisheries management and conservation to climate change. However, States fishing on the high seas do have obligation to adopt and seek to negotiate CMMs, with other States fishing on the high seas, through reference to use of best available science, and generally recommended international minimum standards (including from FAO instruments and relevant MEAs) and taking into account relevant environmental factors. Since exercising these obligations is a flag State obligation and one of due diligence, the nature of that obligation is

[438] Rosemary Rayfuse, 'Article 118' in Proelß and others, (n 82) 817, 826.
[439] *Fisheries Jurisdiction*, para. 73.
[440] ibid., para. 78.
[441] UNCLOS, Arts. 119(1)(a).
[442] Churchill, Lowe and Sander, (n 414) 562.

open to change over time and can be informed by the revelation of new facts and the development of new standards. Considering the findings of chapter one on the factual situation of climate change impacts on the ocean and fish stocks are shifting or predicted to shift, one can argue that the effects of climate change must be taken into account in exercising these obligations. However, very few fish stocks exist exclusively on the high seas (known as "discrete fish stocks"), and since the shifting of fish stocks across management jurisdictions, either between coastal States' EEZs or between EEZs and the high seas or vice versa (see chapter 1, figures 1.1 and 1.2), analysis of UNCLOS provisions on shared, straddling and highly migratory stocks are necessary, and Articles 117–119 must be understood in light of these. The applicable provisions are discussed in the next three sections.

2.1.3 Shared, Straddling and Highly Migratory Stocks

This subsection critically analyses the obligations of States Parties to UNCLOS concerning shared, straddling and highly migratory stocks – which are be referred to collectively in this thesis as "transboundary stocks". These are analysed in light of the findings of chapter one that, due to the effects of climate change, fish stocks are predicted to shift and become transboundary.

Shared stocks are addressed in UNCLOS Article 63(1) as '[s]tock or stocks of associated species occur[ing] within the [EEZs] of two or more coastal States'. For these stocks, additional measures to those of the coastal States whose EEZs these stocks occur in are required for effective conservation and management. UNCLOS obliges coastal States, to enter into negotiations either bilaterally or through a relevant regional management organisation in an attempt to agree on the necessary measures for the conservation and management of shared stocks in their respective EEZs.[443] In addition to the case law cited above, ITLOS has elaborated on the obligation to negotiate under Article 63, stating: 'the consultations should be meaningful in the sense that substantial effort should be made by all States concerned, with a view to adopting effective measures necessary to coordinate and ensure the conservation and development of shared stocks.'[444] This provision does not oblige States to come to an agreement, instead it is an obligation of conduct, indicated by the term 'seek'. This does

[443] ibid.
[444] *Fisheries Advisory Opinion*, para. 210.

indicate that should a fish stock shift its range in response to the effects of climate change, from the EEZ of one state and into another, it would become a shared stock under the Convention and this obligation would take effect.

Article 63(2) of UNCLOS concerns "straddling" stocks. Though does not use that term explicitly. This provision creates a similar obligation as UNCLOS 63(1) does for shared stocks. Such stocks are defined as 'the same stock or stocks of associated species [which] occur both within the exclusive economic zone and in an area beyond and adjacent to the zone'.[445] The term 'straddling stocks' appeared after the completion of UNCLOS, including in Agenda 21 in 1992,[446] and in UNFSA which deals with issues in the fisheries provisions of UNCLOS (discussed in the next subsection). While no minimum percentage of the stock being within or adjacent an EEZ is given for a stock to qualify as straddling, usage of the term straddling stocks 'seems to indicate that as long as there is some directed fishing effort at catching the stock on either side of the EEZ line, it is considered to be straddling.'[447] Since the unregulated fishing of a straddling stock in the high seas adjacent to the EEZ where that stock is also fished would likely have severe negative impacts on the stock, cooperative management is necessary. The Parties in question are obliged to seek to agree either directly or through an RFMO/A on CMMs for any straddling stock they exploit.[448] However, 'the agreement of necessary measures only concerns the area beyond the EEZ, as no cooperative arrangement is expressly required for the whole range of stocks. Thus, the discretion of coastal States to adopt [CMMs] within their own EEZ is not affected by this article.'[449] While the ITLOS held that it did not have jurisdiction in the *Fisheries Advisory Opinion* since it was not applicable to the EEZs of the Members of the Southern Regional Fisheries Commission.[450] This obligation to cooperate can be inferred a as due diligence obligation.

[445] UNCLOS, Art. 63(2).
[446] UN Conference on Environment and Development (UNCED), Report of the United Nations Conference on Environment and Development, UN Doc. A.CONF/151/26/REV.1 (Vol.1) (1992), 9 (Agenda 21), Ch. 17.45, 17.49.
[447] FAO, *The State of World Highly Migratory, Straddling and Other High Seas Fishery Resources and Associated Species* (FAO 2006), 4.
[448] UNCLOS Art. 63(2).
[449] James Harrison and Elisa Morgera, 'Article 63' in Proelß, (n 82) 506–513; See also David Attard, *The Exclusive Economic Zone in International Law* (Clarendon Press; Oxford University Press 1987) 184.
[450] *Fisheries Advisory Opinion*, paras. 200–201.

Species classified as highly migratory stocks are listed in Annex 1 of UNCLOS[451], and includes large, commercially valuable species such of tuna, marlin, and swordfish.[452] The species listed in Annex I are known to be capable of migrating long distances and as such are likely to occur in both EEZs of coastal States and on the high seas. However, the list is rather short, and unlikely to be updated with new species in the immediate future due to complications with updating the Convention.[453] As such its application is limited. Nevertheless, UNCLOS outlines the relevant obligations for conservation and management for highly migratory stocks:

> The coastal State and other States whose nationals fish in the region for the highly migratory species listed in Annex I shall cooperate directly or through appropriate international organizations with a view to ensuring conservation and promoting the objective of optimum utilization of such species throughout the region, both within and beyond the [EEZ]. In regions for which no appropriate international organization exists, the coastal State and other States whose nationals harvest these species in the region shall cooperate to establish such an organization and participate in its work.[454]

This provision creates a considerably stronger obligation to cooperate in comparison to Article 63 on shared and straddling stocks. Whilst States are not required to reach an agreement, they are obliged to negotiate in good faith on the management of highly migratory species, through the relevant organisation.[455] This includes setting an allocation of a TAC for a species inclusive of the catch harvested within the EEZ of the coastal States(s).[456] The ITLOS has also clarified that the CMMs in the EEZ 'should be consistent and compatible with those taken by the appropriate regional organization'.[457] Both Article 64(1) and Article 63(1) have been interpreted by the ITLOS as due diligence obligations and the analysis on due diligence presented in the previous subsection too applies here to the States involved.[458] Importantly, if an agreement cannot be reached, the coastal State is not prevented from exploiting species within its own EEZ.

[451] UNCLOS, Annex I.
[452] Annex I of UNCLOS also includes some species of marine mammal, but these are not be discussed here.
[453] Caddell, (n 31) 287–288.
[454] UNCLOS, Art. 64(1).
[455] *Fisheries Advisory Opinion*, para. 210; UNCLOS, Art. 300.
[456] Harrison and Morgera, (n 449) 514.
[457] *Fisheries Advisory Opinion*, Operative Clause, para 6.
[458] ibid., para. 210.

To close this subsection, it is obvious that the obligations under UNCLOS on transboundary fish stocks are general and rather imprecise. While there is no explicit obligation to adapt to climate change, there is general obligation to cooperate on the conservation and management of transboundary stocks with the relevant States. This has been clarified as a due diligence obligation, meaning the factors that need to be taken in to account – including the effects of climate change– in exercising this due diligence can evolve over time due to changing circumstances. However, there are no clear rules of reference contained in these provisions which limits their evolutive interpretation. The UNCLOS obligations on transboundary stocks do infer that should a stock become shared or straddling by shifting its location in response to climate change, States have an obligation to enter in to negotiations in good faith, however do not have to reach an agreement. Whereas obligations for highly migratory fish stocks are restricted to specific species and so would not apply to shifting fish stocks outside the list in UNCLOS Annex I. The UNFSA addresses several issues with provisions on transboundary stocks under UNCLOS. That agreement in addressed in the next subsection.

2.1.4 The United Nations Fish Stocks Agreement

UNFSA is a subsequent agreement for interpreting the provisions of UNCLOS that address high seas and transboundary fisheries. The adoption of UNFSA as a treaty in its own right sought to address the unclear nature of these provisions.[459] In this section, the obligations of UNFSA are critically analysed with the aim of clarifying the extent to which they place an obligation on States to adapt their fisheries management to climate change. It begins with a brief overview, analysis of the general principles of Article 5, the obligation to cooperate, the operation of RFMO/As, flag State obligations, the needs of developing States, and then concludes.

UNCLOS provisions on straddling and highly migratory fish stocks analysed above are further clarified, modernised and elaborated by UNFSA.[460] In terms of geographic scope of application, Articles 5 (general principles), 6 (precautionary approach) and 7 (compatible measures) are applicable both within and beyond national jurisdiction, and so apply directly to shared stocks in the EEZ, while the remaining provisions of UNFSA applies exclusively to the

[459] UNFSA, Art. 4.
[460] Highly migratory fish stocks are listed in Annex I of UNCLOS.

high seas/ABNJ.[461] This attempts to ensure that CMMs implemented on the high seas are consistent with CMMs in the EEZs of coastal States. UNFSA should be interpreted and applied consistently with UNCLOS,[462] and it requires the application of the precautionary approach to fisheries,[463] an EAF;[464] and the protection of marine biodiversity.[465] These three concepts are all relevant for climate change adaptation in fisheries and are discussed in greater detail and in the context of other MEAs in their own dedicated subsections in section 3 of this chapter. Moreover, instead of obliging that specific management measures are followed the power of the UNFSA rests in its laying out of overarching principles for RFMO/as, including on cooperation, establishment, function, participation, transparency and administrative matters.[466] UNFSA also contains provisions on enforcement and dispute settlement.[467]

The UNFSA lays out general overarching governance principles for the conservation and management of straddling and highly migratory fish stocks in Article 5. In giving effect to their duty to cooperate in line with the obligations in section 2.1.3 States are required to adopt measures to ensure the long-term sustainability of these stocks, ensuring that these measures are based on the best available science and accounts for fishing patters, interdependence of stocks and generally recommended international minimum standards, as well as apply the precautionary approach (discussed in section 3 below).[468] States are also obliged to assess fishing impacts, and the impacts of 'other human activities and environmental factors on target stocks and species belonging to the same ecosystems or associated with or dependent upon the target stocks' as well as protect biodiversity, collect and share data, and implement CMMs through monitoring, control and surveillance.[469] Aside from the inclusion of reference to the best available science and generally recommended international minimum standards, the importance of which have been analysed above, the requirement to assess environmental factors and to protect biodiversity can be interpreted to implicitly include the effects of climate change.

[461] UNFSA, Art. 3; Part VII.
[462] ibid., Art. 4.
[463] UNFSA, Art. 5(c); Application of the precautionary approach is laid out in UNFSA Art. 6 & Annex II; See also: Rio Declaration on Environment and Development, Concluded 13 June 1992, 31 ILM 874 Principle 15.
[464] ibid., Arts. 5(d-e).
[465] ibid., Art. 5 (g).
[466] ibid., Arts. 8–14.
[467] ibid., Arts. 18–23, 30–32.
[468] ibid, Art. 5(a–c).
[469] ibid, Art. 5(e–l).

The UNCLOS obligations to cooperate in exploiting straddling or highly migratory fish stocks,[470] are built upon by the provisions of the UNFSA, and highlighted as paramount in achieving effective management and conservation of such stocks, as such Parties are obliged to implement CMMs compatible with those of a neighbouring State or RFMO/As for straddling or highly migratory fish stocks.[471] The duty to cooperate is both 'individual and collective',[472] and 'ensures that each straddling and highly migratory fish stock is conserved and managed in its entirety'.[473] States with a real interest in the fishery must either cooperate bilaterally, or through establishment of RFMO/As, or join the existing relevant RFMO/A.[474] UNFSA stipulates that this is a key component of the obligation to cooperate:

> [w]here a subregional or regional fisheries management organization or arrangement has the competence to establish [CMMs] for particular straddling fish stocks or highly migratory stocks. States fishing for the stocks on the high seas and relevant coastal States shall give effect to their duty to cooperate by becoming members of such organization or participants in such arrangement, or by agreeing to apply the [CMMs].[475]

Guidance as to how RFMO/As are to operate are provided in Articles 8–12 of the UNFSA, including the competence of RFMO/As to establish binding CMMs, and how they will obtain scientific advice to inform those CMMs. Indeed, these guidance also provides a template for the establishment of new RFMO/As or other cooperative approaches to straddling, highly migratory, or discrete stocks.[476] Non-members of RFMO/As are prohibited from fishing for stocks in that RFMO/A's management area, unless they agree to follow the CMMs established by that organisation.[477] If a State does not agree to abide with that RFMO/A's CMMs 'it is not discharged from the obligation to cooperate, in accordance with the Convention and this Agreement, in the conservation and management of the relevant [shared] fish stocks'.[478]

[470] UNCLOS, Arts. 63(1), 64, 117–119.
[471] UNFSA, Art. 7.
[472] Rosemary Rayfuse, 'Regional fisheries management organizations' in Donald Rothwell and Tim Stephens (eds) *The Oxford Handbook on the Law of the Sea* (Oxford University Press 2017), 439, 440.
[473] Erik Molenaar, 'Non-Participation in the Fish Stocks Agreement: Status and Reasons' (2011) 26 The International Journal of Marine and Coastal Law 195, 201–202.
[474] Supported by the Code, Art. 7.1.3.
[475] UNFSA., Art. 8(3).
[476] James Harrison, 'Key challenges relating to the governance of regional fisheries' in Caddell and Molenaar (n 16) 79, 80–81.
[477] UNFSA, Art. 17(1).
[478] ibid., the role of the Global Environment Facility is discussed in Chapter 3.

The duties of States in ensuring compliance and enforcement with CMMs by vessels flying their flag are also outlined UNCLOS.[479] For a flag State to follow this obligation, it could prohibit fishing by vessels flying their flag in said RFMO/A management area. The duty of the flag State to exercise jurisdiction and control of vessels flying its flag was clarified by the ITLOS to include ensuring compliance with CMMs, and that this constitutes 'an integral element in the protection and preservation of the marine environment'.[480] Duties of the flag State are outlined in Article 18 of UNFSA and compliment those prescribed in UNCLOS.[481] A flag State is obliged to ensure vessels flying its flag comply with and do not undermine RFMO/A CMMs.[482] Flag States are responsible for transposing and implementing any RFMO/A CMMs into its national law (in accordance with its due diligence obligations outlined in UNCLOS).

In the context of climate change, the provisions of UNFSA Article 24 on recognition of the special requirements of developing States are particularly relevant. Article 24 requires States to 'give full recognition to the special requirements of developing States in relation to conservation and management of straddling fish stocks and highly migratory fish stocks and development of fisheries for such stocks' and requires States either directly, or through a non-exhaustive list of international organisations, including FAO and the Global Environment Facility.[483] It then requires States to take into account the special requirements of developing States when exercising the duty to cooperate, including:

> (a) the vulnerability of developing States which are dependent on the exploitation of living marine resources, including for meeting the nutritional requirements of their populations or parts thereof;
>
> (b) the need to avoid adverse impacts on, and ensure access to fisheries by, subsistence, small-scale and artisanal fishers and women fishworkers, as well as indigenous people in developing States, particularly small island developing States; and
>
> (c) the need to ensure that such measures do not result in transferring, directly or indirectly, a disproportionate burden of conservation action onto developing States.

[479] ibid., Arts. 19–23.
[480] *Fisheries Advisory Opinion*, paras. 116–120.
[481] UNFSA, Art. 18.
[482] ibid., Art. 18(1).
[483] ibid., Art. 24(1).

The language used here is similar to that found in the international legal framework applicable to climate change (see chapter 3) by way of reference to the needs and vulnerabilities of developing States, the use of human rights language by reference to nutritional requirements and to small-scale and artisanal fishers, indigenous peoples and small island developing States, as well as a need to avoid an (undefined) disproportionate burden on developing States. These provisions have been argued to reflect the principle of common but differentiated responsibilities most prominently found in international climate law,[484] since it acknowledges the fact that developing States may simply not have the resources to implement RFMO/As CMMs swiftly, enforce CMMs or prosecute infractions. They may also not have the immediate means to adapt their fisheries management to climate change or implement any RFMO/As CMMs that aim to do so. States are therefore obliged by way of Article 24(1) and Article 25 UNFSA to cooperate either directly or through regional, subregional or global (e.g., FAO) organisations to assist developing States in this context, including on improving conservation and management, stock assessment and monitoring control and surveillance measures.[485]

Finally, Annex I of UNFSA outlines the standard requirements for the collection and sharing of data for straddling and HM fish stocks.[486] Data on these stocks should be collected and compiled in a way that allows meaningful statistical analysis for the purposes of conservation and management of those fishery resources.[487] UNFSA also outlines key general principles to be considered when defining the parameters for collection, compilation and exchange of data from fishing operations of straddling and highly migratory fish stocks by flag States.

It is clear from the above that there is no explicit mention of climate change in UNFSA. This is interesting considering that instrument was negotiated during the 1992 United Nations Conference on Environment and Development,[488] after the finalisation of the negotiations of the UNFCCC. One can argue that this is a rather significant point, especially considering that RFMO/As constituted after entry in to force of the Agreement in 2001 adopt the phrasing of

[484] Hussain Sinan and others, 'Common but Differentiated Rights and Responsibilities in Tuna Fisheries Management' (2022) 23 Fish and Fisheries 202.
[485] UNFSA, Art. 25.
[486] ibid., Annex I.
[487] ibid., Art. 1(1).
[488] Agenda 21 (Annex II to the Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3 to 14 June 1992. UN Doc. A/CONF.151/26, paras. 17.49(e); Molenaar, (n 32) 272.

the UNFSA within their mandates. In fact, even the relatively new RFMO/As or regional fisheries bodies negotiated this decade mimic the UNFSA language, which may indeed be a contributing factor to their ability to integrate climate change into their mandates or decision making and has inhibited their effectiveness in this context. Solutions as to how RFMO/As have or could get around this issue are discussed in chapter 4.

Despite this omission, however, the UNFSA supplements the UNCLOS obligations on transboundary fish stocks through integration of principles from international environmental law, which are analysed in greater detail in section 3 of this chapter. It also clarifies the obligation to cooperate, indicating that it involves referring to the best available science and generally recommended international minimum standards, as well as assess environmental factors and protect biodiversity. These can be understood as evolutive due diligence obligations, and so are open to interpretation to include an obligation to take climate change impacts into account in fisheries management, including adapting to the climate change effects highlighted in chapter 1. The UNFSA clarifies further the obligation to cooperate to mean the joining or establishment of an RFMO/A for the conservation and management of straddling or highly migratory fish stocks, and as such any climate adaptive CMMs must be implemented through RFMO/As. The next subsection goes on to outline the key institutions found in international fisheries law.

2.2 Institutions in International Fisheries Law

In achieving the obligations analysed above, States make use of a number of institutions for both the international management and conservation of fisheries and for the development and evolutive interpretation of international fisheries law. This subsection analyses the role of these institutions. Specifically, RFMO/As (section 2.2.1),[489] the UNGA (section 2.2.2), and FAO (section 2.2.3) and the extent to which they play (or could play a role in the development of international fisheries law in the context of climate adaptation.

[489] Note that climate adaptation action taken by individual RFMO/As is analysed in chapter 4.

2.2.1 RFMO/As

As outlined above, States undertake international fisheries regulation unilaterally or through bi- and multi-lateral cooperation. UNCLOS and UNFSA envisage regional multilateral coordination on the management of fish stocks in areas of ocean beyond States' maritime boundaries, to achieve the principles of conservation and cooperation.[490] This coordination is achieved primarily through regional fisheries bodies. There are over 60 regional fisheries bodies in existence which have varying geographical and substantive mandates. Some have a purely advisory mandate and can only provide their members with advice, coordinating mechanisms that are not binding on their members. Those which have a management mandate, meaning that they have the competence to adopt binding management CMMs on their members are RFMO/As. RFMO/As are the intergovernmental bodies through which straddling and highly migratory fish stocks are managed within a set maritime area.[491] They are 'at the forefront of international efforts to achieve the conservation and sustainable utilisation of fish stocks'[492] achieving inter-State coordination through CMMs, for example, the catch allocation for fish stocks in their agreed maritime area.[493] The difference between an RFMFO and an RFMA is that an RFMO's are established with a formal organisation, administrated by a secretariat, whereas RFMAs are regional fisheries agreements where no formal organisation is established, but whose Parties do meet regularly to adopt and review CMMs.[494] As will be elaborated in chapter 4, there are eighteen RFMO/As around the world. However, RFMO/As are not without their problems.[495] First, some areas of the high seas remain unmanaged, for example there are gaps in high seas coverage due to *inter alia* political deadlock (e.g., in the Central Atlantic and Southern Indian Ocean). Second, an issue is that for some RFMO/As with a fixed geographical area face 'and an influx of additional species [lying] beyond their individual remits' due to climate change, which indicates that RFMO/As are unprepared for the consequences of shifting fish stocks highlighted in chapter 1.[496] Indeed, few management organisations have developed a clear posture on regulating new fisheries, or cooperative

[490] UNCLOS, Art. 117 & 118; UNFSA, Art. 8.
[491] See FAO, Regional Fisheries Body Map Viewer <https://www.fao.org/figis/geoserver/factsheets/rfbs.html>; Note that the The Commission for the Conservation of Southern Bluefin Tuna (CCSBT) is geographically non-specific.
[492] Harrison, (n 20) 226.
[493] See FAO, (n 491).
[494] Churchill, Lowe and Sander, (n 414) 575–582.
[495] See Rayfuse, (n 472).
[496] Pinsky and others, (n 6) 1190.

management between neighbouring organisations or States.[497] This indicates a challenge in terms of international fisheries regulation in the face of climate change. This lacuna could result in 'newly fished stocks to be heavily exploited before meaningful standards are developed.'[498] Third, other concerns include weak management, lack cross-organisation cooperation, and failure to elaborate on regulations for new fisheries - facilitating a loophole that allows for overfishing.[499] Fourth, there are criticisms over the limited application of the EAF by RFMOs 'including limited consideration of impacts on species not directly managed by the RFMOs.'[500] The regulations of RFMOs on "new and exploratory fisheries" including new species in the deep-sea and those species who may have arrived as a consequence of has recently been analysed by Caddell, who concluded that the vast majority of organisations were unprepared for this pervasive response of marine species and other issues brought about by climate change.[501] Further, RFMO/As have been criticised for their inability to successfully achieve sustainable management of transboundary fish stocks.[502] Indeed, regional marine management organisations, such as OSPAR, which lack the authority to address marine environmental issues in full have illustrated that ABMTs limited to sectoral issues may not always be fruitful.[503] Overall, RFMO/As appear by-and-large unprepared for dealing with issues such as shifts in fish stock distribution,[504] and other climate related impacts. For example, Rayfuse has indicted that, so far, ocean acidification and deoxygenation has received little to no attention in the reports of RFMO/A meetings and scientific bodies, and limited scientific discussion on RFMO/As addressing these issues and their impacts on fisheries.[505] The practice of RFMO/As and their responses to climate change receives dedicated attention in chapter 4 of this thesis, as such this subsection is primarily for illustrative and contextual purposes. The next subsection discusses the role of UNGA within the framework of international fisheries law and climate change adaptation.

[497] See Richard Caddell, 'Precautionary Management and the Development of Future Fishing Opportunities: The International Regulation of New and Exploratory Fisheries' (2018) 33 The International Journal of Marine and Coastal Law 199.
[498] Pinsky and others, (n 6); Caddell, ibid.
[499] Pinsky and others, ibid.
[500] ibid.
[501] Caddell, (n 497).
[502] Gjerde, (n 409).
[503] Richard Barnes, 'The Law of the Sea Convention and the Integrated Regulation of the Oceans' (2012) 27 The International Journal of Marine and Coastal Law 859.
[504] Rayfuse, (n 41) 247–245; Pentz and others, (n 14).
[505] Rosemary Rayfuse, 'Regional Fisheries Bodies and Ocean Acidification' in David VanderZwaag, Nilüfer Oral and Tim Stephens (eds), *Research Handbook on Ocean Acidification Law and Policy* (Edward Elgar Publishing 2021) 131–132.

2.2.2 The United Nations General Assembly

The UNGA discusses fisheries topics as part of its annual law of the sea debate and has 'had a practice of adopting a separate resolution on fisheries since 1989'.[506] These resolutions come in three forms: i) General 'oceans and law of the sea' resolutions; ii) Resolutions on sustainable fisheries; and iii) Subject-specific resolutions. UNGA resolutions on oceans and law of the sea and sustainable fisheries are adopted annually, while subject-specific resolutions have addressed a range of issues of international concern throughout the years, including use of large-scale pelagic drift nets,[507] fisheries bycatch and discards,[508] and unauthorized fishing in waters under national jurisdiction,[509] bottom fishing requirements,[510] implementation of the UNFSA, among other themes. Subject-specific fisheries resolutions are no longer adopted and instead the UNGA favours annual adoption of one oceans and the law of the sea (adopted with a vote) and one sustainable fisheries resolution (adopted without a vote) annually. While fisheries resolutions adopted by UNGA are not law-making instruments *per se*, instead they raise awareness of particular issues and encourage the relevant actors (e.g., States, fisheries bodies, FAO) to address them, and promote the progressive development of international fisheries law to adapt to new challenges.[511] As such they do carry normative force and legal weight as informing the fisheries conservation and management obligations under UNCLOS and UNFSA as generally recommended international minimum standards.[512]

[506] Harrison, (n 20) 201; For more detail on the normative impacts of UNGA Resolutions in international fisheries law, see Harrison, (n 20) 201–204.
[507] UNGA, *Large-scale pelagic driftnet fishing and its impact on the living and marine resources of the world's oceans and seas,* Resolution adopted by the General Assembly on December 22 1989 UN Doc. A/RES/44/225; UNGA, *Large-scale pelagic driftnet fishing and its impact on the living and marine resources of the world's oceans and seas,* Resolution adopted by the General Assembly on December 21 1990 UN Doc. A/RES/45/197; UNGA, *Large-scale pelagic driftnet fishing and its impact on the living and marine resources of the world's oceans and seas,* Resolution adopted by the General Assembly on December 20 1991 UN Doc. A/RES/46/215.
[508] UNGA, *Fisheries By-catch and discards and their impact on the sustainable use of the world's living marine resources,* Resolution adopted by the General Assembly on December 19 1994 UN Doc. A/RES/49/118.
[509] UNGA, *Unauthorized fishing in zones of national jurisdiction and its impact on the living marine resources of the world's oceans and seas,* Resolution adopted by the General Assembly on December 19, 1994 UN Doc. A/RES/49/116.
[510] UNGA, *Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments,* Resolution adopted by the General Assembly on 8 December 2006 UN Doc. A/RES/61/105 (2006), para. 83.
[511] Harrison, (n 20) 204.
[512] VCLT, Art. 31(3)(a).

Since 2008, UNGA resolutions have also requested States to act on the effects of climate change on international fisheries individually, and through RFMO/As.[513] Most recently, the 2021 UNGA resolution on sustainable fisheries makes explicit references to climate change adaptation in fisheries, and requests States to develop climate adaptive fisheries management strategies. The resolution recalls the Paris Agreement and its aim to strengthen the global response to climate change by increasing the ability to adapt to its effects, urged States either directly or through regional fisheries bodies 'to intensify efforts to assess and address, as appropriate, the impacts of global climate change and ocean acidification on the sustainability of fish stocks and the habitats that support them, in particularly the most affected ones', as a reference to impacts of climate change the resolution refers to the IPCC Special Report on Oceans and the Cryosphere, the content of which was outlined in chapter 1 of this thesis, and then goes on to note the importance of FAO's work on climate change, specifically on climate adaptation, resilience and mitigation measures.[514] This clearly indicates an awareness by the international community of the need for States and RFMO/As to adapt fisheries management and conservation to the effects of climate change to fulfil their UNCLOS and UNFSA obligations. This is further supported by the UNGAs request that:

> States and regional fisheries management organizations and arrangements, as appropriate, to assess the risks and potential adverse impacts of climate change with respect to fish stocks, consider them when establishing [CMMs] and identifying options to reduce risks and adverse impacts with respect to fisheries management and the health and resilience of marine ecosystems and enhance efforts to cooperate to collect, exchange and publish scientific and technical data and best practices related to the development and implementation of adaptation strategies, and to assist developing States in this regard, especially those that are particularly vulnerable to the adverse impacts of climate change.[515]

[513] See for example UNGA, *Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments,* Resolution adopted by the General Assembly on 5 December 2008 UN Doc. A/RES/63/112, Preamble and para. 3; UNGA, *Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments,* Resolution adopted by the General Assembly on 11 December 2018 UN Doc. A/RES/73/125, paras. 13, 183, 198.

[514] UNGA, *Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments,* Resolution adopted by the General Assembly on 9 December 2021 UN Doc. A/RES/76/71, Preamble and paras. 11–13.

[515] ibid., para. 15.

The resolution also encourages: 'States and relevant organizations and arrangements to assess and consider the impacts of climate change on fisheries and aquaculture sectors in their policies and planning, as appropriate, in order to identify effective adaptation strategies to reduce the vulnerability of these sectors to climate change'.[516] This should be undertaken by strengthening the science-policy interface to more effectively apply the ecosystem approach (discussed in section 3) to develop adaptive fisheries management strategies.[517] Additionally, States are called upon to account for climate change impacts in the management of deep-sea fisheries and vulnerable marine ecosystems.[518]

The point was made earlier in this chapter that the recommendations in UNGA resolutions act as tools for evolutive interpretation for the conservation and management of fisheries, and since sustainable fisheries resolutions are adopted without a vote, thereby representing consensus (notwithstanding any reservations that may have been made on adoption) on the generally accepted standards on the topic.[519] This considered, it can be argued that in order to fulfil their fisheries management and conservation obligations under UNCLOS and the UNFSA, States and regional fisheries bodies are required to adopt climate adaptive fisheries CMMs. In doing so, States are to cooperate, assess potential climate risks with respect to fish stocks, share scientific and technical data and best practices, with a view to identify and develop adaptation strategies and better implement the precautionary and ecosystem approach to fisheries. This notion is supported by previous UNGA resolutions on oceans and law of the sea.[520] Finally, decisions of the Resumed Review Conference on the Implementation of the UNFSA,[521] which serves to assess the effectiveness of UNFSA and its provisions and suggest ways to support and strengthen its provisions, have requested Parties to:

> Explore ways to incorporate the consideration of the adverse impacts of climate change and ocean acidification and the uncertainties regarding such impacts on fisheries, including in

[516] ibid., para. 16.
[517] ibid., para. 189.
[518] ibid., para. 204.
[519] See, *Whaling in the Antarctic*, paras. 46 and 83.
[520] UNGA, *Oceans and the law of the sea* Resolution adopted by the General Assembly on 5 December 2017 UN Doc. A/RES/72/73, para. 196.
[521] At the time of writing there are 91 Parties to UNFSA. See all Parties at the DOALOS *Chronological lists of ratifications of, accessions and successions to the Convention and the related Agreements*, online at: <https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXI-7&chapter=21&clang=_en>; Note that there are several non-parties to UNFSA in comparison to UNCLOS, for a detailed analysis and reasoning for possible reasons of non-participation, see Molenaar, (n 469).

> relation to migration patterns and productivity, in decision-making processes related to the adoption of [CMMs], in line with the precautionary approach.[522]

This clearly supports the notion that States are obliged to adapt their fisheries CMMs to the effects of climate change including the shifting distribution of fish stocks. Interestingly, however, apart from acknowledgement of the Paris Agreement and its role in advancing action on adaptation in the 2021 UNGA resolution on sustainable fisheries, States obligations under the climate regime are not mentioned, which indicates further integration is required on this front and is discussed in chapter 3 of this thesis.

Clearly, UNGA resolutions on the law of the sea, fisheries and the UNSFA review conference support climate adaptive fisheries management. The resolutions make use of similar language to FAO's Committee on Fisheries which in 2011 recommended that the impacts from climate change and ocean acidification be considered in fisheries conservation and management approaches, the Committee and the role of FAO is discussed in the subsection below.[523]

2.2.3 The Food and Agriculture Organization of the United Nations

FAO plays a critical role in the development of international fisheries law. As a United Nations specialised agency,[524] the UNGA frequently calls on FAO to engage in activities related to developing international fisheries law and policy.[525] Indeed, 'the FAO is one of the most prominent institutions in which fisheries issues are considered in detail at the international level.'[526] The FAO achieves this through its Committee on Fisheries, a subsidiary body of the FAO Council established in 1965 which addresses fisheries issues and makes recommendations to the appropriate institutes and stakeholders as per its mandate.[527]

[522] UNGA, *Report of the resumed Review Conference on the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*, New York, 23-27 May 2016, UN Doc. A/CONF.210/2016/5, Annex, para. A(4) (own emphasis).
[523] FAO, *Report of the 29th Session of FAO Committee on Fisheries* (FAO 2011), para 40a.
[524] Agreement between the United Nations and the Food and Agriculture Organization of the United Nations, June 10, 1946, 10 UNTS 208, Art. I.
[525] UNGA, Resolution 64/72, paras 16, 37, 38, 49, 63, 75, 111, 127, and 145.
[526] Harrison, (n 20) 205; for greater detail on the role of the FAO and fisheries see Harrison, (n 20) 204–233.
[527] FAO, General Rules of the Organization, Rule XXX in Basic Texts of the Food and Agriculture Organization of the United Nations Vols. I and II (FAO, 2015) available at <https://www.fao.org/3/mp046e/mp046e.pdf>.

Membership is open to members and non-members of the FAO.[528] Membership is not open to UN bodies, international organisations, RFMO/As or non-governmental organisations, but they are permitted to join the biennial meetings as observers without a vote.[529] The Committee plays a crucial role in policy development related to fisheries and aquaculture. However, the Committee is not a legislative body and cannot adopt binding decisions on its members. – Instead, the decisions of the Committee are understood as recommendatory.[530] The Committee does however provide a forum for members to discuss and negotiate agreements and other international instruments concerning fisheries, including the implementation of the Code. The Committee also facilitates information sharing, exchange and analysis, including of scientific research, best practices, and technical expertise to support evidence-based decision-making and policy development. This in turn contributes to the Committee's normative work. The Committee oversees the development of international standards and guidelines related to fisheries and aquaculture. This includes establishing technical norms for responsible fishing practices (i.e., the Code and other instruments), addressing environmental impacts, promoting sustainable aquaculture, and ensuring the conservation and management of fishery resources. The Committee also conducts review and monitoring by conducting periodic reviews and assessments of the state of global fisheries and aquaculture, including trends, challenges, and opportunities.[531] It monitors progress in implementing international fisheries agreements and provides recommendations for improved management and governance. The Committee also promotes capacity building and collaboration and partnerships with governments, intergovernmental organizations, non-governmental organizations, and other stakeholders. Through these activities, this informs the Committees role in treaty-making and development of non-binding fisheries policies and guidelines to promote the progressive development of international fisheries law.[532] As explained earlier in this chapter, the instruments adopted by the Committee constitute generally recommended international minimum standards for the purposes of the fisheries provisions of UNCLOS and the UNFSA. Indeed, the role of the FAO in developing international fisheries law cannot be understated.[533] Technical guidance (as opposed to voluntary or technical guidelines) produced by FAO by request of the Committee

[528] FAO, *Rules of Procedures of the Committee on Fisheries* in ibid., Rule III.
[529] ibid; FAO, (n 524), Rule XVII.
[530] Constitution of the Food and Agricultural Organization of the United Nations (FAO Constitution), Art. IV(3) in (n 527).
[531] See, for example FAO, (n 183).
[532] Harrison, (n 20) 207.
[533] See generally ibid., 200–235.

have no binding force 'since they are not adopted by the [members] or a political body',[534] however they inform, for example, the implementation of generally recommended international minimum standards for fisheries such as the Code, discussed next.

The Code was initiated by the Committee and adopted in 1995 by the FAO Council. It provides a framework for both international and national efforts in ensuring sustainable exploitation of aquatic living resources in a sustainable manner through the establishment of standard which can be implemented at all levels of fisheries activity. The Code promotes sustainable use of fishery resources while protecting the aquatic environment and its biodiversity. The Code is not legally binding but is in part 'based on relevant rules of international law' and as such, these sections may be used to interpret the fisheries provisions of UNCLOS and UNFSA as a recommended international standard.[535] Moreover, it:

> sets out in detail both specific duties of flag States, port States and others in relation to the implementation of relevant provisions of UNCLOS and other instruments, and also policies for the promotion of safe and sustainable fisheries. A State that is plainly failing to reach the standards set out in such a non-binding instrument is likely to be found in breach of the legally binding obligations that the instrument is amplifying.[536]

The Code places particular emphasis on marine ecosystems throughout, and recommends that fisheries activities should: avoid over fishing; conserve biodiversity and ecosystems; protect endangered species; minimise pollution and waste; minimise discards and minimise impacts on dependent or non-target species.[537] The Code highlights that conservation and management decisions for fisheries should be based on the best scientific evidence available, as such States should prioritise research and data collection to improve scientific and technical knowledge of fisheries (including their interaction with the ecosystem).[538] Perhaps the most interesting provision of the Code for the purposes of this thesis is the provision on fisheries research under Article 12. Paragraph five of which reads:

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[534] Solène Guggisberg, *The use of CITES for Commercially-Exploited Fish Species* (Springer 2016) 55, citing Jürgen Friedrich, 'Legal challenges of nonbinding instruments: The Case of the FAO Code of Conduct for Responsible Fisheries' (2008) 9 German Law Journal 1593, 1550.
[535] The Code, Art. 1.1.
[536] Churchill, Lowe and Sander, (n 414) 19.
[537] The Code., Art. 7.2.
[538] ibid., Art. 6.4.

> States should be able to monitor and assess the state of the stocks under their jurisdiction, including the impacts of ecosystem changes resulting from fishing pressure, pollution or habitat alteration. They should also establish the research capacity necessary to assess the effects of' climate or environment change on fish stocks and aquatic ecosystems.[539]

While this provision appears limited to fisheries research specifically, it informs the due diligence obligations under Articles 61(2) and 119(1)(a) of UNCLOS to take measures designed on the best available scientific evidence, and since the Code is understood as a generally recommended international minimum standard under 61(3) and 119(1)(a), this supports the argument in this thesis that States, either individually in their EEZ or through RFMO/As on the high seas, have a positive legal obligation to adapt their fisheries management and conservation to the effects of climate change, provided the scientific research available to them indicates those living resources are being affected by climate change. However, considering the Code was adopted in 1995, and climate-adaptive fisheries management has not proliferated in State practice,[540] it is evident that further guidance on climate change and fisheries conservation management is to needed to inform the Code. This is of particular importance since the other key objectives of the Code are impacted by climate change, as demonstrated in chapter 1.

To support the implementation of the Code, several international plans of action, and technical guidelines have been adopted by the Committee under the Code in collaboration with the Fisheries and Aquaculture Department of the FAO, often in conjunction with its legal office, to aid States and RFMO/As in implementing the provisions of the Code as an internationally recommended standard, including the International Plan of Action for Conservation and Management of Sharks,[541] the International Plan of Action to prevent, deter and eliminate illegal, unreported and unregulated fishing,[542] and the International Guidelines on Bycatch Management and Reduction of Discards.[543] These are produced on request of FAO Members during sessions of the FAO Committee on Fisheries and, though non-binding, provide FAO Members with more detail. Implementation of International Plans of Action has

[539] ibid., Art. 12.5.
[540] Although as will be discussed in chapter 3, several States *do* include fisheries as an 'adaptation priority' under their Nationally Determined Contributions under the Paris Agreement.
[541] FAO, *International Plan of Action for Conservation and Management of Sharks* (FAO 1999)
[542] FAO, *International Plan of Action to prevent, deter and eliminate illegal, unreported and unregulated fishing* (FAO 2001) (IPOA-IUU).
[543] FAO, *International Guidelines on Bycatch Management and Reduction of Discards* (FAO 2010).

been slow across the board, but with some success tackling illegal, unreported and unregulated fishing.[544] With regards to the technical guidelines mentioned above, these also are generally recommended international minimum standards and have had a range of success. The Bycatch and Discards Guidelines, for example has been adopted by some RFMOs.[545] Apart from the mention of climate change in the marine scientific research section of the Code, no other instrument adopted to support the implementation of the Code mentioned climate change until 2014 with the endorsement of the FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty eradication (SSF Guidelines).[546] Against the background that small-scale fishers are extremely vulnerable to the effects of climate change, have historically been left out of fisheries management decision making by governments, and are often rights-holders as indigenous people,[547] the SSF Guidelines make direct reference to climate change mitigation and adaptation and the 'objective, principles and provisions of the [UNFCCC]'.[548] For example, the Guidelines recommend that in accordance with their climate change obligations, 'States should develop policies and plans to address climate change in fisheries, in particular strategies for adaptation and mitigation, where applicable, as well as for building resilience, in full and effective consultation with fishing communities including indigenous peoples, men and woman, paying particular attention to vulnerable and marginalized groups.'[549] Notably the SFF Guidelines were endorsed prior to the adoption of the Paris Agreement, however an evolutive interpretation would support the notion that this recommendation would be undertaken by States in line with their adaptation and reporting obligations under the Paris Agreement (discussed in detail in chapter 3). Moreover, States should consider supporting small-scale fishing communities affected by climate change or natural disasters.[550] In terms of climate finance, 'States should consider making available to small-scale fishing communities transparent access to adaptation funds, facilities and/or culturally appropriate technologies for climate change adaptation, as

[544] Churchill, Lowe and Sander, (n 414) 587–591.
[545] Karen N Scott, 'Bycatch mitigation and the protection of associated species' in Caddell and Molenaar (n 16) 165; Churchill, Lowe and Sander, ibid., 593.
[546] Voluntary Guidelines for Securing Sustainable Small-scale fisheries in the context of food security and poverty eradication (adopted at the 31st Session of the Committee on Fisheries, 9-13 June 2014) (SSF Guidelines).
[547] See Elisa Morgera and Julia Nakamura, 'Shedding a Light on the Human Rights of Small-scale Fisheries: Complementaries and Contrasts between the UN Declaration on Peasants' Rights and the Small-Scale Fisheries Guidelines' in Margherita Brunori and others (eds) *Commentary on the Declaration on the Rights of Peasants* (Routledge 2022) 68.
[548] SSF Guidelines, para. 9.1.
[549] ibid., para. 9.2.
[550] ibid., para. 9.4.

appropriate.'[551] However, as will be discussed in chapter 3, despite the available funds under the UNFCCC, funding relating to climate change and fisheries projects has been limited thus far.[552] Importantly, the Guidelines make an explicit reference to the EAF as a guiding principle,[553] coupled with their inclusion of climate change via specific reference to UNFCCC principles, and objectives. This is an implicit recognition that climate considerations must be taken into account when applying the EAF in the context, at least, of small-scale fisheries. These exist at the intersection between international fisheries law, international environmental law, and international human rights law,[554] and as such bring together principles from these three sectors of international law into a generally recommended international minimum standard for the management of small-scale fisheries in the EEZs of coastal States. Not only that, they are interesting from an international fisheries law scholarship perspective, and indicate the possibility of future guidance on fisheries and climate change adopted by the Committee. The adoption of this instrument supports the notion that, at least in context of small-scale fisheries management, States hold a positive legal obligation to adapt fisheries management and conservation to the effects of climate change. That said, a study by Nakamura and others indicated that a small number of States implicitly refer to small-scale fisheries through broad reference to 'fisheries' in national legislation, while others specifically define small-scale fishers, though this varies widely.[555] This does indicate in the latter case, climate adaptive fisheries measures aimed at small-scale fisheries could apply to all fisheries conservation and management in a States' EEZ, meaning implementation of the SSF Guidelines could aid fulfilment of the obligation to adapt fisheries management and conservation to climate change.

Despite the limited number of "soft" law instruments adopted or endorsed by the FAO that directly relate to climate change, the FAO's Fisheries and Aquaculture Department has developed an array of scientific and technical documents on the impacts of climate change and fisheries,[556] the EAF,[557] and provides technical assistance to RFMO/As. FAO adopted a

[551] ibid,, para. 9.9.
[552] See Solène Guggisberg, 'Funding Coastal and Marine Fisheries Projects under the Climate Change Regime' (2019) 107 Marine Policy 103352.
[553] SSF Guidelines, 3.11.
[554] Morgera and Nakamura, (n 547).
[555] Julia Nakamura, Ratana Chuenpagdee and Mostafa El Halimi, 'Unpacking legal and policy frameworks: A step ahead for implementing the Small-Scale Fisheries Guidelines' (2021) 129 Marine Policy 104568.
[556] FAO, *Climate change implications for fisheries and aquaculture: Overview of current scientific knowledge* (FAO 2009); FAO, *Impacts of climate change on fisheries and aquaculture* (FAO 2018).
[557] FAO, *The ecosystem approach to fisheries* (FAO 2003).

Strategy for its Work on Climate Change in 2016,[558] and a Strategy for Fisheries Aquaculture and Climate Change for 2017–2020.[559] Specific technical guidance was published in 2021 on adaptive fisheries management responses to climate change.[560] This technical guidance seeks to improve understanding how to introduce flexibility into fisheries management in response to climate change. It is primarily aimed at fisheries managers, to assist in adapting their practices to the changing conditions caused by climate change. The guidance emphasizes the importance of understanding the impacts of climate change on fisheries and the need to incorporate this knowledge into management strategies throughout. Adaptive management involves continually monitoring and assessing the effects of climate change on fisheries and adjusting management measures accordingly (discussed in more detail in chapter 3).[561] Through a showcasing of various examples of good practice from around the world, the guidance recommends a participatory approach, involving stakeholders in decision-making processes and incorporating traditional knowledge into management plans.[562] The guidelines also highlight the need for collaboration and information sharing among different sectors and organizations to enhance the resilience of fisheries to climate change. It highlights challenges including lack of political will and inflexible law and governance frameworks. Notably, the guidance states that they are 'only a start in developing comprehensive guidelines for climate-adaptive fisheries management',[563] and identifies the object and purpose of the guidance is to move from good practices to normative guidelines.[564] The guidance is indeed a valuable collection of good practice elaboration of key concepts necessary for adaptive fisheries management. However, it does not stipulate principles, guidelines, or best practice in the way that the Code or technical guidelines adopted to implement the Code does vis-à-vis obligations under UNCLOS and the UNFSA. Of course, this is not the purpose of this guidance. In addition, since they are not endorsed by the Committee on Fisheries or adopted by the FAO Council, they do not hold binding force or constitute a generally recommended international minimum standards for the purposes of UNCLOS or UNFSA. However, the guidance does

[558] FAO Doc. COFI/2016/Inf.17, April (2016.).).
[559] FAO Doc. COFI/2016/Inf.18, April (2016.).).
[560] FAO, (ed), *Adaptive management of fisheries in response to climate change* (FAO Technical Paper 667 (FAO, 2021) <https://www.fao.org/3/cb3095en/cb3095en.pdf>.2021)
[561] ibid., FAO, 'Good practices in adaptive management of fisheries in response to climate change' (FAO 2021) 7.
[562] See, for example, FAO, ibid.; Carl D van der Lingen, 'Adapting to climate change in the South African small pelagic fishery' in ibid., 177–194; Sangaalofa Clark and others, 'The Parties to the Nauru Agreement (PNA) "Vessel Day Scheme": a cooperative fishery management mechanism assisting member countries adapt to climate variability and change' 209–224.
[563] FAO, (n 561) 32.
[564] ibid.

allude to the need for a normative instrument. Yet, a comprehensive normative instrument on fisheries and climate change in the form of voluntary guidelines or an international plan of action, has yet to be developed under the FAO ambit. Considering the limitations of existing guidelines and guidance adopted by the FAO Committee on Fisheries or developed by the Department of Fisheries and Aquaculture, there is a substantial need for a normative instrument. This could play a similar role to other FAO instruments which inform the international fisheries law obligations outlined in this chapter and aid both States and RFMO/As in adapting their fisheries management practices to the effects of climate change. This idea will be further substantiated in the following chapters of this thesis, with expectations for this instrument stipulated in the conclusions of the thesis.

There are developments moving this idea forward at the institutional level. For example, the FAO Committee on Fisheries has recommended that States strengthen their efforts to assess climate impacts on fish stocks,[565] but has so far not produced a specific, binding or non-binding instrument on climate change and fisheries. In past years however, the Committee has requested the development of guidelines focused on climate and fisheries.[566] This call was repeated by the Committee in 2021 which:

> [C]alled on FAO to engage more actively in international processes, offering its fisheries management and aquaculture expertise, including through the development of technical guidance, to support climate change mitigation and adaptation, marine conservation and sustainable and inclusive ocean economies.[567]

The Committee on Fisheries also:

- Highlighted the relevance of cooperation between FAO and UNFCCC processes, acknowledging FAO's role in the Ocean and Climate Change Dialogues at the UNFCCC;

- Requested FAO to enhance technical guidelines on mainstreaming climate adaptation and mitigation in fisheries management with the support of its members;

[565] FAO, (n 560) para. 40a.
[566] FAO, *Report of the 32nd Session of FAO Committee on Fisheries* (FAO 2016), paras. 16 and 114; FAO, *Report of the 33rd Session of FAO Committee on Fisheries* (FAO 2018), para. 101; See also Molenaar, (n 32) 274.
[567] FAO, *Report of the 34th Session of FAO Committee on Fisheries* (FAO 2021) 7.

- Acknowledged the need to transition to more carbon-efficient practices in fisheries and the climate mitigation potential in fisheries;

- Encouraged all Members to include, with assistance from FAO, the inclusion of fisheries within nationally determined contributions under the Paris Agreement and [National Adaptation Plans].[568]

In addition, the Committee highlighted the need for the implementation of 'integrated and coordinated multi-sectorial, evidence and ecosystem-based management approaches […] in the context of growing external pressures on marine systems', including climate change and biodiversity loss.[569] On this basis, it is evident that there is appetite among States for normative guidelines on conservation and management of fisheries in the face of climate change. These could be produced in the similar legitimate fashion as the SSF Guidelines and thus should they be voluntary they would, like the SSF Guidelines still carry considerable normative force as generally recommended international minimum standards.[570] Importantly, any guidance should be developed through inter-institutional cooperation between the FAO and, for example, RFMO/As and other regional fisheries bodies, the secretariats of MEAs including the CBD, CMS, and UNFCCC, the UN Division of Ocean Affairs and Law of the Sea, and other key stakeholders including international human rights bodies and UN Special Rapporteurs (not least the special rapporteurs on climate change and human rights, the human right to a healthy environment, and the right to food). This recommendation is one of the key contributions of this thesis and will continue to be developed throughout subsequent chapters.

2.4 Interim Conclusions

This section undertook a critical analysis of the key provisions of UNCLOS and UNFSA concerning the conservation and management of fisheries and the institutions within international fisheries law, with a view to establish the extent to which they place an obligation on States to adapt their fisheries conservation and management to the effects of climate change. It established that this is the international legal framework through which adaptive fisheries

[568] ibid., 14–15.
[569] ibid., Appendix D 5.
[570] As argued by Nakamura on the legal force of the SSF Guidelines, see Julia Nakamura, 'Legal Reflections on the Small-Scale Fisheries Guidelines: Building a Global Safety Net for Small-Scale Fisheries' (2022) 37 The International Journal of Marine and Coastal Law 31.

management can occur, either nationally, bilaterally or multilaterally through RFMO/As to the impacts of climate change as outlined in chapter 1, specifically shifting fish stocks across management jurisdictions. It demonstrated that while there is no explicit obligation on States to adapt their fisheries and management and conservation to the effects of climate change, the provisions of UNCLOS and the UNFSA concerning fisheries are broad and flexible enough to allow for evolutive interpretation and argued that in order to fulfil these existing obligations on the conservation and management of fisheries, States must take in to account the effects of climate change and adapt to them. This argument is supported by the rules of reference contained in these provisions, including the references to best available science and generally recommended international minimum standards, as well as the obligations to negotiate and cooperate in the management of transboundary fish stocks. The section established that fisheries conservation and management obligations are obligations of conduct and of due diligence. As such they are open to evolve over time due to changing circumstances and standards, which supports the integration of climate change. Turning to the institutions in international fisheries law that help set those standards, the section further developed and contextualised the argument from the scientific literature review in chapter 1 that RFMO/As appear by-and-large unprepared for dealing with issues related to climate change including shifting fish stocks, and face other institutional problems which stymie their ability to help States adapt their fisheries conservation and management to the effects of climate change, and adapt as institutions themselves. On a more positive note, in the analysis of the UNGA and FAO, this section established that recent decisions on fisheries at the UNGA encourage States to adapt their fisheries CMMs to the effects of climate change through the development and establishment of adaptation strategies. Existing instruments and technical documents produced by FAO to assist States and RFMO/As with addressing climate change impacts in fisheries these instruments do not go far enough. On that front, the chapter also noted the growing interest in fisheries and climate change at the multilateral level within the FAO Committee on Fisheries and on that basis suggested as a key thesis contribution the development of a normative instrument on fisheries and climate change under the FAO ambit.

An omission from this section was detailed critical analysis of the environmental principles and approaches found within UNFSA, including the precautionary approach, ecosystem approach to fisheries, and the protection and preservation of the marine environment and its biodiversity. To that end, the next and final section of this chapter will examine these, and other principles in more detail.

3. Obligations and Principles in International Environmental Law

The previous section concluded that there is an obligation on States under international fisheries law to adapt their fisheries conservation and management to the effects of climate change. These obligations do not exist in a vacuum and are informed by other relevant international legal obligations, rules and standards which can aid their effective implementation in the face of climate change. The point was raised in the introductions of the thesis and this chapter that MEAs play an important role in bolstering the obligations of international fisheries law, and this integrated approach facilitates progressive development of standards for the management and conservation of international fish stocks and marine biodiversity. Therefore, this section is dedicated to the extent to which MEAs inform international fisheries law in the context of adaptation to shifting fish stocks. It aims to map out the relevant obligations and principles from MEAs which aid in informing and clarifying international fisheries law obligations, and elaborating to what extent they place on States an obligation to adapt or otherwise respond to climate change. Despite the considerable development of international fisheries law since the 1990s, the integration between international fisheries law and international environmental law has been criticised for its slow pace. Barnes argues that:

> [I]t took around 20 years for environmental [principles] to permeate into international fisheries law. It has taken another 15 years for some degree of institutional coordination of fisheries and environmental matters to emerge. Even now, this cross-cutting governance of issues remains ad hoc and under development. This indicates a slow process of cross-fertilization of ideas and practices.[571]

Indeed, the same can be said for the integration of other areas of international law into international fisheries law, including human rights and international trade law for example, but discussion on this front is beyond the scope of this thesis. Discussion on the opportunities for the integration of international climate law – particularly climate adaptation – is advanced in chapter three of this thesis. On top of a need to investigate how MEAs can inform international fisheries law's response to climate change, it has been argued that 'considerable scope exists for international fisheries law to be influenced and strengthened through strategic partnerships

[571] Richard Barnes, 'Alternative Histories and Futures of International Fisheries Law' in Caddell and Molenaar, (n 16) 25, 31.

with other multilateral and sectoral regulators'[572] this particular point will be developed throughout this part of the chapter and the rest of the thesis. Specifically, this section investigates how biodiversity-focused MEAs, including the CBD and the Convention on Migratory Species (CMS),[573] strengthen conservation and management obligations in international fisheries law. Later in the thesis, to what extent the institutions of the international climate regime (i.e., bodies and work programmes under the UNFCCC and the Paris Agreement) can influence and strengthen international fisheries law in terms of climate adaptation (see chapter 3) through inter-institutional cooperation and collaboration with institutions of international fisheries law, including FAO and RFMO/As.

This considered, the section explores the principles and obligations found in international fisheries law as they relate to climate change adaptation in greater depth. It develops them in detail from an evolutive and integrated approach by analysing them systemically by reference to provisions within MEAs. Having already established that there is an obligation on States to adapt fisheries conservation and management to the effects of climate change, this section takes this approach to further clarify the scope and the content of the obligation. In addition to the relevant provisions of UNCLOS and the UNFSA, the MEAs analysed here are primarily the CBD and the CMS, along with relevant reasoning from international courts and tribunals, and soft law. The approach in this section contributes to the cross-fertilisation of ideas between international fisheries and environmental law described by Barnes in the quote above. The section does not primarily engage in international climate law as this receives a dedicated chapter in the context of climate change adaptation in chapter 3. To that end, the section takes the following plan. It critically analyses the obligation to protect and preserve the marine environment (section 3.1), the duty to cooperate (section 3.2), the use of the best available science (section 3.3), the precautionary principle (section 3.4), and the ecosystem approach (section 3.5), before concluding (section 3.6).

[572] Richard Caddell, 'International Fisheries Law and Interactions with Global Regimes and Processes' in Caddell and Molenaar, (n 16) 133, 150.
[573] Convention on the Conservation of Migratory Species of Wild Animals, Bonn 23 June 1979, in force 1 November 1983, 1651 UNTS 333 (CMS).

3.1 Protection and Preservation of the Marine Environment

This subsection critically analyses the general obligation under UNCLOS to protect and preserve the marine environment, a provision which has not yet received much attention in this thesis so far but is important in supporting the argument that States have an obligation to adapt their fisheries management and conservation to climate change. It first covers the general scope and application of the obligation (section 3.1.1), the extent to which it includes fisheries (section 3.1.2) and marine biodiversity (section 3.1.3) and the obligations relationship with climate change (section 3.1.4) before concluding that exercising this obligation entails adapting fisheries management and conservation to climate change and there is scope for further integration of the climate adaptation obligations in international climate law to support this.

3.1.1 General Scope and Application

The provisions of UNCLOS concerning the protection of the marine environment and its biodiversity are found within Part XII. Article 192 obliges States with 'disarming simplicity' to protect and preserve the marine environment.[574] This is an obligation of conduct, one of 'due diligence', and applies to all maritime areas regardless of jurisdiction. [575] The Tribunal in the *South China Sea* Arbitration clarified that the scope and content of this general obligation is a concrete one:

> Although phrased in general terms, the Tribunal considers it well established that Article 192 does impose a duty on States Parties, the content of which is informed by the other provisions of Part XII and other applicable rules of international law. This "general obligation" extends both to "protection" of the marine environment from future damage and "preservation" in the sense of maintaining or improving its present condition. Article 192 thus entails the positive obligation to take active measures to protect and preserve the marine environment, and by logical implication, entails the negative obligation not to degrade the marine environment. The corpus of international law relating to the environment, which informs the content of the general obligation in Article 192, requires that States "ensure that activities within their jurisdiction and control respect the environment of other States or of areas beyond national control."[576]

[574] Churchill, Lowe and Sander, (n 414) 504.
[575] *South China Sea Arbitration*, para. 940; *Fisheries Advisory Opinion*, para. 120.
[576] *South China Sea Arbitration*, para. 941; On duties of States Parties see *M/V "Louisa" (Saint Vincent and the Grenadines v. Kingdom of Spain)*, Provisional Measures, ITLOS Reports 2008-2010, 58, 70, para. 76; Dispute

Further, the Tribunal clarified that 'the content of the general obligation in Article 192 is further detailed in the subsequent provisions of Part XII', this includes Article 194 on measures to prevent, reduce and control pollution, and importantly for the central argument of this thesis 'as well as by reference to specific obligations set out in other international agreements, as envisaged in Article 237 of the Convention.' Article 237 concerns obligations under other conventions on the protection and preservation of the marine environment and states:

> 1. The provisions of this Part are without prejudice to the specific obligations assumed by States under special conventions and agreements concluded previously which relate to the protection and preservation of the marine environment and to agreements which may be concluded in furtherance of the general principles set forth in this Convention.
>
> 2. Specific obligations assumed by States under special conventions with respect to the protection and preservation of the marine environment, should be carried out in a manner consistent with the general principles and objectives of this Convention.[577]

This reasoning supports the systemic approach to treaty interpretation taken in the rest of this chapter. Importantly, the obligation to protect and preserve the marine environment are *erga omnes*. This means that they are owed to, and enforceable by, any member of the international community.[578] While an initial reading of Part XII appears only to cover pollution, international jurisprudential developments over the past 20 years indicate an evolutionary interpretation, with the provisions covering *inter alia* fisheries and other marine living resources.[579] Having clarified the scope and application of UNCLOS Part XII, this section turns to inclusion of fisheries within its provisions.

Concerning Delimitation of the Maritime Boundary Between Ghana and Côte D'Ivoire in the Atlantic Ocean, Provisional Measures, ITLOS Reports 2015, 145, para. 69; on respect for the environment of States and areas outwith national control, see Legality of the Threat of Use of Nuclear Weapons, Advisory Opinion, ICJ Reports 1996, 226, para. 29.

[577] UNCLOS, Art. 237.

[578] See generally: *Case Concerning the Barcelona Traction, Light and Power Co., Ltd. (Belgium v. Spain)*, Judgment, ICJ Reports 1970, 3; *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area*, Advisory Opinion, ITLOS Reports 2011, 59, para. 180; See ILC, (n 75), 78–80; Yoshifumi Tanaka, 'Reflections on Locus Standi in Response to a Breach of Obligations Erga Omnes Partes: A Comparative Analysis of the Whaling in the Antarctic and South China Sea Cases' (2018) 17 The Law & Practice of International Courts and Tribunals 527.

[579] *Southern Bluefin Tuna (New Zealand v. Japan; Australia v. Japan)*, Provisional Measures, ITLOS Reports 1999, 280 para. 70; *Chagos Marine Protected Area Arbitration*, paras. 320 & 583; *South China Sea Arbitration*, para. 945.

3.1.2 The Inclusion of Fisheries

Earlier in this chapter it was highlighted that UNCLOS places responsibility for the management and conservation of fish stocks within the EEZ on the coastal State.[580] Part of this responsibility is that States have an obligation to ensure that fisheries within their jurisdiction are not overexploited.[581] Importantly, it has been declared that 'the conservation of living resources of the sea is an element in the protection and preservation of the marine environment'.[582] Through this obligation, there is the possibility of national regulations contributing to the far-sighted sustainable management of fish stocks who may newly move into or straddle an adjacent State's jurisdiction due to climate change.[583] As mentioned in an earlier section (2.1.2) above, ITLOS stated that it is mandatory in accordance with UNCLOS for the coastal State to adopt CMMs for living resources in its EEZ.[584] Thus if new fish stocks appear in a coastal States' EEZ due to climate change (as described in chapter 1, section 3, and section 4.3 for example) the State in question is under a positive obligation to introduce CMMs to manage that stock, cooperating with any neighbouring States whose waters that stock may also inhabit.[585] The fisheries CMMs of both coastal States and RFMO/As 'constitute an integral element in the protection and preservation of the marine environment.'[586] Examples of CMMs include measures such as allocation of quotas and closures of fishing areas, and failure to ensure respect of these constitutes a violation of UNCLOS Parts V, VII, and XII. In terms of enforcement, all vessels flying the flag of a State are under its *exclusive* jurisdiction whilst on the high seas,[587] and must comply with the coastal State legislation while in their EEZ.[588] It is the responsibility of the flag State to ensure vessels flying its flag refrain from undermining international law of CMMs of coastal States, or of RFMO/As.[589] The above analysis indicates that fisheries conservation and management is well within the scope of UNCLOS Part XII. In addition, States must exercise their fisheries management and conservation obligations under UNCLOS and UNFSA in order to comply with UNCLOS Part XII.

[580] UNCLOS, Art. 56.
[581] ibid., Arts. 61(3) and 191(1)(a), respectively.
[582] *Southern Bluefin Tuna*, para. 70.
[583] Pinsky and others, (n 6) 1190.
[584] *Southern Bluefin Tuna*, para. 96.
[585] The international legal obligation to cooperate is discussed in the next subsection.
[586] *Fisheries Advisory Opinion*, para. 120.
[587] UNCLOS, Art. 92(1).
[588] ibid., Arts. 58(3) and 217.
[589] *Fisheries Advisory Opinion*, para. 119; UNCLOS Art. 217.

3.1.3 The Inclusion of Marine Biodiversity

As a product of its time, UNCLOS does not mention the term 'biodiversity' anywhere in the text. Though it does refer to rare and fragile ecosystems, and habitats of depleted, threatened or endangered species.[590] However, having established that conservation and management of fisheries is a key component of fulfilling the obligation to protect and preserve the marine environment, and considering developments after the Rio Conference on Environment and Development, it can be argued that conservation of marine biodiversity is too a key component.

On that front, the CBD is a crucial tool in providing further clarity on the general obligation to protect and preserve the marine environment and its biodiversity. The CBD Preamble affirms that 'the conservation of biological diversity is a common concern of humankind' and that States are responsible for its conservation and use of resources in a sustainable manner.[591] Importantly, CBD parties must read the obligations under the Convention consistently with UNCLOS,[592] which informs and strengthens its provisions relating to the marine environment.[593] The CBD acts, through its obligations and subsequent COP decisions as a tool in interpreting the provisions of UNCLOS on the protection and preservation of the marine environment contained in Part XII of UNCLOS,[594] and fisheries conservation and management provisions in UNCLOS based on the international judicial reasoning discussed earlier in this chapter. Articles 6–20 of the CBD elaborate its general principles,[595] into legally binding commitments.[596] The CBD's provisions may seem unclear and qualified,[597] but these do not relieve Parties from substantive obligations, particularly when read with Article 237 of UNCLOS, which supports the argument that the provisions of the CBD inform obligations under UNCLOS Part XII. Building upon the obligations, CBD Parties have adopted commitments to establish and well-manage ecologically representative systems of MPAs and other ABMTs by 2020.[598]

[590] UNCLOS, Art. 194(5) - discussed later in this section.
[591] CBD, Preamble.
[592] ibid., Art. 22.
[593] *South China Sea Arbitration*, para. 908.
[594] Alan Boyle and Christine Chinkin, *The Making of International Law* (Oxford University Press 2007) 256–257.
[595] CBD, Art. 1.
[596] Patricia W Birnie, Alan Boyle and Catherine Redgwell, *International Law and the Environment* (3rd edition, Oxford University Press 2009) 616.
[597] ibid., 617.
[598] CBD, Decision X/2, Annex, Target 11.

Obligations under the CBD relating to conservation and sustainable use of biological diversity apply to fisheries, fishing activities, and conservation of marine biodiversity. For example, CBD parties are encouraged to review their national environmental laws and relevant legislation and consider appropriate institutional mechanisms relevant to integrated marine and coastal management.[599] CBD Parties have also indicated the necessity for further implementation and improvement of ecosystem approach to fisheries.[600] Moreover, CBD Parties have committed to achieving Aichi Target 6,[601] which outlines that by 2020 all fish and invertebrate stocks and aquatic plans are managed and harvested legally and sustainably, applying ecosystem-based approaches (discussed in Section 3.5), so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.[602] With this commitment, Parties are expected to engage in sustainable management practices framed by the ecosystem approach to fisheries.[603] This can be argued to include adaptive management to account for species range shifts. Further, Aichi Target 10, commits to minimizing the multiple anthropogenic pressures on vulnerable marine ecosystems impacted by climate change and ocean acidification in order to maintain their functioning and integrity.[604] Implementation practices for this target include reduction of overexploitation and harvesting to sustainable levels.[605] An example of this in practice in terms of climate adaptation in response to arrival of new species has been described by Scheffers and Pecl:

> In response to arrival of new species, natural resource managers in the Australian island State of Tasmania have created proactive management policies to limit catch of several new species through the introduction of bag limits for recreational fishers (www.tas.gov.au), to allow new fish populations to become established.[606]

In terms of conservation, the CBD places considerable weight on return to historical conditions and *in situ* conservation, which could potentially be a barrier to successful adaptive management in response to marine species redistribution under climate change. Though

[599] CBD, Decision VIII/22.
[600] CBD, Decision X/2; CBD, Decision XI/18, para. 2; See also: Decision XIII/2.
[601] See CBD, Decision X/2.
[602] ibid.
[603] ibid.
[604] CBD, 'TARGET 10- Technical Rationale extended (provided in document COP/10/INF/12/Rev.1) no date, available at: <https://www.cbd.int/sp/targets/rationale/target-10/>.
[605] ibid.
[606] Scheffers and Pecl, (n 34) 2.

inexplicit, the CBD definition of *in situ*,[607] reflects the ecosystem approach,[608] which parties to the CBD have committed to applying.[609] Article 8 of the CBD provides an exhaustive list of obligations to be applied on a case-by-case basis to achieve conservation *in situ.*[610] Including, *inter alia* establishing protected areas or areas requiring special measures,[611] maintain viable populations,[612] rehabilitation of degraded ecosystems,[613] and legislation for protection of threatened species.[614] However, the definition of *in situ* has yet to be addressed by the CBD Parties at COP. It is recommended that a shift in objective is needed to account for climate change consequences in both marine and terrestrial environments.[615] Considering the issues identified in the conservation of marine species in the face of climate change, in the marine conservation in Section 3 of chapter 1 this prompts the question – should marine conservation areas have 'temporary' status to account for species range shifts? Could this form of protection maintain resilience or ability to adapt to climate change? This question will be examined in chapter 4 in the context of RFMO/As.

Alike the CBD, another MEA whose obligations can support mutually supportive interpretation under UNCLOS is the CMS. The CMS is a multilateral conservation treaty with the aim of protecting migratory species, especially those species which are threatened, vulnerable, or have unfavourable conservation status. It is important to note here that the CMS does not boast near-universal participation but has 133 Parties including the European Union,[616] like the CBD, UNFCCC and the Paris Agreement and (albeit less so) UNCLOS. In any case, its provisions and decisions act as a useful analytical tool to demonstrate how decisions by MEAs can support climate adaptation. Applying to areas within and beyond national jurisdiction, the Convention defines migratory species as: 'the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries.'[617] The CMS lists species that are considered threatened or

[607] CBD, Art. 2
[608] Birnie, Boyle and Redgwell, (n 596) 639.
[609] CBD, Decision V/6; CBD, Decision VII/11.
[610] CBD, Art. 8.
[611] ibid., Art. 8(a).
[612] ibid., Art. 8(d).
[613] ibid., Art. 8(f).
[614] ibid., Art. 8(k).
[615] Arie Trouwborst, 'Climate Change Adaptation and Biodiversity Law' in Jonathan Verschuuren (ed) *Research Handbook on Climate Change Adaptation Law* (Edward Elgar Publishing 2022) 257.
[616] CMS, 'Parties and Range States' no date, available at: <https://www.cms.int/en/parties-range-states>.
[617] CMS, Art. I(a).

endangered in its Appendix I.[618] For these listed species, range States hold obligations to protect them, namely the prohibition the taking of listed species, unless exceptions apply such as the taking of species for scientific research, or to enhance the survival of the species.[619] For example, species listed in Appendix I, which includes several species of shark and ray.[620] Range States[621] are expected to "*endeavour*" to conserve or restore habitats of listed species and prevent, reduce or control other activities that may limit or impede their migration and contribute to their endangerment.[622] States Parties are expected to take measures to protect Appendix I species against bycatch.[623] Despite its limited participation, the 192 CBD Parties have recognised the CMS as a lead partner in the conservation and sustainable use of migratory species over their entire range.[624] Parties to the CMS are obliged to take necessary steps to conserve migratory species and their habitat with the objective of achieving favourable conservation status.[625] It can be argued that Article III of CMS clearly covers marine climate adaptation measures. Article III, paragraph 4 reads:

> Parties that are Range States of a migratory species listed in Appendix I shall endeavour:
>
> a) To conserve and, where feasible and appropriate, restore those habitats of the species which are of importance in removing the species from danger of extinction;
>
> b) To prevent, remove, compensate for or minimize, as appropriate, the adverse effects of activities or obstacles that seriously impede or prevent the migration of species;

This obligation has been elaborated on in a number of ways through the Programme of Work on Climate Change and Migratory Species,[626] and Resolution 12.21, which states Parties are encouraged to 'take into account potential social and environmental impacts on migratory species when developing and implementing relevant climate change mitigation and adaptation

[618] ibid., Art. III(1).
[619] ibid., Art. III(5).
[620] See also: CMS Memorandum of Understanding on the Conservation of Migratory Sharks (MoU-Sharks) Concluded 1 March 2010. Entered into force 1 Mach 2010.
[621] Range States are defined as 'A State, flag vessels of which are engaged outside national jurisdictional limits in taking that migratory species' CMS Art. I(h).
[622] CMS, Art. III(4).
[623] CMS, Resolution 6.2.
[624] CBD, Decision VI/20.
[625] CMS, Art. II.
[626] CMS, Resolution 11.16.

action and land use planning.'[627] Moreover, Parties are required to interpret Article I(1)(c)(4) CMS, on the definition of 'favourable conservation status' in light of climate change as follows:

> According to Article I (1) (c) (4) of the Convention, one of the conditions to be met for the conservation status of a species to be taken as "favourable" is that: "the distribution and abundance of the migratory species approach historic coverage and levels to the extent that potentially suitable ecosystems exist and to the extent consistent with wise wildlife management". Whereas there is a continued need to undertake conservation action within the historic range of migratory species, such action will increasingly also need to be taken beyond the historic range of species in order to ensure a favourable conservation status, particularly with a view to climate-induced range shifts. Such action beyond the historic range of species is compatible with and may be required in order to meet the objectives and the obligations of Parties under the Convention.[628]

This furthers the argument that States have a positive obligation to adapt management and conservation of shifting marine biodiversity. In a terrestrial context, Trouwborst and Blackmore have argued that this is enough to facilitate the necessary climate adaptation measures for large terrestrial carnivores, i.e., protected areas, connectivity and dealing with non-climate threats can be achieved through implementation of this obligation.[629] The interpretation in this resolution is in itself ground-breaking and will prove invaluable for furthering the argument that States have an obligation to act to adapt to changes associated with marine species on the move. While not explicitly applicable to fisheries exploitation in the sense that commercially fished are not listed on the appendices of the CMS, this resolution is relevant for marine biodiversity conservation in the face of climate change as it acknowledges that species may no longer remain fixed to their historic ranges and that conservation measures must adapt to species range shifts. Having established that the protection and preservation of marine biodiversity in response to climate change a component of the obligations under UNCLOS Part XII and are supported and clarified by the CBD and CMS, the next subsection turns to the relationship between climate change and UNCLOS Part XII.

[627] CMS, Resolution 12.21, para. 3.
[628] ibid., para. 9.
[629] Arie Trouwborst and Andrew Blackmore, 'Hot Dogs, Hungry Bears, and Wolves Running Out of Mountain—International Wildlife Law and the Effects of Climate Change on Large Carnivores' (2020) 23 Journal of International Wildlife Law & Policy 212.

3.1.4 Climate Change and UNCLOS Part XII

As mentioned in the introduction of the thesis, much has been said on the integration of climate mitigation issues into the obligation to protect and preserve the marine environment under UNCLOS. The UNFCCC and its subsequent instruments constitute the body of law known as international climate law.[630] Thus far, these instruments have failed to be implemented effectively by States thus far to reduce GHG emissions adequately enough to prevent catastrophic warming.[631] UNCLOS obligations for the protection and preservation of the marine environment include measures to prevent, reduce and control atmospheric pollution and takes all necessary measures to 'ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States and their environment' by way of Article 194(1–2) and the definition of pollution contained in Article 1.[632] The general consensus in the international legal literature is that these obligations include measures for the reduction of emission of GHGs into the atmosphere.[633] As already mentioned above, the scope and content of the general obligation was shown by the *South China Sea Arbitration* to be 'informed by other provisions of Part XII and other applicable rules of international law'[634] and that any breach of 'generally accepted international regulations' is a breach of UNCLOS.[635] This, read in conjunction with UNCLOS Article 212 concerning pollution of the oceans from or through the atmosphere,[636] could 'bring the Kyoto Protocol and the 2015 Paris Agreement within the scope of Part XII'[637] meaning compliance with international climate law would constitute compliance with Article 212. With that line of argument, Redgwell notes that

[630] Daniel Bodansky, Jutta Brunnée and Lavanya Rajamani, *International Climate Change Law* (Oxford University Press 2017) 10–11.
[631] See chapter 1.
[632] UNCLOS, Art. 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'.
[633] Boyle, (n 40) 84; Alan Boyle, 'Climate change, ocean governance and UNCLOS' in Barrett and Barnes, (n 66) 211, 215; Redgwell (n 40); Millicent McCreath, 'Singapore: Report of the Conference on Climate Change and the Law of the Sea: Adapting the Law of the Sea to Address the Challenges of Climate Change, Centre for International Law, National University of Singapore, 13–14 March 2018.' (2018) 33 The International Journal of Marine and Coastal Law 836; Harrison, (n 139) 246–274; Marcos A Orellana, 'Climate Change and the International Law of the Sea' in Randall S Abate (ed), Robin Kundis Craig, *Climate Change Impacts on Ocean and Coastal Law* (Oxford University Press 2015); Alan Boyle, 'Law of the Sea Perspectives on Climate Change' (2012) 27 The International Journal of Marine and Coastal Law 831.
[634] *South China Sea Arbitration* paras. 945–946.
[635] ibid., para. 1083; UNCLOS Art. 207.
[636] UNCLOS, Art. 212.
[637] Boyle, (n 633) 215.

UNCLOS is important in supplementing the climate regime 'not least because States Parties to UNCLOS are under a legal obligation to prevent, control and reduce sources of marine pollution, including from the atmosphere, regardless of whether they are also party to the climate regime instruments.'[638]

However, with regard to the relationship between Part XII and climate adaptation, things are not as clear cut.[639] Failure by a State to adapt to climate change impacts may not be regarded as pollution from or through the atmosphere, but failure to take adaptive action though climate responsive fisheries conservation and management may cause damage to the marine environment insofar as fish stocks or their dependent or associated species may be vulnerable to overexploitation, and therefore in breach of Part XII. Since adaptation is included as a key response in the international climate change regime,[640] but the integration of the adaptation provisions of the climate regime is challenging and has seen very little attention in the literature. The case may be that primarily because while one can certainly argue that adaptation provisions in the climate regime inform the obligations of UNCLOS Part XII, and therefore the fisheries provisions and measures to conserve marine biodiversity, they are, unlike climate mitigation provisions, not target-based in nature and therefore difficult to quantify as a 'standard'. Indeed, the extent to which the adaptation provisions of the climate change remine provide a standard to inform the conservation and management of fisheries in response to the effects of climate change warrants further discussion in the next chapter.

3.1.5 Summary

While the most obvious of international legal obligations applicable to this work, it is clear that the preservation and protection of the marine environment rooted in Part XII of UNCLOS and interpreted evolutionarily with aid of the CBD,[641] and other international legal tools such as the CMS, clearly contains obligations on climate adaptation. As States are obliged to respond to changes in the state of the marine environment and available information, it becomes apparent that there is a clear legal obligation to respond to marine species range shifts in order

[638] Redgwell, (n 40); Harrison, (n 135) 256; Boyle, (n 633) 836.
[639] See Robin Kundis Craig, 'Mitigation and Adaptation' in Johansen, Busch and Jakobsen (n 32) 49–80; Boyle, (n 40) 84.
[640] See UNFCCC, Art. 4(1); Paris Agreement, Arts. 7–10.
[641] CBD, Art. 22.

to fulfil the obligation to protect and preserve the marine environment. The next section critically analyses the obligation to cooperate in the context of adaptive fisheries management and conservation.

3.2 The Obligation to Cooperate

International cooperation is vital for effective adaptive governance to shifting fish stocks and other marine species. The duty to cooperate is well established in international law,[642] and was furthered and framed in environmental terms in 1992 with Principle 7 of the Rio Declaration on Environment and Development,[643] stating: 'States shall cooperate in a spirit of global partnership to conserve, protect and restore the heath and integrity of the Earth's ecosystem'[644] Importantly, the ITLOS stated in the *MOX Plant* case that 'the duty to cooperate is a fundamental principle in the prevention of pollution of the marine environment under Part XII of the Convention [UNCLOS] and general international law.'[645] Following from the analysis in the above subsection on the protection and preservation of the marine environment, cooperation also applies to conservation of the marine environment and of marine living resources, and is enshrined in UNCLOS Article 197, which states:

> States shall cooperate on a global basis and, as appropriate, on a regional basis, directly or through competent international organisations, in formulating and elaborating international rules, standards and recommended practices and procedures consistent with this Convention, for the protect and preservation of the marine environment, taking into account characteristic regional features.[646]

The term 'regional features' is directly applicable to coastal States bordering an enclosed or semi-enclosed sea,[647] which, as pointed out in Article 123 of UNCLOS obliges States

[642] UNGA, *Declaration on Principles of International Law concerning Friendly Relations and Cooperation among States in accordance with the Charter of the United Nations* Resolution adopted by the General Assembly on 19 October 1970 UN Doc. A/RES/25/1625.
[643] Rio Declaration on Environment and Development, (n 463).
[644] ibid., Principle 7.
[645] *The MOX Plant Case*, para. 82; See also: *Case concerning Land Reclamation by Singapore in and around the Straits of Johor (Malaysia v. Singapore)*, Provisional Measures, ITLOS Reports 2003, 10, para. 92; *Fisheries Advisory Opinion*, para. 140.
[646] UNCLOS, Art. 197.
[647] Defined by UNCLOS, Art. 122 as: "[A] gulf, basin or sea surrounded by two or more States and connected to another sea or the ocean by a narrow outlet or consisting entirely or primarily of the territorial seas and exclusive economic zones of two or more coastal States".

'bordering an enclosed or semi-enclosed sea should cooperate with each other in their exercise of their rights and in the performance of their duties under [UNCLOS].'[648] Namely, to coordinate in the management, conservation exploration and exploitation of ;[649] coordinate the implementation of their rights and duties in the protection and preservation of the marine environment;[650] coordinate scientific research policies and undertake join research programmes where appropriate;[651] and to invite other interested States or international organisations to cooperate with them in fulfilling the obligations of Article 123.[652] An example of this cooperation in practice is the establishment of the General Fisheries Commission for the Mediterranean (GFCM), an RFMO administered under FAO's ambit.[653] How regional organisations can address unique regional challenges brought about by climate change impacts on the ocean are examined throughout in chapters 3 and 4. UNCLOS Articles 123 and 197 can be read together, as was the case in *South China Sea*, where China was found to fail to cooperate or coordinate with other States bordering the South China Sea, a semi-enclosed sea under Article 123.[654] On the importance of cooperation, the Tribunal quoted the ICJ's reasoning in *Pulp Mills on the River Uruguay*, who stated 'by cooperating […] the States concerned can manage the risks of damage to the environment that might be created by the plans initiated by one or [the] other of them, so as to prevent the damage in question.'[655]

States bear 'both an individual and collective duty to cooperate'[656] in both the conservation of marine living resources,[657] and the management, conservation and exploitation of straddling or highly migratory fish stocks: Those that exist in the EEZs of two or more

[648] UNCLOS, Art. 123.
[649] ibid. Art. 123(a).
[650] ibid., Art. 123(b).
[651] ibid., Art. 123(c).
[652] ibid., Art. 123(d).
[653] Agreement for the establishment of a General Fisheries Commission for the Mediterranean as amended by the General Fisheries Council for the Mediterranean at its first special session (May 1963), at its thirteenth session (July 1976) and at its twenty-second session (October 1997) and approved by the FAO Conference at its twelfth session (December 1963) and by the FAO Council at its seventieth session (December 1976) and at its hundred and thirteenth session (November 1997), Rome, 6 November 1997, in force 29 April 2004, 2275 UNTS 157 (GFCM Agreement).
[654] *South China Sea,* para. 984–986.
[655] *Pulp Mills on the River Uruguay,* para. 77; See also *South China Sea,* para. 985; International Law Commission 'Consequences Arising Out of Acts Not Prohibited by International Law (Prevention of Transboundary Harm from Hazardous Activities),' in *Report of the International Law Commission on the work of its Fifty-third session (23 April-1 June and 2 July-10 August 2001),* UN Doc. GAOR/A/56/10 (2001).
[656] Rayfuse, (n 472) 440.
[657] UNCLOS, Art. 117–119.

coastal States,[658] and on the high seas.[659] It is important that the biological unity of these stocks is considered when managing and conserving these stocks and requires cooperation across governance scales. This duty is elaborated on by Article 8 UNFSA and institutionalised through the establishment or joining of regional or sub regional fisheries organisations or arrangements.[660] Notably, the duty to cooperate does not stop with the joining of RFMOs or other regional management organisations. States are required to cooperate *within* these organisations improve their effectiveness in establishing and implementing CMMs for straddling and highly migratory fish stocks.[661] Indeed, some RFMO conventions uphold the duty to cooperate.[662]

In terms of obligations to cooperate under the CBD, Parties:

> [S]hall, as far as possible and as appropriate, cooperate with other Contracting Parties, directly or where appropriate, through competent international organizations, in respect of areas beyond national jurisdiction and on other matters of mutual interest, for the conservation and sustainable use of biological diversity.[663]

Article 10(e) of the CBD also encourages cooperation between government authorities and the private sector in the development of methods for sustainable use of biodiversity.[664] Parties to the CMS are obliged to cooperate in the conservation of species and habitat of migratory species.[665]

In summary, is clear that cooperation is a crucial component in fulfilling the obligation to protect and preserve the marine environment. Scheffers and Pecl make the point that adaptation-based management must be achieved through increasing international and inter-State cooperation to either maintain or create proactive transboundary agreements on marine

[658] ibid., Arts. 63–4.
[659] ibid., Art. 118; UNFSA Art. 8.
[660] UNFSA, Art. 8.
[661] ibid., Art. 13.
[662] Established by the Convention on the Conservation and Management of High Seas Fisheries Resources in the North Pacific Ocean, Auckland, 14 November 2009, in force 24 August 2012, 2899 UNTS 211 (SPRFMO Convention), Art. 3; Created by the Convention on the Conservation of Antarctic Marine Living Resources, Canberra, 20 May 1980, in force 7 April 1982, 1329 UNTS 47 (CAMLR Convention), Preamble.
[663] CBD, Art. 5; See also CBD, Art. 13(b) on cooperation with other States and international organizations in the development of educational and public awareness programmes concerning the conservation and sustainable use of biological diversity.
[664] CBD, Art. 10(e).
[665] CMS, Art. II.

species which may appear in new jurisdictions as a result of climate change.[666] Based on analysis in this thesis so far, it can be argued that because of the existence of an adaptive component in this obligation in response to climate change in marine conservation, cooperation operationalised through regional organisations bi- or multilateral dialogues is not only a key component to successfully achieve this, but an international legal obligation. How cooperation is, and can be, operationalised through RFMO/As is the subject of chapter 4. The next subsection turns to the obligation to use the best available science.

3.3 Use of the Best Available Science

Scientific research is vital in developing and maintaining understanding of the environment. As illustrated in this introductory chapter, a scientific understanding of the environment is necessary for managers in making the best possible decisions and solutions. In terms of fisheries, States are under the general obligation to use the best science available in managing fish stocks within their jurisdiction,[667] and for shared and highly migratory fish stocks.[668] To implement the precautionary approach (discussed in greater detail in section 3.4) States are obliged to improve the decision-making process for fisheries conservation and management by obtaining and sharing the best available scientific information, as well as improving and implementing techniques for dealing with risks and uncertainty.[669] This could take the form of proactive monitoring and research to detect and predict climate change effects on fish stocks and associated and dependent marine species. States must also determine stock-specific reference points based on the best scientific information available and what action should be taken when they are exceeded.[670] Emergency measures in international fisheries management are also to be based on the best scientific evidence available.[671] UNFSA and RFMO/A conventions also contain obligations to promote cooperation in the use of best science available.[672] The CMS also obliges States to use the best scientific evidence available to indicate that a migratory species is endangered.[673] Considering the findings from the scientific

[666] Scheffers and Pecl, (n 34) 584.
[667] UNCLOS, Art. 61(2).
[668] ibid., Art. 119; UNFSA, Art. 5(b).
[669] UNFSA, Art. 6.3(a).
[670] ibid., Art. 6.3(b).
[671] ibid., Art. 6.7.
[672] ibid., Art. 14; CAMLR Convention, Art. 15; SPRFMO Convention, Art. 3.
[673] CMS, Art. 3.

literature review in the first chapter of this thesis, it can certainly be argued that as the scientific evidence base on marine species range shifts continues to grow, States are under a clear obligation, and practical necessity to act in response. The next subsection turns to the precautionary principle.

3.4 The Precautionary Principle or Approach

The precautionary principle seeks to ensure the taking of early action in order to address serious environmental threats which may emerge in cases where there is ongoing scientific uncertainty concerning proof of cause and effect. State practice and judicial opinion have supported the precautionary principle as a key component in international environmental law.[674] Rio Declaration Principle 15 provides that:

> In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of scientific certainty shall not be used shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.[675]

Before discussing further, it is important to make the point that there is some contention over the use of term precautionary 'principle' versus 'approach'.[676] For the purposes of this work, 'principle' is preferred as this can be objective, mandatory and enforceable, whereas an approach may be seen as more subjective. Since its enshrinement in Rio, the precautionary principle has featured as a keystone in all MEAs, and policy declarations, especially those relating to the marine environment.[677] As the ICJ observed in *Gabćíkovo-Nagymaros* '[t]he Court is mindful that, in the field of environmental protection, vigilance and prevention are required of the often irreversible character of damage to the environment and of the limitations inherent in the very mechanism of reparation of this type of damage.'[678] The Court also held

[674] See for example, Rio Declaration, Principle 15; UNFCCC Art. 3(3); UNFSA Art. 6; FAO Code of Conduct for Responsible Fisheries, Art. 7.5; CBD, Preamble; OSPAR Convention Art. 2; SPRFMO Convention, Art. 3; CAMLR Convention, Art. 2(3).
[675] Rio Declaration, Principle 15.
[676] See Jacqueline Peel, 'Precaution - A Matter of Principle, Approach or Process?' (2004) 5 The Melbourne Journal of International Law 19.
[677] David Freestone, 'Principles Applicable to Modern Oceans Governance' (2008) 23 The International Journal of Marine and Coastal Law 385.
[678] *Gabčikovo-Nagymaros*, para. 140.

in *Pulp Mills on the River Uruguay* that the precautionary principle may be relevant in the interpretation and application of the provisions of a treaty between parties.[679] ITLOS has acknowledged that the precautionary principle is included in a growing number of treaties and instruments indicated the trend for the inclusion of the principle in customary international law.[680] The Tribunal has also implied the link between the precautionary principle and the obligation of due diligence when designing or implementing CMMs for fisheries.[681] As discussed throughout this chapter, this indicates that climate change factors are to be considered in fisheries management and conservation.

In terms of fisheries, the precautionary approach (as it is referred to in the treaty text) is enshrined in Article 6 of the UNFSA and laid out in the precautionary approach guidelines in Annex II.[682] The Annex II guidelines recommend using two types of reference points: conservation (limit) and management (target). Limit reference points constrain harvesting within safe biological limits, while target reference points are meant to meet management objectives. It is interesting to note that the fishing mortality rate which generates maximum sustainable yield should be regarded as a minimum standard for limit reference points.[683] Further, UNFSA's precautionary approach guidelines also notes that precautionary points should be stock-specific to account for, among other things, the reproductive capacity, the resilience of each stock and the characteristics of fisheries exploiting the stock, other sources of mortality, and major sources of uncertainty.[684] Considering the disruptive nature of and uncertainty cause by climate change, it is clear that while the guidelines do not indicate that climate impacts should be included in the application of these guidelines. The precautionary approach to fisheries also necessitates monitoring. Enhanced monitoring is mandatory under the UNFSA for target, non-target or associated or dependent species of concern to review their status and the efficiency of the conservation and management measures, which shall be revised regularly.[685] Another dimension of the precautionary approach to fisheries is the obligation of States to adopt CMMs on an emergency basis to ensure that fisheries do not exacerbate significant adverse impacts on straddling and highly migratory fish stocks from a natural

[679] *Pulp Mills on the River Uruguay*, para. 164.
[680] *Seabed Advisory Opinion*, para. 135.
[681] ibid., para. 132; *Southern Bluefin Tuna*, paras. 77–80.
[682] UNFSA, Art. 6; Annex II.
[683] ibid., Annex II, para. 7.
[684] ibid., para. 3.
[685] ibid., Art. 6(5).

phenomenon.[686] An example of a natural phenomenon could be a marine heatwave as discussed in chapter 1 (sections 2.5.2, 2.5.3 and 4.2). Such measures are to be temporary and be based on the best scientific evidence available.[687] Caddell has explored the extent to emergency measures may be utilised by RFMO/As and States, and indicated that they could be utilised by States who have found themselves with the majority population of a fishery in waters under their jurisdiction to exclude access to States who previously fished that stock.[688] In terms of adaptive conservation in response to species on the move and the growing scientific body of evidence of marine biodiversity range shifts, the implementing the precautionary principle can aid States in fulfilling the obligation to adapt fisheries management and conservation to climate change. The next subsection discusses the ecosystem approach as it applied to fisheries and fisheries management.

3.5 The Ecosystem Approach to Fisheries and Ecosystem-Based Management

The ecosystem approach, also known as ecosystem-based management, is broadly considered a priority framework for addressing the three objectives of the CBD,[689] namely: 1) Conservation of biodiversity; 2) Sustainable use of its components; and 3) Equitable sharing of benefits arising from the utilisation of genetic resources.[690] The ecosystem approach is defined as 'a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.'[691] The CBD has produced implementation guidelines for the twelve principles of the ecosystem approach, which were developed and endorsed by the CBD COP in 2000.[692] While the ecosystem approach principles support integration and cross-sectoral management, they provide a broader framework for more focused applications of the ecosystem approach, such as the EAF.[693] The EAF is considered a subset of the ecosystem approach applied specifically to the fishing sector.[694] In addition to single species management, the operationalisation of a more holistic ecosystem approach to

[686] ibid., Art 6(7).
[687] ibid., Art. 6(7).
[688] Caddell, (n 6).
[689] CBD, Decision V/6; CBD, Decision VII/11, para. 2.
[690] CBD, Art. 1.
[691] CBD, Decision VII/7, Annex I, para. 1.
[692] CBD, Decisions V/6, and VII/11; CBD Secretariat, *The Ecosystem Approach*, (CBD Secretariat 2004); FAO, (n 557).
[693] FAO, ibid., 219.
[694] See Daniela Diz Pereira Pinto, *Fisheries Management in Areas beyond National Jurisdiction: The Impact of Ecosystem Based Law-Making* (Martinus Nijhoff Publishers 2013).

fisheries is supported by international law, including UNCLOS, UNFSA,[695] and supplemented by FAO instruments, the CBD and by an increasing number of RFMO/A Conventions. The first RFMO/A to adopt the ecosystem approach was the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) in 1995 and has since elaborated, promoted and implemented the EA.[696] Some other RFMO/As have followed suit.[697] As mentioned in Section 3.1.3, the CBD Aichi Biodiversity Target 6,[698] commits CBD Parties to sustainably manage stocks by applying an ecosystem approach.[699] Moreover, CBD COP 13 urged Parties to mainstream biodiversity into the fisheries sector including using guidance on the ecosystem approach to fisheries and applying the precautionary approach to fisheries, and developing measures and regulations to promote the conservation and recovery of endangered species.[700]

As outlined above, the provisions of the CBD, including its COP decisions and intergovernmental agreed guidelines and policies serve as a vital tool in interpreting obligations in international fisheries law. Obligations under the CBD concerning the conservation and sustainable use of biological diversity apply to fisheries, fishing activities and the conservation of marine biodiversity both within and beyond national jurisdiction.[701] The CBD updates the exploitation–oriented obligations of UNCLOS concerning marine biodiversity (i.e., fisheries provisions and part 12) to an ecosystem-focus and helps and supports the achievement of the objectives of UNFSA, and the long-term protection of species, ecosystems and habitats.[702] For example, multiple decisions by the Parties to the CBD have supported the need for further integration, implementation and improvement of the ecosystem approach to fisheries management,[703] and the CBD Guidelines on the ecosystem approach are complimented by guidelines produced by FAO on ecosystem approaches,[704] including from a social, economic, and management perspective.[705] Moreover, since the ecosystem approach under the CBD calls

[695] UNFSA Art. 5(d) and 5(e).
[696] CAMLR Convention, Art. 2.
[697] SPRFMO Convention, Art. 3.
[698] CBD, Decision X/2, Aichi Target 6.
[699] ibid.,
[700] CBD, Decision XIII/3, paras. 69 and 71.
[701] CBD, Art. 4; Note that the provisions of the CBD only apply 'in the case of processes and activities regardless of where their effects occur, carried out under its jurisdiction or control, within the area of its national jurisdiction or beyond the limits of national jurisdiction'.
[702] See Rüdiger Wolfrum and Nele Matz-Lück, 'The Interplay of the United Nations Convention on the Law of the Sea and the Convention on Biological Diversity' (2000) 4 Max Planck Yearbook of United Nations Law 445.
[703] CBD, Decision X/2; CBD, Decision XI/18; para. 2; CBD, Decision XIII/2.
[704] CBD, Decisions V/6 and VII/11; CBD Secretariat, (n 689); FAO, (n 216).
[705] FAO, *Human dimensions of the ecosystem approach to fisheries: an overview of context, concepts, tools and methods* (FAO 2008).

for integration of modern scientific practices and indigenous and local knowledge,[706] as well as concerns of equity and the recognition that humans and their cultural diversity are integral in many ecosystems.[707] Importantly, as well as including climate change (discussed, in section 2.2.3) the FAO SSF Guidelines make an explicit reference to the ecosystem approach to fisheries management as a guiding principle,[708] coupled with their inclusion of climate change, this is an explicit recognition that climate considerations must be taken when applying the ecosystem approach.

3.5.1 Marine Conservation under the Ecosystem Approach

Since the international community has agreed to conserve areas which are important for biological diversity,[709] criteria for identifying such areas have been developed over the past 30 years. The CBD criteria for identifying ecologically or biologically significant marine areas (EBSAs) is important for this chapter insofar as that they can inform the development of standards and guidelines for climate adaptive conservation measures, including ABMTs.[710] In 2008, the CBD COP adopted a set of seven scientific criteria for EBSAs in need of protection,[711] and scientific guidance for selecting areas to establish a representative network of MPAs, including in pelagic and deep-sea habitats.[712] In 2010 at request of the COP a series of regional stakeholder workshops were held to facilitate EBSA description. This was undertaken 'through application of scientific criteria in Annex I of decision IX/20, as well as other relevant compatible and complementary nationally and intergovernmentally agreed scientific criteria'.[713] Parties acknowledged that application of the EBSA criteria is a scientific and technical exercise, and areas which meet the criteria may require enhanced conservation and management measures.[714] Parties also noted that this can be achieved through a variety of means, including MPAs and impact assessments, emphasizing that the identification of EBSAs

[706] CBD, Decision V/6, Principle 11.
[707] ibid., para. 2.
[708] SSF Guidelines, 3.11.
[709] CBD, Art. 8; Aichi Target 1 (CBD, Decision X/2).
[710] Daniel C Dunn and others, 'The Convention on Biological Diversity's Ecologically or Biologically Significant Areas: Origins, Development, and Current Status' (2014) 49 Marine Policy 137.
[711] CBD, Decision IX/20, namely: uniqueness or rarity; special importance for life-history stages of species; importance for threatened, endangered or declining species and/or habitats; vulnerability, fragility, sensitivity or slow recovery; biological productivity; biological diversity; and naturalness. See: Annex I of Decision IX/20.
[712] ibid., Annex II, developed at the Azores Workshop and includes: EBSAs; representativity; connectivity; replicated ecological features; and adequate and viable sites.
[713] CBD, Decision X/29, para 36.
[714] ibid., para. 26.

and the selection of conservation and management measures is a matter for States (if in areas within national jurisdiction) and competent intergovernmental organizations (if in ABNJ), in accordance with UNCLOS and other rules of international law.[715] This means that the description of an EBSA does not result *per se* in management measures. More recently, Parties and other governments have been encouraged to make use of the scientific information contained in the EBSA description when carrying out marine spatial planning, designing MPA networks and other area-based management measures with a view to contributing to the Aichi Biodiversity Targets.[716] Parties are also encouraged, and intergovernmental organizations (including RFMO/As) are invited to take measures within their respective jurisdictions and competencies, to 'ensure conservation and sustainable use by implementing relevant tools, in accordance with national law, including area-based management tools such as MPAs, environmental impact assessment and strategic environmental assessments, and fisheries management measures, and to share their experience in taking these measures through national reports and/or voluntary reports.'[717] Some RFMO/As have played an active role in the EBSA description process.[718]

Whilst EBSA descriptions do not result in automatic management measures, the scientific information contained in these descriptions can help identify appropriate conservation and management measures (e.g. MPAs & fisheries closures, etc.). Several EBSAs have already been highlighted as productive areas that support fisheries.[719] Furthermore, EBSAs can provide important ecosystem services (including economic and cultural services) far past its boundaries. For instance, the Sargasso Sea EBSA has been identified as an important spawning ground for European and American eels.[720] While the criteria for coastal States identifying areas in need of conservation may or may not resemble the CBD EBSA criteria, RFMOA/s can make use of both the criteria and the scientific information in EBSA descriptions to inform their conservation and management measures. This can assist States and

[715] ibid.; see also Elisa Morgera, 'Competence or Confidence' (2007) 16 Review of European Community and International Environmental Law 1.
[716] CBD, Decision XII/22, para. 8.
[717] CBD, Decision XIII/12, para. 14.
[718] See, Daniel C Dunn and others, 'Area-based Fisheries Management' in Caddell and Molenaar (n 16) 189, 206–209.
[719] E.g., Benguela Current Upwelling System EBSA, see Summary report of the south-eastern Atlantic regional workshop to facilitate the description of ecologically or biologically significant marine areas, CBD doc UNEP/CBD/RW/EBSA/SEA/1/4 (2014); Eastern Caribbean EBSA, see UNEP/CBD/SBSTTA/16/INF/7 (2014).
[720] United Nations (n 80), Chapter 50; See also Daniela Diz, 'The Sargasso Sea' (2016) 31 The International Journal of Marine and Coastal Law 359; David Freestone, 'The Sargasso Sea Commission: An Evolving New Paradigm for High Seas Ecosystem Governance?' (2021) 8 Frontiers in Marine Science, available at: <https://www.frontiersin.org/articles/10.3389/fmars.2021.668253>.

RFMO/As alike in making climate responsive and forward-thinking fisheries management decisions, including time bound MPAs, ABMTs where the geographic scope may shift to follow a particular stock, or identifying particular areas that may act as climate refugia for species and requiring protection. This also assists RFMO/As and States alike where capacity to conduct scientific research may be limited. However, there is concern that since there are several species with little adaptation potential to the effects of climate change, '[c]limate change impacts and implications could eclipse the current EBSA criteria, and there have been calls to consider "climate resilience and refugia" as an additional EBSA criterion' to strengthen the EBSA process in the face of climate change.[721]

3.5.2 Summary

The ecosystem approach, EAF, coordination across sectors and integrated management of fisheries and marine biodiversity together all have a crucial role to play in addressing the challenges posed by the shifting of marine species due to climate change. In particular, the extent to which the EA and EAF could be applied more broadly by explicitly taking into account the actual and potential effects of climate change in the conservation and management of marine biodiversity, thus safeguarding ecosystems from the alterations brought about by climate change requires greater attention at an international legal level.

4. Conclusions

This chapter asked to what extent does the international legal framework applicable to fisheries known as 'international fisheries law' place an obligation on States to adapt fisheries management practices to the effects of climate change, particularly shifting fish stocks. It argued that despite the international ocean and fisheries governance framework being largely silent on climate change and climate change adaptation, by utilising a systemic interpretation of relevant international environmental legal principals and approaches, it can be argued that there is in fact a positive general international legal obligation on states to adapt the management of management and conservation of fisheries and other marine living resources.

[721] David Johnson and Christopher B Froján, 'A review of ecologically or biologically significant areas (EBSAs) in the North Atlantic' (2021) *AÇORENA* XI 489, 500; see also David Johnson and others., 'Climate change is likely to severely limited the effectiveness of deep-sea ABMTs in the North Atlantic' (2018) 7 Marine Policy 111; David Johnson and Ellen Kenchington, 'Should Potential for Climate Change Refugia Be Mainstreamed into the Criteria for Describing EBSAs?' (2019) 12 Conservation Letters e12634.

This obligation applies both nationally, and internationally through the institutional mechanisms for fisheries management on the high seas, known as regional fisheries management organisations or arrangements (RFMO/As), however these institutions appear by-and-large unprepared for dealing with climate change impacts.

Although the normative content of the obligation to adapt in international fisheries law is not completely spelled out in the instruments analysed, it is established that the obligation to adapt involves accounting for climate change impacts on fisheries in scientific research that informs conservation and management measures (CMMs), as well as ensuring the CMMs themselves account for and respond to climate impacts. This argument is supported by the rules of reference contained in the provisions of UNCLOS and UNFSA, including the references to best available science and generally recommended international standards, as well as the obligations to negotiate and cooperate in the management of transboundary fish stocks. The links identified between international fisheries law and international environmental law, including the environmental protection regime under the law of the sea, and international biodiversity law discussed in this chapter support the obligation to adapt. This includes application of the precautionary principle and the ecosystem approach to account for and respond to climate change impacts in fisheries management. The chapter has established that the obligation to adapt is a due diligence obligation. As such, this is open to evolve over time due to changing circumstances and standards. New standards which support the integration of climate change were found in the analysis of UNGA and FAO, where recent decisions on fisheries at the UNGA encourage States to adapt their fisheries CMMs to the effects of climate change through the development and establishment of adaptation strategies, and certain components of the Code and technical documents from FAO which seek to address climate change in fisheries conservation and management.

The chapter also highlighted growing attention paid to fisheries and climate change at the multilateral level within the FAO Committee on Fisheries, and on that basis suggested as a key thesis contribution the development of an instrument on fisheries and climate change under the FAO ambit. However, since these guidelines do not exist as yet, and since international legal obligations on climate adaptation are found within the climate regime, this warrants further investigation regarding the extent to which the adaptation provisions of the climate change regime can support the obligation to adapt fisheries management and conservation to

climate change generally and provide normative clarity to the obligation to adapt fisheries management and conservation to climate change. This issue is the topic of the next chapter.

CHAPTER THREE: Climate Change Adaptation Law

Bringing International Fisheries into the Fold?

'The first obstacle to adaptation is the reluctance to contemplate it.'[722]

[722] Paul E Waggoner, 'Now, Think of Adaptation' (1992) 9 Arizona Journal of International and Comparative Law 137, 146.

1. Introduction

The ocean has played a key role in slowing down the impacts of climate change through the absorption of excess heat, CO_2 and other GHGs from the atmosphere. This has provided the international community with more time to mitigate climate change and delay adaptation measures, as indicated in chapter one, mitigation measures have not been adequate to slow down atmospheric and ocean warming. As a consequence, this has resulted in the climate impacts on the ocean outlined in chapter one. Many of these impacts require adaptation responses. To that end, the purpose of this chapter is to build on the conclusions of chapters 1 and 2 by analysing of the role of the concept of climate change adaptation in international climate law and to establish the extent to which it informs and contributes to States' obligation to adapt their fisheries conservation and management to the effects of climate change, including shifting fish stocks. As a refresher, the research question of this thesis is 'to what extent do States have an international legal obligation to adapt international fisheries management practices to the effects of climate change?'. Before the substantive analysis of this chapter is undertaken, the following two paragraphs summarise the conclusions of chapters one and two.

Chapter one outlined the uncertainties and regulatory challenges that climate change causes in the marine environment. It focused in particular on the conservation and management of marine capture fisheries. It outlined that climate change causes ocean warming, acidification, and deoxygenation. These impacts are in many cases causing redistribution of several marine species Poleward or into deeper waters. This means that species are moving across traditionally static jurisdictional and managerial boundaries, causing complications for conservation and management. These complications include issues with quota allocations and designation of conservation areas (i.e., MPAs and ABMTs), as well as breakdowns in cooperation between States and participants in a fishery which can lead to conflict and overexploitation of fish stocks and other marine living resources. The chapter concluded, based on a review of the scientific literature, that there is a marked need for adaptive management and conservation practices to respond to species shifts, and questioned what role international law plays in facilitating this adaptation.

Chapter two explored the obligations under international fisheries law to partly answer the research question. It argued that – despite the international oceans and fisheries governance framework being generally silent on climate adaptation – there is a positive international legal

obligation on states to adapt management and conservation of fish and other marine species to the effects of climate change. This obligation applies both nationally, and internationally through the institutional mechanisms for fisheries management on the high seas, RFMO/As. This involves accounting for climate change impacts in the scientific research that informs CMMs as explicitly specified in Article 12.5 of the Code, as well as ensuring those CMMs account for and respond to climate impacts. It concluded that, in addition to the general obligation to adapt fisheries management to climate change, there is a lack of scholarly attention to the relationship between the ocean and climate legal frameworks in the context of climate adaptation. This gap is particularly apparent in the case of international fisheries law. The chapter also suggested as a key thesis contribution the potential development of instrument on fisheries and climate change under the auspices of the FAO. However, since explicit guidelines are yet to be developed, and since international legal obligations on climate adaptation are found within the climate regime, the extent to which the adaptation provisions can provide normative clarity and support the interpretation to the obligation to adapt fisheries management and conservation to climate change merits scholarly attention.

Against this background, the purpose of this third chapter is to build on the above conclusions through an examination of the international law of climate adaptation to establish to what extent this can elaborate and clarify the obligation to adapt identified in chapter 2. It is also an investigation into how climate adaptation law can support the progressive development of international fisheries law in response to climate-induced environmental change. Why look at climate law to address an issue in international fisheries, with an established and (fairly) well-codified legal system?[723] What is the role of international climate law here (if any) in addressing a fisheries matter? And how do these two discrete legal systems interact in this context? Bodansky indicates:

> Most of the issues arising from the climate could be addressed by either or both bodies of law. The effects of climate change on fisheries, for example, could be addressed by regional fisheries organizations as a management issue or by the UN climate regime as an adaptation issue.[724]

From the outset, it is obvious that neither regime will have all the answers or solutions to the regulatory challenges that climate change poses to international fisheries. International

[723] See caveats to this statement in chapter 2.
[724] Bodanksy, (n 32) 321–322.

fisheries law cannot stop climate change, and international climate change law cannot prevent overexploitation of fish stocks, for example. Nevertheless, Bodansky indicates that the two regimes can either reinforce one another, share the load, or come into conflict.[725] Consider the arguments from the introduction of this thesis and in chapter two, namely that international fisheries law and the environmental provisions of the law of the sea can benefit from systemic integration of other legal instruments to deal with new challenges. Therefore, both the climate and international fisheries law legal frameworks are challenged to facilitate effective marine climate adaptation policies, but it is solely within the remit of climate law to mitigate GHGs, thus slowing ocean warming and shifts in fish populations. This considered, the degree to which the international fisheries and the climate regimes can work synergistically in the context of adaptation must be explored to answer the research question of this thesis. This third chapter will explore the law on climate adaptation, and the next chapter will examine adaptive management by RFMO/As. As such, this chapter examines the normative component of adaptation by analysing the law on climate adaptation at the international level. In doing so, it aims to clarify the scope and content of the general obligation to adapt fisheries management to climate change.

The international intergovernmental forum for addressing climate change is the United Nations. The international legal framework on climate change adaptation is found in the 1992 UNFCCC, its 1997 Kyoto Protocol,[726] the 2015 Paris Agreement, and decisions adopted by the Parties to these agreements at the annual COP. COP decisions are not formally legally binding, they remain internationally negotiated and agreed policy commitments by the Parties to the UNFCCC and the Paris Agreement to promote the achievement of the objective of those treaties.[727] Together these texts are collectively understood as international climate law (ICL). In examining the adaptation provisions of ICL, this chapter aims to shed light on how the climate regime has dealt with adaptation, how adaptation as a concept has developed over time, and the extent to which the regime applies to the ocean and to fisheries. To achieve these aims, it will analyse its development within the climate framework, and offer insights on how this evolution may continue to develop in the short-term future.[728] It will argue that fisheries and

[725] ibid., 332.
[726] The Kyoto Protocol has effectively been superseded by the Paris Agreement, and although the Protocol itself remains in force, the second commitment period (2013–2020) was not renewed. Considering it is primarily a climate mitigation instrument under the UNFCCC, it is not discussed in any great detail in this thesis.
[727] UNFCCC, Art. 7(2)(g); Paris Agreement, Art. 16(4).
[728] Jan McDonald and Phillipa McCormack, 'Rethinking the Role of Law in Adapting to Climate Change' (2021) 12 WIREs Climate Change e726.

other marine issues are indeed relevant for climate adaptation, but have not been included prominently in the legal regime and architecture of climate adaptation law thus far. However, in light of important recent developments, namely the inclusion of the ocean formally in the UNFCCC policy discussion at COP26,[729] the chapter will conclude that since there is now an official integration of the ocean in international climate fora, there is a clear window of opportunity for marine issues – including national and international fisheries – to be included in the climate-ocean policy discussion at the UNFCCC in the context of adaptation (as well as mitigation and finance). Further developments at COP27 in November 2022 and future COPs may strengthen the call for and development of fisheries and climate change guidelines under the auspices of FAO.

Based on the understanding developed in the last two chapters, the understanding in this thesis is that 'adaptive responses' are CMMs in fisheries that include, for example, allocation of total allowable catches, allocation of quotas, and declaration of MPAs. Section two will, for the purpose of clarity, define key concepts used through the chapter and the remainder of the thesis. Including i) climate adaptation; ii) resilience; iii) vulnerability and adaptive capacity. These are key terms contained in the ICL framework, particularly in Article 7 of the Paris Agreement on adaptation but remain undefined in the Agreement text. Section three offers a critical analysis of the legal nature of climate adaptation as found in ICL. Namely, what are the developments, limitations, and legal impacts of climate adaptation? This will help clarify how adaptation is understood, interpreted, and enforced in ICL and contribute to answering the research question. Section four analyses the findings of Sections 2 and 3 in the context of the ocean and fisheries. It argues that there is a legal relationship between climate adaptation and the ocean in the context of the ocean/climate change legal nexus, but this is limited by lack of inter-institutional cooperation, and this problem could be addressed by further developments under UNFCCC policy discussions calling for greater inter-institutional cooperation. Specifically, it highlights the link between the Paris Agreement and international fisheries, by reference to the systemic interpretation of international fisheries law undertaken in chapter 2. On that basis, the section then argues that adaptation provisions found in ICL do indeed apply to oceans and fisheries, and this is supported the clear interest by ICL institutions such as the Nairobi Work Programme and its work on oceans adaptation, and developments at

[729] UNFCCC, Decision 1/CP.26; Kyoto Protocol, Decision 1/CMP.16; Paris Agreement, Decision 1/CMA.3; Lennan and Morgera, (n 25).

COP26. However, the legal nature of the obligations of climate adaptation are rather weak and lack normative clarity. Despite the clear knowledge gaps in this area, this section points to the notion that coastal States and States who fish on the high seas must include oceans and fisheries in their adaptation components of their national determined contributions (NDCs). And if they participate in RFMO/As the obligations under the climate regime and within States NDCs must be exercised through implementation of CMMs. Developments at COP26 have the potential to strengthen inter-institutional cooperation and may work as a policy driver for the implementation of international adaptive fisheries management measures including the development of FAO guidelines on fisheries and climate change. The fifth section concludes, reflecting on the findings of the chapter and how these have answered the research question so far. It also explains how these findings will inform the next chapter which goes on to look at climate adaptation at an institutional level through RFMO/As.

2. Defining Adaptation and Other Key Concepts

This section defines three key concepts necessary to understanding the legal framework on climate adaptation. These are i) 'adaptation'; ii) 'resilience' and; iii) 'adaptive capacity' and 'vulnerability'. These terms are undefined in the treaty text of the Paris Agreement, or anywhere else in the ICL framework. Article 7(1) of the Paris Agreement established the global goal on adaptation 'of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change' but is silent on what these terms mean.[730] Defining these terms helps establish consensus on the objectives of adaptation,[731] and provides clarity for the rest of this chapter and the remainder of the thesis. 'Vulnerability' is defined only briefly in this section as the vulnerability of marine ecosystems, and fisheries as social/socio-ecological systems to climate change has been discussed in chapter 1.

Initially, the IPCC definitions are introduced here, and then elaborated on with reference to secondary materials. The IPCC definitions can be considered the most authoritative in interpreting the ICL provisions in section 3. This is undertaken for several reasons. First, the IPCC is considered 'the most important source of scientific, technical and

[730] Paris Agreement, Article 7(1).
[731] See Emma L Tompkins and others, 'Documenting the State of Adaptation for the Global Stocktake of the Paris Agreement' (2018) 9 WIREs Climate Change e545.

socioeconomic information on climate change for the UNFCCC'[732] Second, the IPCC is funded in part by the UNFCCC,[733] and is responsible, at the request of the UNFCCC's Subsidiary Body on Scientific and Technical Advice (SBSTA) to provide assessment reports and other work on climate change issues. This includes technical and special reports such as the Special Report on the Oceans and Cryosphere in a Changing Climate, discussed in detail in chapter 1.[734] Importantly, the IPCC does not provide legal or political advice, but does provide unbiased scientific information for Parties to interpret and develop into legal tools.[735] That said, reference to secondary materials provides a deeper understanding of the IPCC definitions and gives greater clarity of the meaning of these concepts in a fisheries context.

2.1 Adaptation

'Climate adaptation' is a necessity in reducing vulnerability and expose to climate change. This is because climate mitigation alone is not enough to address or prevent some of the serious impacts caused by climate change. Chapter one of this thesis explained that, even if there was a totally cessation of GHG emissions today, it can be expected that the effects of historical GHG emissions would still be observed for several decades to come, indicating that adaptation is vital for the actual and potential impacts of climate change.[736] This notion was confirmed by the 2007 report of the IPCC Working Group II, which warned that for current observable impacts, or those in the near future, adaptation is 'the only available and appropriate response'.[737] This includes responses to increases in species range shifts in terrestrial and marine environments across the globe.[738] The contributions of Working Groups I, II and III

[732] CBD Secretariat, *Working Relationship Between the United Nations Framework Convention on Climate Change and the Intergovernmental Panel on Climate Change*, (2012) para. 6; See Ghaleigh, (n 90) and discussion in chapter 1, section 2.1.
[733] As well as UNEP, the WMO and voluntary contributions by Parties. See Memorandum of Understanding between [UNEP] and the [WMO] on the [IPCC], (8 May 1989), available at: <https://www.ipcc.ch/site/assets/uploads/2019/06/MOU_between_UNEP_and_WMO_on_IPCC-1989.pdf>.
[734] IPCC, (n 3).
[735] IPCC, *Principles Governing IPCC Work*, Approved at the Fourteenth Session (Vienna, 1–3 October 1998) on 1 October 1998, amended at the Twenty-First Session (Vienna, 3 and 6–7 November 2003), the Twenty-Fifth Session (Mauritius, 26–28 April 2006), the Thirty-Fifth Session (Geneva, 6–9 June 2012) and the Thirty-Seventh Session (Batumi, 14–18 October 2013), available at: <https://www.ipcc.ch/site/assets/uploads/2018/09/ipcc-principles.pdf>, para. 2.
[736] IPCC, WMO and UNEP, *Climate Change: The IPCC Scientific Assessment. Reported Prepared for Intergovernmental Panel on Climate Change by Working Group I* (Cambridge University Press 1990) at xi; IPCC, 'Primer on climate change and sustainable development': Facts, policy analysis, and applications (Cambridge University Press 2005) 172.
[737] Parry, (n 12) 13; On the IPCC's relationship with the ocean, see Chapter 1.
[738] ibid., Table TS.3, 66.

contributions to the Sixth Assessment Report by the IPCC compounds these warnings and paints an alarming picture of the necessity of adaptation in several contexts, including with dedicated chapters on the ocean.[739] Importantly, the efficacy of adaptation measures are limited by efforts to mitigate climate change. Failure to adequately mitigate GHG emissions will limit the success of adaptation measures and limit States' capacity to adapt.[740] The IPCC has stressed that adaptation and mitigation 'are two complimentary strategies for responding to climate change' and 'both adaptation and mitigation can reduce and manage the risks of climate change impacts.'[741] Measures that achieve both aims are known as 'mitigation-adaption co-benefits', and development plans which combine adaptation and mitigation to realise the goal of sustainable development are known as 'climate-resilient pathways'.[742] This subsection defines climate change adaptation, how it is understood as an evolving concept, and the role of law in facilitating it.

Climate adaptation varies according to the system in which it occurs, who undertakes that adaptation, the climate forces that drive the adaptation, as well as their 'timing, functions, forms and effects.'[743] In particular, adaptation is understood differently depending on whether said adaptation occurs in a human or in a natural system. Adaptation in human systems is 'the process of adjustment to actual or expected *climate* and its effects, in order to moderate harm or exploit beneficial opportunities'[744] However, in natural systems, climate adaptation is understood as 'the process of adjustment to actual climate and its effects' and that 'human intervention may facilitate adjustment to expected climate and its effects'.[745] Since fisheries are understood as social-ecological systems, where management decisions and fishing

[739] Fox Kemper and others, (n 80) 1211; IPCC, *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, (Cambridge University Press 2022); See in particular, IPCC 'Chapter 3: Oceans and Coastal Ecosystems and their Services' in IPCC WGII; IPCC, *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press 2022).
[740] IPCC, (n 3) 80.
[741] ibid., 76.
[742] See generally, IPCC 'Climate-resilient pathways: adaptation, mitigation and sustainable development' in *Climate Change 2014: Impacts, Adaptation and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, (Cambridge University Press 2014) 1101–1131.
[743] IPCC, 'Adaptation to Climate Change in the Context of Sustainable Development and Equity' in IPCC, *Climate Change 2001, Impacts, Adaptation and Vulnerability*, (Cambridge University Press 2001) 879.
[744] IPCC, 'Annex II: Glossary' in Parry and others, (2022) (n 12) 2 (own emphasis).
[745] ibid.

activities are undertaken by humans with impacts of the marine ecosystem.[746] A similar but more detailed definition of adaptation is provided by the UNFCCC website:

> Adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change. In simple terms, countries and communities need to develop adaptation solution and implementation action to respond to the impacts of climate change that are already happening, as well as prepare for future impacts.[747]

These definitions indicate that adaptation is essentially any and all actions, policies, strategies and laws which allow human communities and systems to live with and cope with impacts of climate change. Adaptation ensures – to an extent at least – that human systems can continue to 'live with' the impacts of climate change.[748] Indeed, adaptation that is appropriate will 'contribute to the well-being of current and future populations, the security of assets and the maintenance of ecosystem goods and services now and in the future'.[749] Adaptation efforts operate over a range of scales, (local, regional, national, international),[750] and minor adaptations measures may in themselves be incremental or transformative.[751] Transformational adaptation is defined as '[a]daptation that changes the fundamental attributes of a social-ecological system in anticipation of climate change and its impacts'.[752] Transformational adaptation is encouraged by the IPCC in certain circumstances, for example: '[t]ransformations in economic, social, technological and political decisions and actions can enhance adaptation and promote sustainable development'.[753] However, transformational adaptation may be limited or impossible in existing governance structures, and new governance frameworks or approaches may need to be implemented. For example, the IPCC 2014 Synthesis Report highlighted that:

[746] Carl Folke, 'Social–Ecological Systems and Adaptive Governance of the Commons' (2007) 22 Ecological Research 14; Carl Folke and others, 'Social-Ecological Resilience and Biosphere-Based Sustainability Science' (2016) 21 Ecology and Society 41.
[747] United Nations Climate Change, 'What do Adaptation to Climate change and Climate Resilience Mean?' No date, available at: <https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/what-do-adaptation-to-climate-change-and-climate-resilience-mean>.
[748] Craig, (n 633) 55.
[749] IPCC, (n 742) 79.
[750] ibid., at 76 and 79.
[751] ibid., at 79.
[752] ibid., 'Annex II: Glossary' 3.
[753] ibid., 80; Craig, (n 633) 55–66.

> Transformational adaptation can include introduction of new technologies or practise, formation of new financial structures or systems of governance, adaptation at greater scales or magnitudes and shifts in the location of activities. Planning and implementation of transformational adaptation could reflect strengthened, altered or aligned paradigms and consequently may place new and increased demands on governance structures to reconcile different goals and visions for the future and to address possible equity and ethical implications: transformational adaptation pathways are enhanced by iterative learning, deliberative processes, and innovation.[754]

Transformational governance for ocean biodiversity is already under discussion by scholars and stakeholders, and such a governance approach must of course contain an adaptation component.[755] The importance of scientific cooperation and capacity building to identify adaptation needs and vulnerabilities of coastal and marine ecosystems and the communities that depend on them has also been stressed.[756] This will be further discussed in Section 4.

The understanding of adaptation by the international community has evolved over the past decade from technological- and engineering-focused pathways to 'include more ecosystem-based, institutional and social measures.'[757] The broadening and expansion of the adaptation as shown above allows 'policymakers to consider multiple values (including ethics, fairness and environmental values) simultaneously and to incorporate risk, uncertainty, and trade-off analyses into adaptation planning'.[758] Scenario planning now also features as an increasingly applied tool in adaptation planning, which is beneficial as decision-makers can consider several options under different climate change scenarios which can still provide benefits or transformational change in spite of the uncertainty climate change holds.[759]

Successful adaptation must avoid what is understood as 'maladaptation', defined as:

[754] ibid., 80; See also definition of 'transformational changes' in ibid., 1101, 1107.
[755] See, Erinosho and others, (n 15).
[756] ibid.
[757] IPCC, (n 742) 79.
[758] Craig, (n 24) 55; ibid.
[759] See: Sara S Moore and others, *Scenario Planning for Climate Change Adaptation: A Guidance for Resource Managers* (2013) available at: <http://glslcities.org/wp-content/uploads/2015/09/Scenario_planning_for_climate_change_adaptation_-_A_guidance_for_resource_managers_2013.pdf>.

> 'Actions that may lead to increased risk of adverse climate-related outcomes, including via increased [GHG] emissions, increased or shifted vulnerability to climate change, more inequitable outcomes, or diminished welfare, now or in the future. Most often, maladaptation is an unintended consequence.'[760]

The Organisation for Economic Co-operation and Development (OECD) maintains a similar definition.[761] Maladaptation is, in essence, the opposite of successful adaptation.[762]

Considering the above, there are three main forms of climate change adaptation that can take place. First, 'anticipatory' or 'proactive' adaptation, which occurs before the impacts of climate change are observed.[763] Second, 'autonomous' adaptation, which is defined as '[a]daptation that does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems'.[764] This is also understood as 'passive' or 'spontaneous' adaptation, meaning no normative adaptation took place.[765] In this case, the adaptation happens within existing legal frameworks, and since it is hard to predict if or when autonomous adaptation will occur – or whether it has occurred at all – it cannot be relied on in most cases.[766] This considered, the third form of adaptation is at the fore of this chapter, known as 'planned' adaptation. Planned adaptation is defined as '[a]daptation that is the result of deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is requires to return to, maintain, or achieve a desired state'.[767] Planned adaptation can of course be anticipatory, depending on the nature of the adaptive action and the impact it is responding to. Based on discussions of the regulatory challenges faced because of marine biodiversity redistribution under climate change or shifting fish stocks, planned adaptation is the most appropriate form of adaptation for discussion in this thesis, discussed in the next subsection.

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[760] IPCC, (n 742) 28.
[761] '[B]usiness-as-usual development which, by overlooking climate change impacts, inadvertently increases exposure and/or vulnerability to climate change. Maladaptation could also include actions undertaken to adapt to climate impacts that do not succeed in reducing vulnerability but increase it instead' OECD, *Integrating Climate Change Adaptation into Development Co-operation: Policy Guidance* (OECD Publishing 2009) 53.
[762] See Susanne Moser & Maxwell Boykoff, *Successful Adaptation to Climate Change: Linking Science and Policy in a Rapidly Changing World* (Routledge, 2013).
[763] Field and others, (n 133) "Glossary of Terms" in *Managing the risks of extreme events and disasters to advance climate change adaptation* Special Report of IPCC Working Groups I and II (Cambridge: Cambridge University Press: 2012) 556, 869.
[764] Parry, (n 12).
[765] ibid.; Jonathan Verschuuren, 'Introduction' in Jonathan Verschuuren (ed) *Research Handbook on Climate Change Adaptation Law* (Edward Elgar 2013) 1–15, 6.
[766] ibid.
[767] Parry, (n 12) 896.

2.1.1 Planned Adaptation

Planned climate adaptation in a social-ecological system has two main components. These are 'normative' and 'practical' adaptation. Normative adaptation is understood as creating the legal conditions allowing practical adaptation to occur. Practical adaptation on the other hand is an action. For example, a fisheries management decision granting access to allow a fisher to exploit a different location due to a shifting fish stock. Put simply, the normative facilitates the practical.

What is planned climate adaptation supposed to achieve? Generally, there are three cornerstones as to what climate adaptation should set out to accomplish.[768] The first cornerstone is that the adaptation should reduce the sensitivity of the system (anthropogenic or natural) to climate change. This could include reducing external pressures, such as overfishing. The second cornerstone, any climate adaptation action should alter the exposure of that system to climate change. An obvious example of this is reduction of CO_2 emissions to mitigate ocean warming and acidification. This is also an example of a mitigation-adaptation co-benefit.[769] Third, the adaptation action in question should increase the resilience of the system to cope with future changes.[770] Resilience is defined and discussed in section 2.2. In terms of measuring success, this can be difficult in both the short- and long-term, and 'important factors for success are not only the effectiveness of measures, but also their efficiency and equity and legitimacy.'[771] Achieving the above objectives of planned adaptation is, generally, what would make a successful adaptation action, in that it reduces vulnerability and can realise opportunities that climate change may present, and can be applied across various policy sectors and scales.[772]

[768] W Neil Adger and others, 'Successful adaptation to climate change across scales' (2005) 15 Global Environmental Change 77, 79.
[769] Discussed in the context of RFMOs in chapter 4.
[770] Neil Adger and others, (n 768).
[771] Verschuuren, (n 765) 8; See also Neil Adger and others, ibid., 82.
[772] IPCC, (n 25) 179.

2.1.2 Adaptation in Fisheries Systems

Since the focus of the thesis is on climate adaptation in international fisheries, a brief stocktake of the above discussion in a fisheries context is necessary. Chapter one discussed, based on a systematic literature review, the various adaptive strategies, management responses, and limits to adaptation in fisheries. For context, it is valuable to reiterate some key points. In fisheries systems, achieving successful adaptation can be particularly challenging. This is because it is often necessary to implement adaptive action across jurisdictional scales when exploiting a single stock, while also taking the whole ecosystem into account in line with the obligations analysed discussed in chapter 2. Both in terms of local, national, regional and international management. As well as in the natural sense, where 'different biological and ecosystem processes dominate at different levels', but these issues are not always well understood by resource managers, and there may be considerable knowledge gaps that hinder effective adaptation.[773] This is indicative of the challenges faced in implementing climate adaptive international fisheries management. For example, Miller explored the climate adaptation potential in North-West Pacific salmon fisheries, where several organisations manage salmon across both national and federal boundaries.[774] Miller also found that conflict between management organisations over the salmon stocks was aggravated by climate fluctuations, which limited and disrupted the incentive to cooperate between organisations.[775] Cooperation in international fisheries management and conservation was outlined as both a legal obligation and a practical necessity to ensure the integrity of the stock and protect and preserve the marine environment in chapter 2. The obligation to cooperate will be further discussed in the ICL context in sections 3 and 4 of this chapter. Further, Miller highlighted the fact that there will inevitably be institutional variation in management across organisations. Some may choose to address the cross-scale transboundary nature of the stocks in their management decisions, and others may not account for this at all.[776] These issues will be discussed in detail in the context of RFMO/As in chapter 4.

[773] Neil Adger and others, (n 768) 80.
[774] Kathleen A Miller, 'Pacific salmon fisheries: Climate, information and adaptation in a conflict-ridden context' (2000) 45 Climate Change 37.
[775] ibid.
[776] ibid.

Moreover, since the effects of climate change on the ocean and coastal communities varies depending on location, appropriate adaptation responses will vary. As discussed in chapter one, adaptation measures to warming seas and changes in species ranges and distributions may require changes in quota allocations, reliance of different species, and reduced fishing effort. With regard to conservation of marine biodiversity in response to climate change, MPAs, ABMTs, and climate responsive marine spatial planning are prominent adaptation tools.[777] Adaptation strategies that produce co-benefits with climate mitigation, such as 'protection of ecosystems for carbon storage and other ecosystem services' are encouraged by the IPCC and an important adaptation tool with regards to fisheries and the marine environment.[778] Adaptation in a marine context is discussed in section 3.1, which addresses the growing attention paid to adaptation by the IPCC. After much discussion of systems and governance structures, the next section focuses on the law's role in climate change adaptation.

2.1.3 Adapting to Climate Change: The Role of Law

Adapting to climate change and its impacts requires a mix of actions from managerial, technological, scientific, social and cultural standpoints.[779] The law is integral to facilitating these changes i.e., the normative component of climate adaptation must facilitate the practical component. The importance of a robust legal framework in facilitating adaptation is explained by McDonald:

> A well-functioning legal regime can provide stability in times of rapid change and uncertainty, a principled foundation from which to effect needed reforms, and a mechanism by which to safeguard the rights of disadvantaged individuals and groups in the design and implementation of adaptation options.[780]

[777] Craig, (n 24) 55.
[778] IPCC, (n 742) 90.
[779] See for example, Parry and others, (n 12), chapter 17; Jan McDonald, 'Mapping the legal landscape of climate adaptation' in *Adaptation to Climate Change: Law and Policy* in Timothy Bonyhady and others (eds) (The Federation Press 2010) 1; Robin Craig, 'Stationary is dead – Long live transformation: Five principles for climate adaptation law' (201) 34 Harvard Environmental Law Review 9; Jan McDonald and Megan Styles, 'Legal strategies for adaptive management under climate change' (2014) 26 Journal of Environmental Law 25.
[780] Jan McDonald, 'The role of law in adapting to climate change' (2011) 2 WIREs Climate Change 283.

Importantly, climate change is understood as legally disruptive, meaning that legal systems and frameworks must themselves adapt to this disruption.[781] As discussed above, adaptation can take various forms, and will vary depending on the form of climate stimuli that a natural, social or economic system is responding to. As such, there is variation in legal instruments and their role in facilitating and promoting adaptation.[782] While autonomous adaptation may occur in systems and be undertaken by individuals, as discussed above, autonomous adaptation is generally unreliable. The role that law can play here is the promotion or mandating of certain adaptation activities.[783] However, 'law can also hinder adaptation, when property and other rights undermine efforts to enhance resilience to hazards such as flood, drought, coastal risks, wildfire and heatwave'.[784] Scholars have highlighted the key features of responsive climate adaptation laws needed to achieve the three objectives of planned adaptation; although the focus has been at the national level, as this is where most climate adaptation laws are designed and implemented.[785] Climate adaptation laws must '(i) prepare for, and respond to, change; (ii) address the distributive effects of climate change and adaptation; (iii) promote participation in adaptation processes; and (iv) cross sectors and scales', and that despite several examples at the national level, these principles are applicable at the international or global level, though with different levels of emphasis.[786] As has also been mentioned, above, climate change adaptation may not be possible in a particular governance framework, so may require transformational adaptation. In the marine context, much of the literature has focused on coastal adaptation, such as restoring mangroves, seagrass beds, or the construction of coastal reinforcements to counteract the impacts of sea-level rise.[787] This research is of course vital, as it can foster resilience in vulnerable coastal habitats and communities, ensuring livelihoods are sustained and human rights are maintained. However, few have focused on the legal aspects of climate adaptation and fisheries at an international or national level.[788] Those that have

[781] Fisher, Scotford and Barritt, (n 345).
[782] McDonald and McCormack, (n 728) 1.
[783] ibid., 2.
[784] ibid.
[785] Joseph Wenta, Jan McDonald and Jeffrey McGee, 'Enhancing Resilience and Justice in Climate Adaptation Laws' (2019) 8 Transnational Environmental Law 89, 91.
[786] ibid., the authors make the point on international or global applicability at n 14; See also McDonald, (n 780) 288.
[787] Jonathan Verschuuren and Jan McDonald, 'Towards a legal framework for coastal adaptation' (2012) 1 Transnational Environmental Law 355.
[788] However, see, Marcus Haward, *Governing Oceans in a Time of Change: Fishing for the Future?* (Edward Elgar, 2020); McDonald and Torrrens, (n 45) 227.

indicated shortfalls in terms of directly incorporating climate adaptation into fisheries management policies and legislation and implementation.[789]

2.1.4 Summary

To summarise, climate change causes uncertainty, instability and change in social-ecological systems, making adaptation a necessity. These impacts pose challenges to conventional legal and governance frameworks, which traditionally function to ensure certainty, stability. Marine biodiversity redistribution challenges this stability, meaning that 'we require governance mechanisms that strategically maintain stability while flexibly accommodating rather than rigidly repressing unknown variability sure to arise on a rapidly changing planet.'[790] Climate change pressurises these frameworks by requiring them to adapt to climate impacts (normative adaptation) so that adaptive action can be taken (practical adaptation). The role of law here is to facilitate adaptive action to increase resilience and adaptive capacity of social-ecological systems to climate change. The concepts of resilience, adaptive capacity and vulnerability are discussed in the next two subsections.

2.2 Resilience

Climate change adaptation seeks to build resilience in, and increase the adaptive capacity of, systems in response to the effects of climate change and reduce the vulnerability of those systems. However, resilience is not defined in the Paris Agreement, nor is it defined in any legal instrument relating to fisheries, and so merits discussion establish a definition. Resilience is an ecological concept introduced by Holling in 1973.[791] The greater resilience in a system, the greater the ability of a system to 'spring back' from a particular shock or disturbance.[792] By increasing resilience, it is possible to reduce sensitivity to climate impacts and therefore the uncertainty in a system. In the context of this thesis, resilience can be understood as the capacity

[789] ibid.; Andrea Bryndum-Buchholz and others, 'The status of climate change adaptation in fisheries management, policy, legislation and implementation' (2021) 22 Fish and Fisheries 1248.
[790] Robin Craig and others, 'Balancing stability and flexibility in adaptive governance: an analysis of tools available in U.S. environmental law' (2017) 22 Ecology and Society 3.
[791] Crawford S Holling, 'Resilience and stability of ecological systems' (1973) Annual Review of Ecological Systems 4, 1.
[792] Brian Walker and others, 'Resilience, Adaptability and Transformability in Social-Ecological Systems' (2005) 9 Ecology and Society, available at: <http://www.ecologyandsociety.org/vol9/iss2/art5/>.

of a fishery to cope with the impacts of climate change (i.e., shift in distribution) without the stock collapsing.[793] This subsection will define and discuss the concept(s) of resilience as it relates to interpreting the legal provisions on climate adaptation in section 3.

Previous definitions of resilience by the IPCC did not make a direct link to adaptation,[794] however the latest IPCC WG II report defines resilience as: '[t]he capacity of interconnected social, economic and ecological systems to cope with a hazardous event, trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure. Resilience is a positive attribute when it maintains capacity for *adaptation*, learning and/or *transformation*.'[795] Resilience is embedded in both climate change and disaster risk reduction legal and policy frameworks, and acts as a bridging concept between the two.[796] Moreover, resilience can act 'as a bridging construct between different sectors/disciplines and provide a common agenda' and as was demonstrated in chapter one, provides a link between climate change and fisheries management.[797] For example, the United Nations International Strategy for Disaster Reduction (UNISDR) shares a similar definition of resilience as: '[t]he ability of system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely an efficient manner, including through the preservation and restoration of its essential basic structures and functions'.[798] As too does the OECD, though this is the only definition that makes a clear link to adaptation: the ability of individuals, communities and states and their institutions to absorb and recover from shocks, while positively adapting and transforming their structures and means for living in the face of long-term changes and uncertainty.[799]

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[793] Elena Ojea and others, 'Assessing Countries' Social-Ecological Resilience to Shifting Marine Commercial Species' (2021) 11 Scientific Reports 22926; See chapter 1 which reviews the recent fisheries science literature which adopts the 'resilience perspective'.

[794] E.g., 'The ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions' IPCC, *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: Special Report of the Intergovernmental Panel on Climate Change* (IPCC 2007) 563.

[795] IPCC, (n 26) 37–38.

[796] P Sturgess and R Sparrey (first names not available), *What is Resilience?* (DFID, 2016) 15, available at: <www.gov.uk/research-for-development-outputs/what-is-resilience<www.gov.uk/research-for-development-outputs/what-is-resilience>.

[797] ibid.

[798] See UNISDR, *Terminology on Disaster Risk Reduction* (UNIDSR, 2009) available at: <https://www.preventionweb.net/files/7817_UNISDRTerminologyEnglish.pdfhttps://www.preventionweb.net/files/7817_UNISDRTerminologyEnglish.pdf> at 24.

[799] See OECD, Factsheet: What Does "Resilience Mean for Donors?" (OECD 2010) available at: <https://www.oecd.org/dac/May%2010%202013%20FINAL%20resilience%20PDF.pdfhttps://www.oecd.org/dac/May%2010%202013%20FINAL%20resilience%20PDF.pdf>

As indicated by the UNISDR definition, resilience is also central to disaster risk reduction and is integrated into the Sendai Framework for Disaster Risk Reduction. The Sendai framework is a non-legally binding global agreement which seeks to substantially reduce disaster risk and build resilience 'into policies, plans, programmes and budgets at all levels and to consider both within relevant frameworks'.[800] The Framework establishes voluntary obligations and four priorities for action, including 'investing in disaster risk reduction for resilience'.[801] The framework, alongside the Global Platform for Disaster Risk Reduction complement the Paris Agreement and the SDGs, recognising climate change as a key driver of risk and calling for greater alignment between disaster risk reduction, resilience and adaptation frameworks. Resilience against extreme events can be enhanced through the adoption of comprehensive policies or taking measures to avoid, prepare for, respond to, and recover from the risks of a disaster.[802] Since the focus of disaster risk reduction is to reduce sensitivity and exposure of a system to shocks from extreme events, such as increasingly extreme climate events highlighted in section 2.1, and including marine heatwaves described in chapter 1, its inclusion is valuable here.

Turning to socio/social-ecological systems,[803] which are a concept that 'comprehends the Earth system as consisting of linked biophysical and socio-political arrangements that are inextricably connected'.[804] Based on discussions in chapters one and two, international fisheries fits well in to this conceptualisation. The concept of socio/social-ecological resilience 'is the capacity to adapt or transform in the face of change in social-ecological systems, particularly unexpected change, in ways that continues to support human well-being'.[805] This form of resilience acknowledges the interactions between biophysical and socio-political systems, rather than maintaining a siloed view of the two. This approach allows greater attention to be paid to climate and other impacts which in turn shape resource management strategies.[806] The role of law in achieving socio-ecological resilience has been to apply the law

[800] UNGA, *Sendai Framework for Disaster Risk Reduction* Resolution adopted by the General Assembly on 3 June 2015, A/RES/69/283, para. 2.
[801] ibid., para. 20, Priority 3.
[802] Rosemary Lyster and Robert Verchick, 'Introduction to the Research Handbook on Climate Disaster Law' in Rosemary Lyster and Robert Verchick (eds) *Research Handbook on Climate Disaster Law: Barriers and Opportunities* (Edward Elgar 2018) 2.
[803] 'Socio-ecological' and 'social-ecological' systems are used interchangeably within the literature. Here, the term used in the text changes depending on which studies are being referred to.
[804] Wenta and others, (n 786) 92.
[805] Carl Folke and others, 'Social-ecological resilience and biosphere-based sustainability science' (2016) 21 *Ecology and Society* 57.
[806] Wenta and others, (n 786) 92.

'in an adaptive or structured decision-making framework, and the utility or effectiveness of the laws can be assessed through monitoring', rather than implementing laws or policies as static or rigid objects in ever-changing environments.[807] Garmestani and others have highlighted that existing United States and European Union environmental laws have 'untapped potential' for strengthening resilience in social-ecological systems, allowing for short-term gains to be made in addressing environmental impacts.[808] For example '[e]xisting flexibility in the US Magnuson-Stevens Fishery Conservation and Management Act can allow regional Fishery Management Councils both to adjust catch allowances as ocean water warms and require fisheries to shift their permits to new species as marine fisheries migrate poleward.'[809] Extant flexible provisions in the law can be harnessed facilitate adaptation to changes in fish stocks without the need for legal reform and strengthen the resilience of the community exploiting the stock to environmental change.[810] However there are limitations, 'if the fishing community needs to transform into a completely different economic and cultural identity' which could result from extreme impacts of climate change, then the Magnuson-Stevens Act is of little use.[811] This illustrates both the importance of legal systems facilitating adaptation to climate and other stressors, but also their limitations in the face of those stressors.

At the international level – the focus of this thesis – examples of this approach in fisheries can be found in the application of the EAF and, in particular, the rights-based approach taken by the FAO SSF Guidelines.[812] As such, socio-ecological resilience concerns the capability of a system to maintain key features through reflexivity and adaptation to unprecedented change and disturbance.[813] However, a scientific review found few scientific papers which tested fisheries resilience to climate change across all parts of the system, with most focusing on the ecological dimension.[814] In practicality, a recent study has shown that

[807] Ahjond Garmestani and others, 'Can Law Foster Social-Ecological Resilience' (2013) 18 Ecology and Society, available at: <https://www.jstor.org/stable/26269288>.
[808] Ahjond Garmestani and others, 'Untapped capacity for resilience in environmental law' (2019) 116 PNAS 19899, available at: <www.pnas.org/doi/pdf/10.1073/pnas.1906247116www.pnas.org/doi/pdf/10.1073/pnas.1906247116>; Atlantic States Marine Fisheries Commission, *Management, policy and science strategies for adapting fisheries management to changes in species abundance and distribution resulting from climate change* (2018) available at: <http://www.asmfc.org/files/pub/ClimateChangeWorkGroupGuidanceDocument_Feb2018.pdf>.
[809] ibid., 19901.
[810] ibid.
[811] ibid.
[812] Discussed in chapter 2.
[813] Walker and others, (n 792).
[814] Julia Mason and others, 'Attributed of climate resilience in fisheries: From theory to practice' (2021) 23 Fish and Fisheries 522.

climate adaptation options within national fisheries in North America, Europe, and the South Pacific found a greater focus on *ecological* resilience.[815] Management decisions were more focused on climate change impacts to ensure ensuring the core functions of ecological resilience were ensured, and adaptation of stakeholders in the system to maintain socio-ecological resilience were generally not focused on. [816] This demonstrates a warning that greater implementation of the ecosystem approach will not necessarily improve *social* resilience in a fishery. Another study indicated that greater resource, technical and governance capacities facilitated more options in building social-ecological resilience,[817] a rather obvious point, but one that will be returned to in section 4. Moreover, less-developed countries, generally have fishery systems with lower capacity or a limited legal framework may have greater adaptive capacity and ability to build a more equitable and resilient fisheries system.[818] Finally, a recent study that addressed the social-ecological resilience of two key stocks in the EU concluded that i) high overexploitation status limits the resilience of a fishery; and ii) alike the other studies discussed here, the need to address social and institutional factors to address fisheries adaptation to climate change.[819]

Another concept that dominates academic and practical understandings and approaches to climate change adaptation is 'resilience thinking'.[820] This is based on socio-ecological resilience, and is utilised in several contexts outwith environmental scholarship and management.[821] Resilience thinking is made up of four pillars which are, according to Wenta and others, '(i) socio-ecological systems; (ii) thresholds and regimes shifts; (iii) the adaptive cycle and (iv) cross-scale interactions and panarchy'.[822] While it is not possible to go into greater detail of these pillars for reasons of space, they are discussed at length, along with critiques of resilience thinking, by Wenta and others.[823] The role of resilience thinking in climate adaptation law has been harnessed to examine the preparedness of existing legal

[815] Pamela Woods and others 'A review of adaptation options in fisheries management to support resilience and transition under socio-ecological change' (2021) 79 ICES Journal of Marine Science 463
[816] ibid.
[817] Kristen M Kleisner and others, 'Identifying policy approaches to build social-ecological resilience in marine fisheries with differing capacities and contexts' (2012) 79 ICES Journal of Marine Science 552.
[818] ibid., 17; Kevern L Cochrane and others, 'Primary fisheries management: a minimum requirement for provision of sustainable human benefits in small-scale fisheries' (201) 12 Fish and Fisheries 275.
[819] Ojea and others, (n 793).
[820] Brain Walker and David Salt, Resilience Thinking: Sustaining Ecosystems and People in a Changing World (Island Press 2006) 9–10; Harmut Füngfeld and Darry McEvoy, 'Resilience as a useful concept for climate change adaptation' (2012) 12 Planning Theory and Practice 324.
[821] Wenta and others, (n 786).
[822] ibid., 92.
[823] ibid.

systems to adapt to climate change, identifies gaps and opportunities for adaptation to occur, understands legal frameworks as nested in socio-ecological systems,[824] and that socio-ecological systems often exist across jurisdictional scales.[825]

Clearly, a multi-faceted, iterative, cross-sectoral approach to strengthening resilience is a prerequisite. As outlined in chapter one, resilience of ecosystems is reduced where biodiversity has declined. Therefore, building ecological resilience therefore depends on addressing the cumulative human impacts on the marine environment.[826] There is integration of this concept in marine and fisheries management, for example, MPAs and ABMTs 'can provide climate reference zones and increase ecosystem resilience'[827] FAO's Strategy for Work on Climate Change for example,[828] includes resilience and risk reduction as an adaptation option in climate change and fisheries management as part of the EAF.[829] Moreover, resilience is integral in the UN Sustainable Development Goals (SDGs), notably SDG 14.2, which, by 2020 aimed to 'sustainable manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans'.[830] Resilience is directly relevant to the ocean and fisheries in the context of climate change, and resilience thinking is a valuable approach in exploring the question of where and how other areas of law can inform the obligation of States to adapt fisheries management and conservation to climate change, this will be discussed further in that context in section 4.

[824] Sandi Zellmer and Lance Gunderson, 'Why Resilience May Not Always Be a Good Thing: Lessons in Ecosystem Restoration from Glen Canyon and the Everglades' (2008) 87 Nebraska Law Review 893, 898; Wenta and others, (n 786) 96.
[825] Ahjond Garmestani and others, 'Panarchy, Adaptive Management and Governance: Policy Options for Building Resilience' (2008) 87 Nebraska Law Review 1036, 1049–51.
[826] Yoshifumi Takei, 'Climate change and high seas fisheries' in MacDonald and others, (n 41) 114, 115; See also, United Nations, (n 6) paras. 33–38;
[827] CCAMLR, *Report of the Thirty-Seventh Meeting of the Commission*, Hobart, Australia 22 October – 2 November 2018, CCAMLR-XXXVII, <https://meetings.ccamlr.org/system/files/e-cc-xxxvii.pdfhttps://meetings.ccamlr.org/system/files/e-cc-xxxvii.pdf>, para. 8.17.
[828] FAO, Doc. COFI/2016/Inf.17.
[829] FAO, *State of World Fisheries and Aquaculture 2018* (FAO 2018) 134–136; See also section 4 on including fisheries in National Adaptation Plans.
[830] See United Nations SDG Website, no date, available at: <https://sdgs.un.org/goals/goal14>; SDGs 9 and 11 also promote resilience in the context of sustainable infrastructure and resilient cities and human settlements, respectively.

2.3 Adaptive Capacity and Vulnerability

The success of adaptation depends on the adaptive capacity or 'adaptability' of a system or region to cope with the risks and impacts of climate change. Adaptive capacity is defined by the IPCC as '[t]he ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.'[831] This capacity varies considerably among systems and regions, and varies over time depending on climate impacts. For context, systems or groups which have high exposure to climate extremes have limited adaptive capacity. The cumulative effects of climate change and overexploitation on marine ecosystems may be beyond the adaptive capacity of many species or the entire ecosystem, limiting their ability to adapt to change.[832] For example, 'systems with low adaptive or transformative capacity, like the Newfoundland cod fishing communities of the 1980s and 1990s, collapse in the face of change',[833] or by comparison the lobster fishery example discussed in chapter 1 (section 4.2). Considering adaptive capacity in the context of the above discussion, for the purposes of this chapter and the rest of the thesis, adaptive capacity is understood as the potential of a socio-ecological system to alter its resilience in response to climate change to maintain the extant social-ecological regime. A system with high adaptive capacity is 'more likely to retain resilience given substantial episodes of change'.[834]

Enhancing adaptive capacity is necessary to reduce vulnerability, for systems most at risk to climate change, and any activity required for advancing adaptive capacity are those which promote sustainable development.[835] Vulnerability has been described as the 'degree to which a system is susceptible to injury, damage or harm'[836] in other words 'the capacity to be wounded'[837], and the vulnerability of a given system is defined by i) its physical exposure to climate change; and ii) its ability to adapt to that change.[838] Decisions, activities and

[831] Parry and others, (n 12) 869.
[832] See discussion in Chapter 1.
[833] Garmestani and others, (n 804) 19899; Ransom A Myers and others, 'Why do fish stocks collapse? The example of cod in Atlantic Canada' (1997) 7 Ecological Application (1997) 91.
[834] Garmestani and others, ibid.; David G Angeler and others, 'Adaptive capacity in ecosystems' (2019) 60 Advances in Ecological Research 1.
[835] IPCC, (n 742) 879.
[836] ibid., 894; Barry Smit and others, 'The science of adaptation: a framework for assessment' (1999) 4 Mitigation and Adaptation Strategies for Global Change 199.
[837] Robert Kates, and others (eds), *Climate Impact Assessment: Studies of the Impact of Climate and Society* (Wiley 1985).
[838] IPCC, (n 794), 894.

programmes must take into account climate impacts and risks associated with climate variability and change. Including risks in design and implementation of management decisions in social-ecological systems such as fisheries, for example, can reduce the vulnerability of the fisheries system and enhance sustainability.[839]

2.4 Summary Conclusions

This section has discussed and defined the key concepts necessary prior to the international legal analysis that will follow in the next section of this this chapter. It has explored the concepts of adaptation, resilience, adaptive capacity and vulnerability. This section has indicated that adaptation involves responding to climate change by assessing impacts, vulnerability and risk; planning and implementing adaptation to enhance resilience and adaptive capacity; making contingency arrangements for when impacts occur; addressing losses; and monitoring and evaluating adaptation. Adaptation is also an evolving concept and an iterative social process,[840] and the sufficiency or efficacy of any adaptation law or action are limited by weak institutions or poor governance.[841] This is, of course, necessary as conditions change over time and new lessons are learned from successful and maladaptive policies, actions and laws. However, at present, the majority of climate adaptation occurs at the local and regional scale, and are tailored to national and local needs and operationalised through those legal frameworks. This is evidence by the fact that much of the literature referred to in this section and much of the scholarly understanding of the legal and scientific aspects of climate adaptation come from a national level. There are limitations on how international law can effectively address adaptation (the limitations of international fisheries law to address the effects of climate change have, for example, been discussed in chapter 2). The legal obligations of climate adaptation at the international level is addressed in the next section.

[839] ibid., 888.
[840] Johanna Wolf, 'Climate change adaptation as a social process' in James D Ford and Lea Berrang-Ford (eds), *Climate Change Adaptation in Developed Nations: From Theory to Practice, Advances in Global Change Research* (Springer 2011) 21.
[841] Bellard and others, (n 221).

3. Adaptation in International Climate Law

After a lengthy discussion on the key concepts of climate adaptation, this section seeks to clarify the international legal nature of climate change adaptation as it is found in ICL. As introduced above, provisions on climate adaptation are found within ICL, the corpus of which is the UNFCCC, the Kyoto Protocol, and the Paris Agreement, as well as the related COP decisions formally adopted by States Parties to the UNFCCC and the Paris Agreement. Adaptation was present from the outset in the adoption of UNFCCC, established as the second pillar of the international climate change legal framework, with mitigation as the first.[842] Adaptation did not play a prominent role, however, in the first 15 years of negotiations at UNFCCC COPs, or institutional processes, and only came to the fore at the COP in Bali, Indonesia in 2007. This initial focus by the international community on climate mitigation the abatement of GHG emissions appears that the focus of the scientific community at that time was abatement of GHGs.[843]

This notion is supported by the content of the IPCC's reports prior to 2007.[844] These reports stressed GHG mitigation as a priority, and paid little to no attention to adaptation, or other topics such as equity, vulnerability or human rights.[845] This could be understood by the fact that at this point there was arguably ample time to address the major impacts of climate change through mitigation alone. Indeed, some have argued that climate adaptation was viewed as a defeatist approach around the time the UNFCCC entered in to force in 1994 where, in some cases 'the discourse surrounding adaptation implied that it betrays an arrogant faith in the capacity of nature and human systems to adapt, and that it could siphon attention and energy away from the urgent problem of reducing emissions.'[846] Nowadays, it has been argued that

[842] It has been argued that the Paris Agreement added a third pillar: 'loss and damage', this will not be discussed here at great length, but see Morten Broberg and Beatriz Martinez Romera (eds), *The Third Pillar of International Climate Change Policy: On 'loss and Damage' after the Paris Agreement* (Routledge 2021); Patrick Toussaint, 'Loss and Damage and Climate Litigation: The Case for Greater Interlinkage' (2021) 30 Review of European, Comparative & International Environmental Law 16; Rosemary Lyster, *Adaptation, Loss and Damage and Climate Justice* (Edward Elgar Publishing 2022).

[843] E Lisa F Schipper, 'Conceptual History of Adaptation in the UNFCCC Process' (2006) 15 RECIEL 82, 82.

[844] See IPCC, no date, available at: <www.ipcc.ch/reports/>.

[845] Robert W Kates, 'Climate change 1995: Impacts, adaptations and mitigation' (1997) 39 Environment: Science and Policy for Sustainable Development 29, cited in Schipper (n 840) 82 (fn 6).

[846] United Nations Climate Change Secretariat, *25 Years of Adaptation under the UNFCCC - Report by the Adaptation Committee* (2019) Available at: <https://unfccc.int/sites/default/files/resource/AC_25%20Years%20of%20Adaptation%20Under%20the%20UNFCCC_2019.pdf> 11; See also Katy Carlyle, 'NEPA and CEQA: Effective Legal Frameworks For Compelling Consideration of Adaptation to Climate Change - Note by Katherine M. Baldwin' (2009) 18 Southern California Law Review 769, 783.

'[t]he need for adaptation is no longer a policy pariah or theoretical future imperative but an immediate and urgent climate policy goal.'[847] The legal nature of the UNFCCC as a 'framework-protocol' model of multilateral environmental agreement,[848] has however been beneficial in regards to developing climate adaptation law and policy in ICL fora, which, as we will see, has developed substantially in the past decade.

The structure of this section is organised into five subsections. First, the growing urgency of climate adaptation both generally, and in the marine environment and fisheries is outlined through the mounting evidence of the need for adaptation to climate impacts based on subsequent IPCC and other reports over the past decade (section 3.1). Then, the adaptation provisions of the UNFCCC (3.2), developments in the post-Kyoto period (3.3) and the Paris Agreement and beyond (3.4) are outlined, analyses and critiqued. This section seeks to clarify what Parties are required to do in order to comply with their adaptation commitments under ICL. It will elaborate on the nature of the key principles of climate adaptation law in ICL, as well as the institutional architecture applicable to climate adaptation i.e., the bodies that deal with, or are responsible for climate adaptation under ICL. This includes information about the various funds that are either directly related to adaptation or are indirectly related thereto, which makes up what is understood as "adaptation finance". The final subsection (3.5) offers the preliminary conclusions that climate adaptation law has developed considerably in recent years, and will continue to develop in the short-term. This strengthens the argument that there is no apparent legal barrier for the inclusion of the marine environment or fisheries as adaptation priorities for States. This sets the tone for the final section of this chapter, which examines avenues for inclusion of the ocean and fisheries within the UNFCCC policy discussion and work of constituted bodies. This includes analysis of landmark developments at COP26, and the extent to which this can inform and strengthen the obligation to adapt international fisheries management and conservation to climate change. The central argument for taking this approach is to demonstrate how the prioritisation of adaptation has changed over time, from a purely developing country issue to a global goal.

[847] McDonald and McCormack, (n 725) 1.
[848] Bodansky, Brunnée and Rajamani, (n 630) 57.

3.1 The Growing Urgency of Adaptation

Climate adaptation developments in international law and policy have increased considerably over the past decade. This development has been through the negotiation of new legal instruments and COP decisions which have a linear relationship with increasing extreme climatic events, and major scientific synthesis reports outlining and warning of the impacts of climate change. The IPCC have played an important role in this after stressing the necessity of adaptation since 2007, and warning that for current observable climate impacts, or impacts that will show in the very near future, adaptation is 'the only available and appropriate response'.[849] Since then, there have been several IPCC reports outlining key trends in well-established climate science, in conjunction with extreme weather events and rapid trends in warming, including in the marine environment.[850] This subsection briefly outlines the increasing attention paid to adaptation within IPCC and other intergovernmental reports over time, including references made to adaptation in a fisheries or marine context. This provides context in understanding the greater attention paid to adaptation in recent years, and strengthens the argument that in order to fully comply with the obligation to follow the best available science under international fisheries law, it is necessary that this science informs adaptive climate action.

An array of international climate synthesis reports have documented changes in the climate, provided projections of future impacts, assessed necessary adaptation requirements, and outlined developing adaptation practices. For example, the IPCC's report on 'Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation' in 2012 was a marked development in the reporting of climate change.[851] The report made a clear connection between risk management for disasters and climate adaptation.[852] This is reflected in the UNISDR definition in section 2.2 which links adaptation, resilience, and disaster risk reduction.[853] The report highlighted for the first time the need to reduce and limit exposure and vulnerability of natural systems and society, and to increase resilience as the adverse impacts of climate change continue through *inter alia* international cooperation and integration across

[849] Parry and others, (n 12) 19 and 65–69; See also section 2.2 of this chapter.
[850] See generally IPCC, (n 3).
[851] IPCC, (n 794).
[852] ibid., Chapter 1.
[853] See section 2.2 of this chapter.

scales.[854] The IPCC's Fifth Assessment Report in 2013 made clear that 'heroic efforts in the field of both mitigation and adaptation are required in order to avoid the worst case-scenarios'[855] it also indicated the emerging global trend of integration of climate adaptation into national planning processes, but with limited implementation.[856] The report stressed that adapting to climate change impacts are cross-cutting or overlapping, and warned of the troubling impacts of climate change on the ocean and the need for adaptation in the marine environment, and sectors which rely on it.[857] Since then, three special reports have been released by the IPCC which cover the impacts of global warming over 1.5°C pre-industrial levels,[858] the ocean and the cryosphere,[859] and climate change and land.[860]

Building on the discussion in section 2, chapter five of the Special Report on the Ocean and Cryosphere in a Changing Climate, titled 'Changing Ocean, Marine Ecosystems and Dependent Communities', contained for the first time, a detailed focus not only on climate impacts in the marine environment, but stressed the important of ocean-based adaptation as a risk reduction response to climate change. However, much of the adaptation component of this report focused on coastal adaptation, building resilience, and reducing risk for coastal communities. This is understandable, since the majority of the global human population lives in coastal regions in proximity to the marine environment and rely on the ecosystem services it provides.[861] Adaptation in areas beyond national jurisdiction is highlighted as a challenge, and that effective governance approaches to adaptation in these areas require further study.[862] The Special Report on the Ocean and Cryosphere defined key ocean-based adaptation responses within ecosystem and human systems as:

- *Nature-based* or *ecosystem-based adaptation* (EbA) 'The use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change.

[854] IPCC, (n 794) Chapter 7.
[855] Catharine Ramstad Wenger, 'Adaptation' in Geert Van Calster and Leonie Reins (eds), *The Paris Agreement on Climate Change* (Edward Elgar Publishing 2021) 174.
[856] Stocker and Qin, (n 86).
[857] Hans-Otto Pörtner and David Karl, Coordinating Lead Authors, 'Oceans Systems' in ibid.
[858] IPCC, (n 97).
[859] IPCC (n 3).
[860] IPCC, *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* edited by P. R. Shukla and others, (Cambridge University Press 2019).
[861] Mark R Payne and others, 'Climate Risk to European Fisheries and Coastal Communities' (2021) 118 Proceedings of the National Academy of Sciences e2018086118.
[862] IPCC, (n 3) 455 and 540.

- *Human systems – Socio-institutional adaptation* - Adaptation responses within human social, governance and economic systems and sections[863]

While the above adaptation responses draw mostly on coastal adaptation literature, both points build on and further clarify the definitions in section 2 of this chapter, and are relevant for understanding climate adaptation in international fisheries management on the high seas in response to climate change. These points will be returned to in chapter 4 this thesis.

For the first time, the Special Report contained a section on adaptation in fisheries and aquaculture,[864] including a review of climate impacts on fisheries.[865] With regards to adaptation in fisheries to the regulatory challenges that climate change presents,[866] the report emphasised the need for cooperative management between States informed by reliable scientific predictions of stock movements, cooperative flexible fisheries arrangements to improve robustness of international fisheries management.[867] Building on these points, the Special Report stated:

> [A]lthough range shifts pose significant challenges to transboundary fisheries management, proactive planning and adjustment of fisheries management arrangements, informed by scientific projects, could help improve adaptive capacity (*medium confidence*). The effectiveness of incorporating MPAs as an adaptation strategy to climate change can be improved by considering climate impacts in the design of MPAs (*medium, high agreement*).[868]

Several adaptive governance responses to support adaptation in fisheries are also put forward in the report. These include 'conducting vulnerability assessments, improving monitoring, and evaluating management strategies' as well as socioeconomic considerations that should shape adaptive responses in coastal communities, such as gender, religion, mobility and access to alternative income.[869] The link between stock recovery and food security is made, and that certain adaptation options – such as expanding fishing grounds to accommodate for range shifts

[863] ibid., see wealth of literature cited to support these definitions in the report.
[864] ibid., 534–536.
[865] Covered in detail of chapter 1.
[866] See chapters 1 and 2.
[867] IPCC, (n 3) 534–536.
[868] ibid., 535.
[869] ibid.

or other climate impacts – excludes small-scale fishers due to increased running costs, which has implications for human rights.[870] Another key point from the Special Report which supports the line of investigation in this thesis is that '[t]he current international regulatory framework for fisheries management has a responsiveness gap, since it does not fully incorporate issues related to the fluctuating and changing distribution of fisheries', that current governance arrangements for high seas fisheries are being rendered ineffective in the face of a changing climate, and that adaptation is needed to enhance resilience of marine capture fisheries.[871]

The recent Sixth Assessment Report from the IPCC in 2021 stressed immediate global action on adaption to climate change is vital.[872] It also reiterates the need for adaptation in fisheries and the marine sector. These IPCC reports, and the World Meteorological Organisation's 'State of the global Climate 2020' report, have emphasised that scaling up adaptation is an urgent need, but that adaptation becomes increasingly difficult as global warming increases. [873] Moreover, the Working Group II contribution, released in February 2022, stressed the urgency of adaptation, recognised the interdependence of climate, biodiversity and ecosystems, and human societies, and highlighted that the implementation of adaptation measures 'depends upon the capacity and effectiveness of governance and decision-making processes.'[874]

In addition to these successive scientific synthesis reports stressing the necessity of adaptation, sectoral reports by various international bodies have stressed the need for scaling up adaptation. For example the Intergovernmental Platform on Biodiversity and Ecosystem Services and the IPCC produced a scientific assessment report on the impact of climate change

[870] ibid.; Belhabib and others, 'Overview of West African fisheries under climate change: Impacts, vulnerabilities and adaptive responses of the artisanal and industrial sectors' (2016) 71 Marine Policy 12.
[871] IPCC, (n 3) 541.
[872] Fox-Kemper and others, (n 105).
[873] WMO, 'State of the Global Climate 2022 – Unpacking the indicators' no date, available at: <https://public.wmo.int/en/our-mandate/climate/wmo-statement-state-of-global-climate#:~:text=The%20global%20mean%20temperature%20for,warmest%20years%20on%20record%20globally.&text=All%20five%20of%20these%20data,three%20warmest%20years%20on%20recordhttps://public.wmo.int/en/our-mandate/climate/wmo-statement-state-of-global-climate#:~:text=The%20global%20mean%20temperature%20for,warmest%20years%20on%20record%20globally.&text=All%20five%20of%20these%20data,three%20warmest%20years%20on%20record>.
[874] Hans-Otto Pörtner and others, Drafting Authors, 'Summary for Policymakers' in *Climate Change 2022 Impacts, Adaptation and Vulnerability. Working Group II contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press 2022) 1, Chapter 3: 'Ocean and coastal ecosystems and their services' and cross-chapter paper 1 'Biodiversity hotspots (land, coasts, and oceans)' are discussed in Chapter 1 of that report

on biodiversity and adaptation pathways and options.[875] Investment in infrastructure for adaptation has been called for by the International Labour Organization in 2018.[876] This investment should protect incomes and works, and facilitate the development of policies to enable a just transition to a 'climate-resilient economy'.[877] In addition, climate change has been identified as an existential threat to world heritage and highlighted that national laws implementing the World Heritage Convention,[878] must have adaptation components to protect cultural heritage.[879] Finally, the latest UNEP Adaptation Gap Report highlighted the need for an increase in adaptation finance, and that implementation of adaptation at the national level was slowly improving.[880]

These reports indicate the growing urgency and impetus for adaptation, and a call for a greater integrated approach in adaptation planning and implementation to include fisheries, ecosystems, and biodiversity. This also provides context for next sections on the development of adaptation in an ICL context and is illustrative of the interaction of science and international environmental law which, as supplied in the introduction – is the methodological approach of this thesis. Having briefly contextualised climate adaption through recent historical developments in scientific and sectoral reports, the next section will shed light on how the normative aspect of climate adaptation has developed within the ICL framework over time.

3.2 Adaptation in the UNFCCC

The purpose of this section is to critically analyse the obligations of climate change adaptation, under ICL. To do so, it will outline and analyse the climate adaptation provisions of the UNFCCC. The objective of the UNFCCC is the:

[875] IPBES and IPCC, *IPBES-IPCC Co-sponsored workshop: Biodiversity and Climate Change - Scientific Outcome* (no date) available at: <https://ipbes.net/sites/default/files/2021-06/20210609_scientific_outcome.pdfhttps://ipbes.net/sites/default/files/2021-06/20210609_scientific_outcome.pdf>.
[876] International Labour Organization (ILO), *The Employment Impact of Climate Change Adaptation – Input Document for the G20 Sustainability Working Group* (ILO 2018) <www.ilo.org/wcmsp5/groups/public/---ed_emp/documents/publication/wcms_645572.pdf>.
[877] ibid.
[878] Convention for the protection of the world cultural and natural heritage, Paris 16 November 1972, in force 9 March 1977, 1037 UNTS 151.
[879] IUCN, *World Heritage Outlook 3* (IUCN 2020) available at: <https://portals.iucn.org/library/node/49134>.
[880] UN Environment, 'Adaptation Gap Report 2021' (UNEP 2021) available at: <http://www.unep.org/resources/adaptation-gap-report-2021>.

> stabilization of [GHG] concentrations in the atmosphere to a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change.[881]

The guiding principles contained in Article 3 UNFCCC mention adaptation as a policy objective to guide Parties in achieving Article 2. Developed countries are expected to 'take the lead in combating climate change and the adverse effects thereof',[882] and developing country parties which are vulnerable to the effects of climate change should be given 'full consideration' by developed countries when implementing measures to combat climate change.[883] Precautionary measures, including adaptation, should be taken by Parties 'to anticipate, prevent or minimize the cause of climate change', and such efforts should be carried out cooperatively by interested Parties. [884] Additionally, the general principles of the UNFCCC: equity, solidarity, precaution, sustainability and good neighbourliness apply to adaptation as well as mitigation.[885] Article 4 UNFCCC contains general commitments on all Parties and has multiple provisions concerning adaptation. For example, all Parties must:

> formulate, implement, publish, and regularly update national, and where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gas not controlled by the Montreal Protocol, and measures to facilitate adequate adaptation to climate change.[886]

A clearer adaptation commitment is found in UNFCCC Article 4.1(e). Parties must '[c]ooperate in preparing for adaptation to the impacts of climate change; develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture'.[887] Moreover, all Parties must also:

[881] UNFCCC, Art. 2.
[882] ibid., Art. 3(1).
[883] ibid., Art. 3(2).
[884] ibid., Art. 3(3).
[885] ibid., Art. 3, Sections 1–5; Jonathan Verschuuren, 'Climate Change Adaptation under the United Nations Framework Convention on Climate Change and Related Documents' in J Verschuuren (ed), *Research Handbook on Climate Change Adaptation Law* (Edward Elgar 2013) 16; Peter PJ Driessen and Helena FMW van Rijswick, 'Normative Aspects of Climate Adaptation Policies' (2011) 2 Climate Law 559.
[886] UNFCCC, Art. 4(1)(b).
[887] ibid., Art. 4(1)(e).

> [T]ake climate change considerations into account, to the extent feasible, in their relevant social, economic, and environmental policies and actions, and employ appropriate methods, for example impact assessments, formulated. Determined nationally, with a view to minimizing adverse effects on the economy, on public health and on the quality of the environment, of projects or measures undertaken by them to mitigate or adapt to climate change.[888]

Parties have also committed to promote and cooperate in research (scientific, technological, technical, socio-economic and other research) on climate change to further understanding and reduce uncertainties on the causes, effects and scale of climate change,[889] and exchange information on this matter.[890] As well as to promote and cooperate in education, training and public awareness on climate change, including adaptation.[891] Developed country Parties in Annex I and other developed country Parties included in Annex II to the UNFCCC have committed to further adaptation obligations. These include assisting 'the developing country Parties who are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects'.[892] In addition, these Parties are under technology transfer obligations detailed in Article 4(5) UNFCCC which 'not only apply to mitigation technologies, but also to technologies and know-how necessary to implement adaptation measures.'[893] Further, Parties are obliged to 'give full consideration' to the specific needs of developing country Parties including small island states and countries with fragile ecosystems.[894] Article 5, concerning research and systematic observation, and Article 6 (education, training and public awareness) of the UNFCCC apply to adaptation as well as mitigation. There are two subsidiary bodies established by the UNFCCC, the SBSTA and the Subsidiary Body for Implementation (SBI) which both have adaptation issues within their competence.[895] These bodies, among others will be discussed in the context of fisheries and ocean ecosystems in Section 4.

The above considered, the UNFCCC arguably set out to deal with adaptation on equal footing as mitigation. Adaptation features rather prominently in the UNFCCC's provisions;

[888] ibid., Art. 4(1)(f).
[889] ibid., Art. 4(1)(g).
[890] ibid., Art. 4(1)(h).
[891] ibid., Art. 4.(1)(i).
[892] ibid., Art. 4.4.
[893] Vershuuren, (n 885) 18–19; UNFCCC, Art. 4(5).
[894] UNFCCC, Art. 4(8); See also discussion on UNCLOS Article 194(5) in chapter 2.
[895] UNFCCC, Arts. 9 & 10.

however, they lack specificity and normative content, and adaptation is not mentioned in a single COP decision until 2001.[896] Indeed, adaptation in international climate policy was to be developed rather slowly over several years. The analysis in this section has indicated that there is not a huge amount of clarity provided by the adaptation obligations under the UNFCCC for the purposes of answering the research question of the thesis thus far. However, alike UNCLOS the UNFCCC is a framework agreement, but unlike UNCLOS, and its provisions are supplemented and clarified by subsequent COP decisions and establishment of processes and institutions. The next section analyses processes and institutions under the UNFCCC which are relevant for adaptation.

3.3 Adaptation Processes and Institutions under UNFCCC

Having outlined the limited obligations under the UNFCCC, this section seeks to establish which processes and institutions under the UNFCCC relevant to adaptation are available to Parties to assist them in complying with their adaptation obligations under the UNFCCC. This is relevant to the research question of the thesis in that it maps out where and how rules and standards for adaptation are developed and agreed in order to inform the obligation to adapt fisheries management and conservation to climate change. The section is divided in to five subsections which cover national adaptation plans (NAPs) (3.3.1); the Nairobi Work Programme (3.3.2); the Cancún Adaptation Framework (3.3.3); the Adaptation Committee (3.3.4); and adaptation funding (3.3.5) before summarising and moving on to adaptation obligations under the Paris Agreement.

3.3.1 National Adaptation Plans

The key component of climate adaptation under the UNFCCC is the National Adaptation Planning (Process) established at the COP in Durban in 2011.[897] This processes aids States in fulfilling their obligation under UNFCCC to formulate, implement and publish measures to facilitate adequate adaptation to climate change,[898] and marks the movement from National Adaptation Programmes of Action (NAPAs) – which were focused on least developed

[896] UNFCCC, Decision 28/CP.7.
[897] ibid., Decision 5/CP.17.
[898] ibid., Arts. 4.1(b); 4.1(e).

countries (LDCs) – to NAPs which focus on both developed and developing country Parties to help identify and address their adaptation needs in the medium to the long term.[899] NAPAs are not covered here as State practice indicates they are no longer submitted or updated any more the last submission was in 2017 by South Sudan.[900] There are few fisheries or marine components within the submitted NAPAs, however, Timor-Leste's NAPA, submitted in 2010, highlighted the risk climate change poses to the protection and preservation of their marine environment, and to their fisheries sector, and that these were national adaptation priorities.[901]

With the discussion in section 2 in mind, the agreed objectives of the NAP process are:

(a) To reduce vulnerability to the impacts of climate change, by building adaptive capacity and resilience.

(b) To facilitate the integration of climate change adaptation, in a coherent manner, into relevant new and existing policies, programmes and activities, in particular development planning processes and strategies, within all relevant sectors and at different levels as appropriate.[902]

It was agreed that adaptation planning at a national level 'is a continuous, progressive and iterative process, the implementation of which should be based on nationally identified priorities, including those reflected in the relevant national documents, plans and strategies, and coordinated with national sustainable development objectives, plans, policies and programmes',[903] and that process should be country-driven.[904] Laid out in an Annex to the Durban COP Report, general guidelines on NAPs for the benefit of LDCs are given as to what activities can be undertaken, including addressing gaps and assessment of development needs, as well as preparatory elements, implementation strategies, and reporting, monitoring and reviewing of the adaptation planning process.[905] Further clarity was given, when by request of

[899] ibid.
[900] All 51 NAPAs submitted to the UNFCCC Secretariat can be viewed here UNFCCC, 'Submitted NAPAs' UNFCCC, no date, available at: <https://unfccc.int/topics/resilience/workstreams/national-adaptation-programmes-of-action/napas-receivedhttps://unfccc.int/topics/resilience/workstreams/national-adaptation-programmes-of-action/napas-received>.
[901] ibid.; See also Saleem Huq and Mizan R Khan, 'Equity in National Adaptation Programs of Action (NAPAs): The Case of Bangladesh' in W Neil Adger and others, *Fairness in Adaptation to Climate Change* (MIT Press 2006) 199 for a detailed account of the NAPA process.
[902] UNFCCC, (n 897) para. 1.
[903] ibid., para. 2.
[904] ibid., para. 4.
[905] UNFCCC, Decision 5/CP.17.

the COP in Doha in 2012, the Least Developed Countries Expert Group (LEG) developed technical guidelines for the NAP process.[906] The Least Developed Countries Expert Group (LEG) was established at COP7.[907] The LEG's mandate is to support LDCs on adaptation planning and implementation under the UNFCCC, and to 'meet the urgent and immediate adaptation needs of [LDCs]'.[908] The LEG Meets biennially and reviews progress on the implementation of its work programme,[909] and has its mandate extended up until 2031.[910]. The LEG assists with national adaptation plans NAPs under the Paris Agreement, which is discussed in more detail in this context in section 3.4.4.

Indicating an alignment with the literature discussed in section 2, the NAP guidelines also highlight that adaptation can be viewed as an adjustment, process or outcome, and the 'framing' of adaptation will be dependent on an individual and case-by-case basis.[911] As discussed in section 2, no definition is given to adaptation, adaptive capacity, resilience, or vulnerability in the ICL framework. The second paragraph is worded generally to include any activity that may be affected by climate change. Again, we are presented with clearer guidance of the aims and objectives of climate adaptation for parties. While the neither the ocean nor fisheries is explicitly mentioned, neither is any other sector, and thus there is no barrier to implementing adaptive measures in the marine sector should a party deem it necessary.[912]

Moreover, considering the encouragement from the UNGA for States to established climate adaptation plans for fisheries discussed in chapter 2, it appears that since States are already obliged to plan, implement and report adaptation action, the NAP process under the UNFCCC can already be utilised for this purpose to support better integration between fisheries and climate change in an adaptation context. We turn next to significant developments in

[906] ibid., paras. 15–16; see also UNFCCC, 'Guidelines for National Adaptation Plans (NAPs)' no date, available at: <https://unfccc.int/topics/adaptation-and-resilience/workstreams/national-adaptation-plans-naps/guidelines-for-national-adaptation-plans-napshttps://unfccc.int/topics/adaptation-and-resilience/workstreams/national-adaptation-plans-naps/guidelines-for-national-adaptation-plans-naps>.
[907] UNFCCC, Decision 29/CP.7; See also 5/CP.7.
[908] UNFCCC, Decision 19/CP.7, Annex, para. 1.
[909] ibid., Annex, para. 7.
[910] UNFCCC, Decision 15/CP.26, paras. 1–2; UNFCCC, Decision 19/CP.21.
[911] Least Developed Countries Expert Group, *National Adaptation Plans - Technical guidelines for the national adaptation plan process* (UNFCCC 2012) available at: <https://unfccc.int/files/adaptation/cancun_adaptation_framework/application/pdf/naptechguidelines_eng_high__res.pdfhttps://unfccc.int/files/adaptation/cancun_adaptation_framework/application/pdf/naptechguidelines_eng_high__res.pdf> 12.
[912] See discussion in section 4.

climate adaptation law through the establishment of the Nairobi Work Programme and explain its role and function.

3.3.2 The Nairobi Work Programme

The Nairobi Work Programme on impacts, vulnerability and adaptation to climate change (NWP) was established at COP11 in 2005 in Montréal after requests by Parties to the LEG to 'develop a work programme that includes implementation of [NAPAs] for consideration by the [SBSTA] at its twenty-fourth session (May 2006)'.[913] The NWP was formally adopted at COP12 in 2006 in Nairobi, Kenya.[914] Instead of framing adaptation from an LDC lens, the conceptual focus of adaptation through the NWP was on sharing knowledge and lessons learned between States. The NWP operates under the SBSTA of the UNFCCC, and assists all Parties, but particularly LDCs in:

i) Improving their understanding and assessments of impacts, vulnerability and adaptation to climate change; and

ii) Making informed decisions on practical adaptation actions and measures to respond to climate change on a sound scientific, technical, and socio-economic basis, taking into account current and future climate change and variability.

A key feature of the NWP is the strengthening of the stakeholder engagement mechanism. This was first established under UNFCCC and has over 380 partner organisations, including academic and research institutions, private sector entities, regional centres, or networks, as well as non-governmental and civil society organisations. This is advantageous as it serves to 'bridge' the technical aspects of climate change adaptation between Parties, constituted bodies under ICL, and non-party stakeholders to share and disseminate knowledge and experience on adaptation and vulnerability. This also facilitates collaboration – Parties can work with experts and partners to identify adaptation needs, produce knowledge products in the form of meetings, workshops, forums (and the summary reports from these events), as well as 'preparing various

[913] UNFCCC Decision, 4/CP.11, para. 2.
[914] UNFCCC, *Report of the Conference of the Parties on its twelfth session, held at Nairobi from 6 to 17 November 2006 Part One: Proceedings*, (2006) FCCC/CP/2006/5, para. 80; See also UNFCCC, *Five-year programme of work on impacts, vulnerability and adaptation to climate* change, FCCC/SBSTA/2006/L.26.

meetings, documents such as technical and synthesis papers, and publications on and compilations of adaptations practices and lessons learned'.[915] In addition, the NWP operates the Adaptation Knowledge Portal, which offers an open access, curated database of adaptation knowledge resources such as case studies, publications and technical documents, tools and other materials.[916]

The mandate of the NWP was extended and enhanced at COP19 in 2013, and the focus of the NWP's work is influenced heavily by the SBSTA.[917] For example, the SBSTA was requested to consider the NWP four thematic areas of adaptation needs: Ecosystems; Human settlements; Water resources; and Health,[918] to strengthen the work of the NWP. In addition, the decision on extension and enhancement indicated that activities under the NWP 'should integrate gender issues, indigenous and traditional knowledge, and the role of and impacts on ecosystems',[919] and continue to receive recommendations for activities to be undertaken by the NWP from the Adaptation Committee.[920] Importantly for the purposes of the thesis, the NWP expert group on oceans was mandated by the SBSTA in 2019,[921] and is discussed in Section 4. In summary the NWP is an important institution in climate change adaptation but has not engaged with fisheries or marine biodiversity issues yet. The Cancún Adaptation Framework is discussed next.

3.3.3 The Cancún Adaptation Framework

Major developments in the global dialogue on climate adaptation occurred at COP16 in Cancún, Mexico in 2010. A key development was that climate adaptation was prioritised over mitigation on the agenda of the conference, reflecting that enhanced action by States on

[915] UNFCCC, Decision 6/CP.17, paras. 4–9.
[916] UNFCCC, 'The Nairobi work programme: The UNFCCC Knowledge-to-Action Hub for Climate Adaptation and Resilience' UNFCCC, no date, available at <https://unfccc.int/topics/adaptation-and-resilience/workstreams/the-nairobi-work-programme-the-unfccc-knowledge-to-action-hub-for-climate-adaptation-and-resiliencehttps://unfccc.int/topics/adaptation-and-resilience/workstreams/the-nairobi-work-programme-the-unfccc-knowledge-to-action-hub-for-climate-adaptation-and-resilience>.
[917] UNFCCC, Decision 17/CP.19.
[918] ibid., para 5.
[919] ibid., para. 6.
[920] ibid., para. 10.
[921] UNFCCC, *Nairobi work programme on impacts, vulnerability and adaptation to climate change* FCCC/SBSTA/2019/L.2, para. 17 'The SBSTA requested the secretariat to collaborate with partners and relevant organizations in the thematic area of oceans, including on organizing the 13th NWP Focal Point Forum, on the topic of oceans, in conjunction with SBSTA 51 (December 2019)'.

adaptation was necessary in light of the 2007 IPCC Fourth Assessment Report which stressed the necessity of adaptation address unavoidable climate change impacts.[922] This conference led to the adoption of the Cancún Agreements, comprising of the Cancún Adaptation Framework (CAF), the establishment of the Adaptation Committee, and a work programme to consider approaches to address loss and damage in most-vulnerable developing countries.[923] Importantly, the conference shed light on the meaning of adaptation in different contexts, and facilitated understanding of adaptation by States through guidance and support. The adoption of the CAF and the Adaptation Committee highlight the Parties' mutual view of long-term cooperative action on climate adaptation in light of the Bali Action Plan.[924] In addition to a comprehensive framework on adaptation, the Cancún COP made advances on adaptation planning for LDCs, loss and damage from the impacts of climate change, and established the Green Climate Fund (GCF). Access to which is supported by the Global Environment Facility.

The CAF was the product of three years of negotiations after the adoption of the Bali Action Plan at COP13 in 2010.[925] The CAF was a key development in climate adaptation law since it sets out provisions on both the scope and approach of adaptation. The CAF affirms that 'adaptation must be addressed with the same priority as mitigation' and 'requires appropriate institutional arrangements to enhance adaptation action and support'.[926] It acknowledges 'that adaptation is a challenge faced by all Parties, and that enhanced action and international cooperation on adaptation is urgently required to enable and support the implementation of adaptation actions aimed at reducing vulnerability and building resilience in developing country Parties'.[927] Further, the CAF outlines the support necessary for implementation through an institutional framework.[928] This includes planning, prioritising and implementing national adaptation actions, plans and strategies. In addition, impact, vulnerability and adaptation assessments, capacity building, building social-ecological resilience,[929] research development, research and knowledge exchange on adaptation, as well as disaster risk

[922] UNFCCC, Decision 1/CP.16; See also UNFCCC, 'The Cancun Agreements' no date, available at: <https://unfccc.int/tools/cancun/adaptation/index.html>.
[923] ibid., para. 26.
[924] ibid., para. 5.
[925] ibid., para. 13; The Bali Action Plan advanced the development of climate adaptation at the UNFCCC in 2007 but is not discussed in this chapter for reasons of space.
[926] ibid., para. 2(b).
[927] ibid., para. 11.
[928] ibid., 4–7.
[929] See discussion in Section 2.

reduction strategies are also covered by the CAF.[930] While there was divergence between Parties on a number of issues during negotiation, including the institutional framework necessary to facilitate adaptation under the UNFCCC, support, as well as the inclusion of loss and damage as an adaptation component.[931] The CAF:

> Recognises the intrinsic link between adaptation action and development and the contribution that a wide range of actors make in this regard. It also recognised the limited, albeit important, role of the Convention on adaptation, in particular in relation to mobilising stakeholder engagement at all levels and building the knowledge and information basis that would underpin the actions of countries.[932]

However, due to its 'soft' law form as a COP decision, the CAF is not legally binding on the Parties to the UNFCCC.[933] Nonetheless, provides the necessary guidance for Parties in the form of generally agreed rules and standards through a legitimate and transparent process.[934] This indicates it is relevant for adaptation planning in fisheries conservation and management. The CAF stipulates that adaptation should be country-driven, gender sensitive, participatory and transparent, and take into account vulnerable groups communities and ecosystems. Indeed, the mandate of the NWP was updated to follow the same guidance in 2013 (see section 3.3.2). Though non-binding, the CAF commits Parties to interpret the adaptation provisions of ICL through this framework, and therefore firmly placing adaptation on the same footing as mitigation, however, as well will see in subsequent sections, the scope and nature of adaptation obligations leave much to be desired. The institutional and financial structures established by the Cancún COP are discussed next.

3.3.4 The Adaptation Committee

The Adaptation Committee was established during the Cancún COP with the object and purpose to maintain and promote stronger action on adaptation through the implementation of

[930] UNFCCC, Decision 1/CP.16, para. 14; See McDonald and McCormack, (n 725) 4–5.
[931] ibid., para. 25.
[932] Irene Suárez Pérez and Angela Churie Kallhauge, 'Adaptation (Article 7)' in Daniel Klein and others (eds) *The Paris Agreement on Climate Change: Analysis and Commentary* (Oxford University Press 2017) 196, 202.
[933] The importance of 'soft' law's role in interpreting 'hard' obligations is discussed at length in the context of international fisheries law in chapter 2 of this thesis, and so is not necessary to repeat here.
[934] See for example, Alan Boyle and Kasey McCall-Smith, 'Transparency in International Law-Making' in Andrea Bianchi and Anne Peters (eds) *Transparency in International Law* (Cambridge University Press 2013).

the CAF coherently under the UNFCCC.[935] This is to be undertaken through the provision of technical support and guidance to the Parties, knowledge sharing and exchange, promoting engagement with organisations at all levels, providing information and recommendations, and inducing further action on adaptation actions.[936] The Adaptation Committee is comprised of 16 members,[937] and functions as a general advisory body to the COP on all aspects of climate adaptation.[938] Generally, in its role as an advisory committee is synthesising and sharing of information and knowledge on the implementation of adaptation measures. The Committee currently works to update Party mandates, workplans and decisions that are relevant to adaptation under the UNFCCC, and conduct comparative analysis and consider action to be taken by the Committee to assist in adaptation action.[939] In terms of development of climate adaptation law international, the establishment of an adaptation institution within the ICL framework facilitates high-level coherence on adaptation between all Parties – not just LDCs – and support on implementation of adaptation actions. The Adaptation Committee, together with the NWP, facilitates and ensures international cooperation on adaptation. As such, they may be a relevant institution in assisting States and the UNFCCC and Paris Agreement COP on adaptation matters on the marine environment and fisheries. The final part of this section concerns adaptation funding.

3.3.5 Adaptation Funding

This subsection convers the various funds under the UNFCCC relevant directly or indirectly to adaptation. Early developments in climate adaptation under the ICL framework were made with the understanding and appreciation by Parties that LDCs faced a heighted vulnerability to the negative effects of climate change. In 2001, COP7 in Marrakech created three funds to finance adaptation. These are the Special Climate Change Fund, and the Least Developed Countries (LDC) Fund,[940] and formalised the Adaptation Fund under the Kyoto Protocol.[941]

[935] UNFCCC, Decision 1/CP.16, para. 20.
[936] ibid.
[937] ibid.
[938] UNFCCC, Decision 2/CP.17, para. 19.
[939] *See*: Flexible workplan of the Adaptation Committee for 2019-2021 (Version 3, March 2020) (UNFCCC Adaptation Committee (AC) 2020), available at: <https://unfccc.int/documents/218221https://unfccc.int/documents/218221>.
[940] The Special Climate Change Fund was established under UNFCCC Decision 7/CP.7, para. 1(c)(ii); The LDC Fund was established under UNFCCC Decision 5/CP.7, para. 12 and Decision 7/CP.7, para. 1(c)(iii).
[941] To 'be financed from the share of proceeds on the clean development mechanism project activities and other sources of funding', UNFCCC Decision, 10/CP.7, paras. 1–2.

The Parties requested the Global Environment Facility, as the operating entity of the financial mechanism of the UNFCCC to operate all three funds under the financial mechanism under the guidance of the COP.[942] These funds 'provided for Parties to contribute funding for pilot or demonstration projects to show how adaptation planning and assessment can be translated into projects, including in the areas of water resource management, land management, agriculture, health infrastructure development fragile ecosystems and integrated coastal zone management.'[943] However, the Adaptation Fund only became fully operational once the Kyoto Protocol entered into force on 16 February 2005.

The aim of the Special Climate Change Fund, jointly with the Adaptation Fund under the Kyoto Protocol is to finance 'adaptation activities promptly where sufficient information is available to warrant such activities, i*nter alia*, in the areas of water resources management, land management, agriculture, health, infrastructure development, fragile ecosystems, including mountainous ecosystems, and integrated coastal zone management'.[944] UNFCCC Annex II and I countries were invited to contribute to the fund.[945] The LDC fund, operated in the same way as the Special Climate Change Fund, was established to support a work programme of LDCs, discussed below.[946] The Parties agreed on further guidance on operation of the LDC Fund,[947] and the Special Climate Change Fund,[948] at COP9 in 2003, and an programme to implement this guidance was produced by the Global Environment Facility.[949] Adaptation and its funding thus far have been framed in LDC terms, which is unsurprising given the focus of COP7. However, we see movement to a global focus on adaptation at COP8 in 2002 in the Delhi Ministerial Declaration on Climate Change. This states that adaptation is of 'high priority' and 'requires urgent attention and action' by all countries.[950] However, this political declaration did not lead to any immediate significant legal or institutional

[942] ibid., para. 3.
[943] UNFCCC Decision, 5/CP.7, para 8(a); UNFCCC, *25 Years of Adaptation under the UNFCCC* Report by the Adaptation Committee (UNFCCC 2019) available at: <https://unfccc.int/sites/default/files/resource/AC_25%20Years%20of%20Adaptation%20Under%20the%20UNFCCC_2019.pdf> at 13.
[944] UNFCCC Decision, 7/CP.7, para. 2(a).
[945] ibid., para. 3.
[946] ibid., para. 6.
[947] UNFCCC, Decision 6/CP.9.
[948] UNFCCC, Decision 5/CP.9.
[949] See Global Environment Facility, *Programming to Implement the Guidance for the Special Climate Change Fund Adopted by the Conference of the Parties to the United Nations Framework Convention on Climate Change at its Ninth Session* (GEF Council 2004) UN Doc. GEF/C.24/12, available at: <thegef.org/sites/default/files/council-meeting-documents/C.24.12_5.pdf>.
[950] See Democratic Republic of Timor-Leste 'NAPA on Climate Change' (UNFCCC 2010) available at: <https://unfccc.int/resource/docs/napa/tls01.pdf>.

developments in adaptation under ICL at COP8 but did signal international interest that adaptation move towards a more global framing. This occurred with the decision on the Bali Action Plan in 2007. The Action Plan prioritised 'enhanced action on the provision of financial resources and investment to support action on mitigation and adaptation and technology cooperation',[951] though adaptation finance has remained a considerably difficult issue during negotiations since the agreement of the Action Plan.[952] This was demonstrated at the COP in Copenhagen in 2009.[953]

The Cancún COP established the GCF, 'to be designated as an operating entity of the financial mechanism of the Convention under Article 11, with arrangements to be concluded between the Conference of the Parties and the GCF to ensure that it is accountable to and functions under the guidance of the Conference of Parties, to support projects, programmes, policies and other activities in developing country Parties using thematic funding windows'.[954] The GCF is governed by a board of 24 members equally comprised from developing and developed country Parties to the UNFCCC and representatives from LDCs and small-island developing States.[955] The GCF is administered by the World Bank as a trustee and the operationalisation of the GCF is undertaken by an independent secretariat, and the fund is designed by a Transitional Committee[956] With regard to GCF, the ocean, and fisheries, FAO and GCF have been partnered since 2016 and have the capacity therefore to fund climate projects in making fisheries more resilient to climate change under that mandate.[957] The GCF have funded fisheries and climate projects at the national level,[958] for example the 'Climate Resilient Fishery Initiative for Livelihood Improvement', produced by FAO at request of the Government of The Gambia, is currently under review to receive funds from the GCF. [959] At present, however, the GCF only directs 2% of its funds to ocean-related climate mitigation and

[951] UNFCCC, Decision 1/CP.13, para 1(e)(i-vi).
[952] See Åsa Persson and others (eds), *Adaptation Finance under a Copenhagen Agreed Outcome* (Stockholm Environment Institute 2009).
[953] Mizan Khan and others, 'Twenty-Five Years of Adaptation Finance through a Climate Justice Lens' (2020) 161 Climatic Change 251.
[954] UNFCCC, Decision 1/CP.16, para. 102.
[955] ibid., para. 103.
[956] ibid., paras. 104–12.
[957] See GCF, 'Food and Agriculture Organization of the United Nations' GCF Website, no date, available at: <https://www.greenclimate.fund/ae/fao>; and GCF, 'Climate Resilience Fishery Initiative for Livelihood Improvement' (2019), available at: <www.greenclimate.fund/document/climate-resilient-fishery-initiative-livelihood-improvement-ppf>.
[958] See Guggisberg, (n 552).
[959] See GCF, (n 957).

adaptation projects.[960] This statistic is disappointing given the general importance of the ocean for the regulation of the global climate and the import role healthy fisheries plays in that role as elaborated in chapter one. Nonetheless, it is evident that there are no institutional barriers at the UNFCCC level that would limit funding for fisheries-related adaptation measures.

3.3.6 Summary

This section has elaborated on the various institutions and processes available that relate to adaptation in the UNFCCC and their relevance for providing normative content or helping States comply with their obligation to adapt fisheries management and climate change. It can be summarised that while a rather well-developed structure exists to assist States in their obligations to adapt under the UNFCCC, the institutions and processes established require greater integration with regards to the ocean and fisheries in order to facilitate marine-based climate adaptation, including in fisheries. Thus far, apart from providing guidance and facilities on adaptation planning which would aid States in fulfilling their obligation to adapt fisheries to climate change, the extent to which the climate regime analysed so far supplies that obligation with normative content is slim. Building on this, next section turns to the Paris Agreement and its adaptation provisions.

3.4 The Paris Agreement and Adaptation

Substantial developments in climate adaptation law were made with the adoption of the Paris Agreement at COP21 in 2015.[961] The Paris Agreement entered into force on 4 November 2016 and has 195 Parties out of 198 Parties to the UNFCCC. The relationship between the general nature and mitigation provisions of the Agreement, ICL generally and the environmental provisions of the Law of the Sea have been discussed in chapter 2. Therefore, the primary focus of this section is on the adaptation provisions of the agreement, including finance as it relates to adaptation. Links will be made as to how these provisions supplement the obligation to adapt fisheries conservation and management to the effects of climate change under international

[960] Statement by the Commonwealth Secretariat, Baroness Scotland, 'COP26 Commonwealth Pavilion Friday 5th November 2021 afternoon session' (2021), at 2:54:15, available at: <https://www.youtube.com/watch?v=yBVHHiQv4hM&t=9483s>.
[961] UNFCCC, Decision 1/CP.21.

fisheries law as established in chapter 2. After a general overview of the Paris Agreement and its legal nature, this subsection outlines, analyses and critically assesses the adaptation provisions of the Agreement, building on the previous discussions from this chapter. This is necessary to assess how climate adaptation can be strengthened in the context of fisheries and the marine environment in section 4.

3.4.1 General Overview

The Paris Agreement establishes the post-Kyoto framework for implementing the UNFCCC. The Agreement makes specific reference to oceans and ecosystems and their biodiversity in its Preamble, '[n]oting the importance of ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity.[962] This provides important context to interpret the Agreement and analyse the object and purpose of the treaty.[963] From the outset, the explicit mention of those three terms is a recognition of the goods and services that marine ecosystems and their biodiversity provide, including fisheries, and it can be argued that the obligations that the Agreement lays out apply to the management and conservation of marine living resources. The Agreement contains a mix of country-based voluntary and binding provisions relating to Parties' contributions to achieve global goals set out in the Agreement on climate mitigation, adaptation and finance.[964] Article 2 sets out the targets of the Agreement in the form of three distinct but interlinked goals, which 'aims to strengthen the global response to the threat of climate change',[965] by keeping 'the increase in global average temperature well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels',[966] thus 'increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas development'[967] and 'making finance flows consistent with a pathway towards low greenhouse gas emissions and climate resistant development.'[968] The Agreement contains a mixture of 'hard, soft, and non-obligations' to achieve these goals.[969] To that end, the legally binding obligations are mainly

[962] Paris Agreement, Preamble.
[963] VCLT, Art. 31.
[964] Daniel Bodansky, 'The Legal Character of the Paris Agreement' (2016) 25 RECIEL 142.
[965] Paris Agreement, Art. 2(1).
[966] ibid., Art. 2(1)(a).
[967] ibid., Art. 2(1)(b).
[968] ibid., Art. 2(1)(c).
[969] Lavanya Rajamani, 'The 2015 Paris Agreement: Interplay Between Hard, Soft and Non-Obligations' (2016) 28 Journal of Environmental Law 337.

of a procedural nature – obligations of conduct, not of result – and the substantive content of obligations on mitigation, adaptation and finance are not legally binding and are left to the discretion of parties.[970] The Paris Agreement was agreed in the context of sustainable development, and as such has a clear link with the UN Sustainable Development Goals (SDGs),[971] and implies 'that sustainable development requires low CO_2 emissions development and a cap on global temperature increases'.[972]

In achieving the global goals on mitigation, adaptation and finance, the Paris Agreement establishes various mandatory and non-mandatory obligations. It gives States' efforts to achieve these goals legal parity and recognises that these efforts will progress over time.[973] Article 4 concerns climate mitigation and places the binding obligation on each Party to 'prepare, communicate and maintain successive [NDCs] that it intends to achieve' and pursue domestic mitigation measures to achieve the objective of their NDC.[974] Each State's contribution to emission reduction or adaptation were not agreed on adoption of the Paris Agreement. Instead, Parties determine their NDCs according to their capabilities, with developing countries expected to lead on emission reductions, and these emission reductions should be economy-wide.[975] Though the principle of common but differentiated responsibilities is still present in the Agreement text,[976] this formulation illustrates a reshaping of this principle found in the Kyoto Protocol into a strengthened and nuanced approach.[977] The Agreement formally acknowledges that adaptation actions can have mitigation co-benefits.[978] Parties are under the procedural obligation to provide the necessary information for clarity,

[970] Cristina Voigt, 'The Compliance and Implementation Mechanism of the Paris Agreement' (2016) 25 RECIEL 161, 161–169; There is a wealth of literature supporting this notion, for example: Lavanya Rajamani, 'Ambition and Differentiation in the 2015 Paris Agreement: Interpretive Possibilities and Underlying Politics' (2016) 65 International and Comparative Law Quarterly 493; Anna Huggins, 'The Evolution of Differential Treatment in International Climate Law: Innovation, Experimentation and "Hot" Law' (2018) 8 Climate Law 195, 196; However, see *contra* Alexander Zahar who argues that all Parties are under a collective obligation of conduct to achieve the 2°C temperature goal, this obligation is achieved primarily through mitigation and finance (those Parties who can supply finance must do so, and Parties who receive it must make use it for mitigation and adaptation), Zahar does not however suggest the obligation to adapt is a collective obligation of conduct. See Alexander Zahar, 'Collective Obligation in the Paris Agreement' (2020) 9 Transnational Environmental Law 165.
[971] UN, 'Sustainable Development Goals' no date, available at: <https://sdgs.un.org/goals>.
[972] Boyle, (n 40) 91.
[973] Paris Agreement, Arts. 3 and 4(3).
[974] ibid., Art. 4(2).
[975] ibid., Art. 4(4).
[976] i.e., in ibid., Arts. 2(2) and 4(3).
[977] Boyle, (n 40); See especially Catherine Redgwell and Lavanya Rajamani, 'And Justice for All? Energy Justice in International Law' Iñigo del Guayo and others (eds), *Energy Justice and Energy Law* (Oxford University Press 2020) 61.
[978] Paris Agreement, Art. 4(7).

transparency and understanding,[979] and must revisit, revise and update their NDCs every 5 years in accordance with decision 1/CP.21 or any relevant decisions of the COP serving as the meeting of the Parties to the Paris Agreement (CMA).[980] Paragraph 27 of decision 1/CP.21 provides a non-exhaustive list of information to be provided by Parties in their NDCs. Parties are obliged to account for their NDCs in line with guidance from the CMA,[981] and are responsible for the emission level set out in their NDCs.[982] The Agreement also reiterates the obligation to 'conserve and enhance, as appropriate sinks and reservoirs of [GHGs]' with reference Article 4(1)(d) UNFCCC but uses the hortatory 'should' as opposed to 'shall'.[983] Article 6 concerns market-based approaches (though does not use this term) and provides for two market-based mitigation approaches through Articles 6(2) and 6(4).[984] The guidance, rules, modalities and procedures for these mechanisms were only agreed upon at COP26.[985] Due to the focus of this chapter, Adaptation and Article 7 of the Agreement are covered in detail in the following subsection. Article 8 of the Agreement 'for the first time in international law formally acknowledges the prospect of climate-related loss and damage as a policy priority separate from adaptation' within the scope of the Agreement.[986] As a freestanding article within the Agreement, loss and damage is recognised as a central element alongside adaptation and mitigation as a response to global climate change, but distinct from the two, and as such will not receive much attention in this thesis.[987] It also reflects a considerable development on a long-standing issue since the inception of the UNFCCC negotiations raised by the AOSIS over issues that could not be addressed through mitigation or adaptation.[988] The formal inclusion of loss and damage within the Agreement attempts to resolve the developing versus developed country debate on whether loss and damage should be treated separately from adaptation with

[979] ibid., Art. 4(8).
[980] ibid., Art. 4(9); UNFCCC, Decision 1/CP.21.
[981] ibid., Art. 14(13).
[982] ibid. Art 4(16).
[983] ibid., Art. 5(1).
[984] ibid., Arts. 6(2) and 6(4); See also Art. 6(8) which refers to the importance of 'non-market mechanisms', and Bodansky, Brunnée and Rajamani, (n 630) 236–237.
[985] See Paris Agreement, Decision 2/CMA.3, and Decision 3/CMA.3.
[986] McDonald and McCormack, (n 725), at 4; See also, Richard J T Klein, and others, 'Integrating mitigation and adaptation into climate and development policy: Three research questions' (2005) 8 Environmental Science and Policy (2005) 579.
[987] See generally Toussaint, (n 842).
[988] AOSIS, 'Submission by Vanuatu on behalf of AOSIS, found in Intergovernmental Negotiating Committee, Negotiation of a Framework Convention on Climate Change, Elements relating to mechanisms, Vanuatu, Draft annex relating to Article 23 (Insurance) for inclusion in the revisited single text on elements relating to mechanisms' submitted by the Co-Chairmen of the Working Group II, 4th Session Agenda item 2(b), 1991UN Doc. A/AC.237/WG.II/Misc.13 (1991).

liability and compensation issues, or within the scope of adaptation.[989] As a consequence of achieving this separation, however, at the insistence of the United States, the Paris COP cover decision indicates that 'Article 8 does not involve or provide a basis for any liability or compensation'.[990] This places a rather severe limitation on the operationalisation of loss and damage but nonetheless allows its scope and content to be further negotiated moving forward.[991] Article 8(1) expressly includes extreme weather events and slow onset events as adverse effects of climate change.[992] Extreme weather events and their impacts of fisheries have been discussed in chapter 1, in addition slow onset events include ocean acidification, loss of biodiversity, and sea-level rise under the CAF,[993] the first two negatively affect the overall health of ecosystems the and location of fish stocks (as discussed in chapter 1) while sea-level rise can have negative impacts on coastal fisheries infrastructure, respectively. This indicates the relevance of Article 8 to fisheries and their response to these climate change impacts in particular. The WIM is effectively incorporated into the Agreement's institutional architecture, and is subject to the authority and guidance of the COP and the CMA.[994] Parties are under the non-binding obligation to utilise the WIM to enhance understanding, action and support on loss and damage.[995] A non-exhaustive list of areas for where this could be achieved are provided and include non-economic losses and resilience of communities, livelihoods and ecosystems.[996] It can be argued that some of these areas of cooperation indicated in Article 8(4) are actually forms of adaptation, nonetheless the inclusion of loss and damage in the Agreement establishes a formal basis for future normative development.[997] This may be supplemented by the 'highly relevant and complementary work' under the 2030 Agenda for Sustainable Development and the UN Office for Disaster Risk Reduction, and the Sendai Framework for Disaster Risk Reduction.[998] Though, the (potentially) slow migration of fish and other marine species to new locations due to climate change, and the marine heatwaves which can cause marine species redistribution can be read into these provisions to constitute as adverse effects.

[989] Karen E McNamara, 'Exploring Loss and Damage at the International Climate Change Talks' (2014) 5 International Journal of Disaster Risk Science, 242; Meinhard Doelle, 'Loss and Damage in the UN Climate Regime' in Daniel Faber and Marjan Peters (eds), *Elgar Encyclopedia of Environmental Law vol. 1: Climate Change Law* (Edward Elgar 2016) 617; Bodansky, Brunnée and Rajamani (n 630), at 238–239.
[990] UNFCCC Decision, 1/CP.21, para 52.
[991] See for example, Toussaint, (n 842).
[992] Paris Agreement, Article 8(1).
[993] UNFCCC, Decision 1/CP.16, para. 25 (see footnote to this paragraph).
[994] Paris Agreement., Art. 8(2).
[995] ibid., Art. 8(3).
[996] ibid., Art. 8(4).
[997] Bodansky, Brunnée and Rajamani, (n 630) 239.
[998] Linda Siegele, 'Loss and Damage (Article 8)' in Klein and others, (n 932) 224, 238.

However, as loss and damage is legally distinct from adaptation, it is beyond the scope of this thesis – and is indeed perhaps a topic for a future PhD thesis – to address how loss and damage could be operationalised in a fisheries context.[999]

The remaining operative provisions of the Agreement outline support, oversight systems and institutional arrangements. Support includes finance, technology development and transfer, and capacity building.[1000] The four funds under the UNFCCC also serve the Paris Agreement.[1001] Oversight mechanisms include transparency of action and support, establishes the Global Stocktake undertaken every 5 years to assess Parties' progress 'in light of equity and the best available science', and the Agreements' implementation and compliance mechanism.[1002] Institutional arrangements establish the CMA and embed the Agreement into existing UNFCCC institutions including the Secretariat, the SBSTA, the SBI.[1003] The final articles of the Agreement contain the usual provisions found in the final part of a multilateral environmental agreement.

Overall, the main objective of the Paris Agreement is that Parties increase their emissions reductions progressively over time. Unlike the Kyoto Protocol, the Paris Agreement has no time-limit, and is designed to operate continuously as parties periodically update and submit their NDCs and achieve their climate mitigation, adaptation and financial goals. NDCs submitted prior to COP26 fall far-short of the 2°C temperature goal, and suggest a less than 50% chance of achieving this.[1004] If net-zero pledges made at COP26 and are included, it is estimated that warming can be kept just below 2°C if all mitigation pledges are made in full and on time.[1005] This indicates the necessity of adaptation, especially since temperatures will

[999] The question of liability and compensation for loss of fish stocks due to climate change may well be addressed by a request for an advisory opinion from the International Tribunal for the Law of the Sea brought by AOSIS members of the Agreement for the Establishment of the Commission of Small Island States on Climate Change and International Law. See David Freestone, Richard Barnes and Payam Akhavan, 'Agreement for the Establishment of the Commission of Small Island States on Climate Change and International Law (COSIS)' (2022) 37 The International Journal of Marine and Coastal Law 166.
[1000] Paris Agreement, Arts. 9–12.
[1001] UNFCCC, Decision 1/CP.26, para. 59.
[1002] Paris Agreement, Arts. 13–15.
[1003] ibid., Arts. 16–19.
[1004] UNFCCC, *Nationally Determined Contributions under the Paris Agreement. Synthesis Report by the Secretariat* (UNFCCC 2021) available at: <https://unfccc.int/documents/306848> (NDC Synthesis Report); It is estimated that if fully implemented these NDCs and net-zero pledges will limit global warming to between 1.8°C and 2.4°C by 2100. See IISD, 'Glasgow Climate Change Conference (UNFCCC COP26)' (Earth Negotiations Bulletin, November 2021) available at: <https://sdg.iisd.org/events/2020-un-climate-change -conference-unfccc-cop-26/>; Malte Meinshausen and others, 'Realization of Paris Agreement Pledges May Limit Warming Just below 2 °C' (2022) 604 Nature 304.
[1005] Meinshausen, ibid.

continue to rise globally unless greater ambition is made by States in their NDCs. Indeed, rising temperatures beyond 2°C will render many adaptation measures ineffective if not meaningless, including adaptive fisheries conservation and management measures. In terms of adaptation, the Paris Agreement elevated climate adaptation from a piecemeal legal and institutional framework, focused primarily on LDCs, into a formal provision in a binding international legal instrument which places obligations on all Parties, regardless of their status. Adaptation in the Paris Agreement is discussed below.

3.4.2 Adaptation Provisions in the Paris Agreement

As discussed in section two, there is no definition of adaptation in the Paris Agreement,[1006] however, the scope, content, and key elements of adaptation are set out in Article 7. This Article indicates the crystallisation of adaptation from being initially spread across provisions within the ICL framework, to its formulation as a substantive provision within the Paris Agreement. During the negotiation of the Agreement, developing States, who had been advocating for mitigation and adaptation to be on the same footing in the climate regime requested these provisions as part of a 'package deal' in exchange for stronger mitigation commitments on developing States.[1007] This suggests that climate adaptation is now understood by the international community as of equal importance to climate mitigation as reflective in successive IPCC reports since 2007. Article 7 contains multiple provisions with the objective of realising the aim of increasing the ability of States to adapt to climate change and fostering climate resilience in Article 2(1)(b). This subsection analyses the adaptation provisions found within the Paris Agreement with the aim of clarifying their legal nature and the scope of the obligation they provide, which will aid further analysis on how to strengthen adaptation in a fisheries context in section 4, and later in this thesis. First with Article 7, then other provisions of the Agreement relevant to adaptation, finally the components of COP decision adopting the Agreement relevant to adaptation will be analysed.

Article 7 clarifies the collective understanding of adaptation among Parties, it also makes considerable effort to 'solidify and consolidate the CAF' and embeds key elements of

[1006] Interestingly, Article 7 does not refer to the exploitation of 'beneficial opportunities' that may be brought about by climate change as found in the IPCC definition. See section 2.
[1007] See Nina Hall and Åsa Persson, 'Global Climate Adaptation Governance: Why Is It Not Legally Binding?' (2018) 24 European Journal of International Relations 540, 545; Bodansky, Brunnée and Rajamani, (n 630) 237.

adaptation within the text of the Article and the Agreement as a whole.[1008] A reminder that in light of the Preamble of the Paris Agreement, the provisions on adaptation must be read in light of the fact that they apply to oceans, ecosystems and biodiversity, therefore an implicit link to fisheries should be assumed from the outset. Article 7(1) establishes the shared ambition of the voluntary and aspirational 'global goal' on adaptation 'of enhancing adaptive capacity, strengthening resilience, and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal referred to in Article 2'.[1009] Given the 'global' nature of the goal and the Agreement itself, this indicates that the adaptation obligations apply to any activity by a State which it deems to require adaptation action to the effects of climate change. Neither adaptation, adaptive capacity, resilience or vulnerability is defined here, hence the discussion of these terms in section 2. No metric of what 'adequate adaptation' entails at the global level is provided either, however this is understandable considering the discussions in sections 2.2. and 2.4 of this chapter, adaptation is an iterative process and challenging to quantify. Since the global goal is not quantitative in nature, as was proposed by the African Group during the negotiations of the Paris Agreement,[1010] some have argued that this, and a lack of mutually agreed methods of assessing adaptation outcomes, undermines the effectiveness of Article 7 entirely and renders the provision a failure.[1011] Indeed, while the global goal lacks normative content and has more in common with a preambular paragraph than a substantive treaty provision.[1012] It is, as Rajamani describes, a collective 'non-obligation'.[1013] The combination of no internationally agreed adaptation metrics to quantify international progress and a focus on a country-driven approach, but all framed within a *global* goal does raise the question of the goal's impact on ABNJ,[1014] and when or how it can be implemented through intergovernmental organisations such as RFMOs (and also through RFMAs). However, the issues of the adaptation goal do not render Article 7 useless, nor should the goal be overlooked by Parties

[1008] See Ramstad Wenger, (n 852) 183.
[1009] Paris Agreement, Art. 7(1).
[1010] See submission by Swaziland on behalf of the African Group on adaptation in the 2015 Agreement (no date), available at: <https://unfccc.int/files/documentation/submissions_from_parties/adp/application/pdf/adp_african_group_workstream_1_adaptation_20131008.pdf>.
[1011] Anju Sharma, 'Precaution and Post-Caution in the Paris Agreement: Adaptation, Loss and Damage and Finance' (2017) 17 Climate Policy 33.
[1012] Ramstad Wenger, (n 852) 181.
[1013] See Rajamani, (n 969); See Ramstad Wenger, (n 852) 180–184 for detailed analysis on the nature of the global goal.
[1014] Ramstad Wenger, (n 852) 183.

to the Agreement.[1015] As will be demonstrated though analysis below, the Article on the whole manages to weigh up the need for global cooperation on adaptation and maintain a country-driven focus in terms of adaptation planning.[1016]

In line with the discussion in sections 2 and 3.1, Article 7(2) also recognises that adaptation 'is a global challenge faced by all with local, subnational, national, regional, and international dimensions',[1017] that the current need for adaptation is significant,[1018] and that greater needs for adaptation as a result of increased temperatures can create higher costs.[1019] This recognition adds, for the first time, an international aspect to adaptation within the United Nations climate treaties. This is important in the context of the thesis, where (as outlined in chapters 1 and 2) shifting fish stocks requires – legally and practically – international cooperation to adapt fisheries management to the effects of climate change. The earlier challenge with analysis of previous adaptation tools is their developing country focus, their national approach secured by the CAF,[1020] and lack of normative clarity or content, with most of their normative content arising from national law.[1021]

These provisions do not oblige Parties achieve the global goal on adaptation through a particular avenue. They are also expressed not as hard legal obligations, but instead as recommendations, expectations, or understandings.[1022] Nevertheless, they are important for the development of climate adaptation law as they 'provide context, construct a narrative, capture shared understanding, and generate mutual reassurances about the nature of the adaptation problem and particular ways of addressing it.'[1023] First, paragraph five reiterates that Parties have acknowledged:

> [A]daptation action should follow a country-driven, gender-responsive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities and ecosystems, and should be based on and guided by the best available science, and, as

[1015] VCLT, Art. 26; Ramstad Wenger, ibid.
[1016] Ramstad Wenger, ibid., 181.
[1017] Paris Agreement, Art. 7(2).
[1018] ibid., Art. 7(4).
[1019] ibid.
[1020] UNFCCC, Decision 1/CP.16, paras. 14(a), 14(i), 18, and 30.
[1021] See section 2; See also Benoit Mayer, 'Climate Change Adaptation Law: Is There Such a Thing?' in Alexander Zahar and Benoit Mayer (eds), *Debating Climate Law* (Cambridge University Press 2021).
[1022] See Rajamani, (n 969).
[1023] Bodansky, Brunnée and Rajamani, (n 630) at 238.

> appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems with a view to integrating into relevant socioeconomic and environmental policies and actions where appropriate.[1024]

Second, Article 7, paragraphs 6 and 7 incorporate an international element of climate adaptation, stipulating that Parties have recognised the importance of support for, and international cooperation on, adaptation efforts and accounting for the needs of developing country Parties.[1025] It recommends that Parties collectively strengthen their cooperation on adaptation, taking into account the CAF, and provides a non-exhaustive list on the variety of ways this could be achieved.[1026] This includes sharing of information and good practices, strengthening scientific knowledge on climate, including research and systematic observation of the climate system, assisting developing country Parties in identifying adaptation practices, needs, priorities and support, as well as improving the effectiveness and durability of adaptation actions.[1027] Specialised organisations of the United Nations, such as FAO, are encourages to support Parties to implement the above actions, taking into account the Article 7, paragraph 5 above.[1028] This indicates the role of FAO in facilitating cooperation on international fisheries in the face of climate change, and supplements the obligation to cooperate in international fisheries conservation and management (including in the face of climate change) analysed in chapter 2.

Adaptation planning is addressed through the Paris Agreement's framework of 'plan, implement, review and improve'. Parties are under a binding obligation to, as appropriate, 'engage in adaptation planning process and the implementation of actions, including the development or enhancement of relevant plans, policies and or contributions' and gives a non-exhaustive list of nationally-focused examples including NAPs, climate change impacts and vulnerability assessments (which account for 'people, places and ecosystems'), and iterative learning from monitoring and evaluation.[1029] The final example of this provision on adaptation planning suggests '[b]uilding the resilience of socioeconomic and ecological systems, including through economic diversification and sustainable management of natural

[1024] Paris Agreement, Art. 7(5).
[1025] ibid., Art. 7(6).
[1026] ibid., Art. 7(7).
[1027] ibid., Art. 7(7)(a–e).
[1028] ibid., Art. 7(8).
[1029] ibid., Art. 7(9).

resources.'[1030] Considering the discussion on social-ecological systems and adaptation, it can be argued that this provision implicitly includes fishery systems and Parties with marine capture fisheries are obliged to include them in climate adaptation plans.

The focus of this thesis is on international fisheries, so where do these systems fit in the adaptation planning context, particularly in the case of multilateral cooperation of international fish stocks through RFMO/As? First, as above, the international dimension of cooperation in adaptation is provided for in paragraphs 2, 6 and 7, and must be read together with paragraph 9 to include cooperative adaptation planning in international fisheries. Second, the 'country-driven' focus of adaptation actions is only recommendatory, and so does not present a barrier to adaptation efforts in a bi- or multilateral context. Third, paragraph 8 implicitly includes FAO and any RFMO/As constituted under it – though it would be a stretch to argue other RFMO/As constituted outside the United Nations ambit are included in this provision, the first and second points still apply. The extent to which FAO has demonstrated its assistance in adaptation planning will be discussed in section 4, and in the RFMO/A context in chapter 4 which is dedicated to that subject. All these provisions contained in Article 7 thus far build on the obligation to adapt fisheries management and conservation to climate change, although given the nature of the obligations, they so far only (albeit very lightly) reiterate existing obligations under international fisheries law as identified in chapter 2, rather than creating any new ones in a fisheries context.

The final paragraphs of Article 7 refer to how Parties should communicate their adaptation actions.[1031] To that end, the Agreement recommends, using non-binding language, that each Party 'should, as appropriate, submit and update periodically an Adaptation Communication, which may include its priorities, implementation and support needs, plans and actions, without creating additional burdens for developing country Parties.'[1032] This Adaptation Communication can be submitted 'as a component or in conjunction with' a NAP, an NDC, or a national communication.[1033] Article 7(11) provides for different vehicles of communication (including as part of a NAP or NDC), but with the obligation that Adaptation Communications are periodically updated. Article 7(12) states that Adaptation

[1030] ibid., Art. 7(9)(e).
[1031] Although these are elaborated on in the Paris Rulebook, discussed below.
[1032] Paris Agreement, Art. 7(10).
[1033] ibid., Art. 7(11).

Communications shall be recorded in a public registry maintained by the Secretariat of UNFCCC. Further, The Agreement stipulates '[c]ontinuous and enhanced international support shall be provided to developing country Parties' to assist in implementation of adaptation commitments, adaptation planning and development and submission of Adaptation Communications.[1034] The Global Stocktake shall recognise, enhance, and review adaptation efforts and the overall progress on achieving the global goal on adaptation.[1035]

This flexibility in Adaptation Communications gives Parties the freedom to choose the context which an Adaptation Communication should be submitted, depending on their own adaptation priorities. However, this makes global comparison of adaptation actions by Parties more challenging than quantifiable mitigation targets. For example, how will these feed in to the Global Stocktake? And what methodologies are available to inform the Global Stocktake in quantifying adaptation action?[1036] Methodologies for assessing adaptation *needs* to assist Parties in formulating their Adaptation Communication – in whatever form they take – are currently being drafted by the Adaptation Committee,[1037] it is uncertain whether these will be adopted in time for the first Global Stocktake in 2023.

In addition to adaptation enshrined in Article 7, we find adaption included in the continued collective obligation for developed country Parties to provide financial resources to assist developing country Parties with both mitigation and adaptation.[1038] The Paris Agreement also operationalises the scaling up of climate finance to support adaptation and mitigation. For example, Article 9(4) calls for 'balanced' funding for mitigation and adaptation. Mandatory biennial reporting is also required for progress monitoring on Parties' commitments to provide financial resources.[1039] Adaptation is referred to in the provisions on technology development and transfer for adaptation in Article 10, capacity building for adaptation under Article 11, framework for transparency under Article 13(8), and for adaptation to be included in the Global Stocktake of implementation of the Agreement in Article 14. In terms of evaluating that adaptation, the Global Stocktake collectively evaluates Parties' progress to the global

[1034] ibid., Art. 7(13); See also Arts. 7(7), 7(9–11).
[1035] ibid., Art. 7(14).
[1036] See Tompkins and others, (n 731).
[1037] Adaptation Committee, *Methodologies for assessing adaptation needs*, draft technical paper (AC21) UN Doc. AC21/TP/7A (2022) available at: <https://unfccc.int/documents/461191>.
[1038] ibid., Article 9.1.
[1039] ibid., Art. 9; Alexandra Lesnikowski and others, 'What Does the Paris Agreement Mean for Adaptation?' (2017) 17 Climate Policy 825.

adaptation goal through the assessment of Adaptation Communications 'in the light of equity and the best available science.'[1040] The first Stocktake will take place in 2023 and every 5 years thereafter, and the outcome of which will inform future work by parties in implementing the Agreement. These provisions considered in line with the central argument of the thesis, there is no barrier to international fisheries being applicable to these provisions, and indeed the effective implementation of the cooperation, reporting, financing capacity building and technology transfer obligations under the Paris Agreement would aid the fulfilment of the obligation to adapt fisheries management and conservation to the effects of climate change. This is particularly pertinent since effective compliance with the Paris Agreement would be in fulfilment of States' due diligence obligations under UNCLOS Part XII to protect and preserve the marine environment, of which (as discussed in chapter 2), the conservation and management of fisheries and other marine living resources is a central part.

3.4.3 Adaptation after the Paris Agreement

Although the broad framework of the Paris Agreement was agreed in 2015, several rules for implementing its provisions, including on adaptation, remained unagreed. This subsection focuses on developments in adaptation after the conclusion of the Paris Agreement. This includes the Katowice Climate Package agreed at CMA1 in 2018, and developments up until COP26 in Glasgow in 2021. This final substantive subsection analyses these provisions before providing conclusions on climate adaptation law in section 3.5.

3.4.3.1 The Katowice Climate Package

What Parties are required to do in terms of climate adaptation was further clarified with the adoption of the implementation guidelines for the Paris Agreement, what is commonly referred to as the 'Paris Rulebook', at COP24 in Katowice, Poland in 2018. As mentioned above, gaps remained in the Rulebook, particularly on Article 6 and common timeframes from NDCs, which were resolved at subsequent COPs. The rules adopted at Katowice apply to both developed and developing countries. This subsection outlines and discusses the adaptation

[1040] Paris Agreement, Art. 14(1).

aspects of the Rulebook to further clarify the nature and scope of States obligations in climate adaptation.

Katowice Decision 9/CMA.1 provides further detail and clarity on Adaptation Communications as introduced by Article 7(10) of the Paris Agreement. on what content Adaptation Communications should contain.[1041] Parties are invited to include elements and additional information (as appropriate) in their Adaptation Communications outlined in an annex to the Decision. This stipulates that Adaptation Communications may include a broad range of information, and could include matters on fisheries or marine conservation.[1042] The Decision reiterates that the Adaptation Communication is country-driven and are not subject to review.[1043] Instead, Adaptation Communications will be synthesised along with other relevant information in the Global Stocktake to assess progress on the global goal on adaptation.[1044] Parties are to update and submit their adaptations periodically through the various means described in section 3.4.2.1 above and as appropriate through the reports on impacts and adaptation by way of Article 13(8) of the Agreement.[1045] For further clarification in addition to the annex in 9/CMA.1, a request was made to the Adaptation Committee to draft supplementary guidance for voluntary use by Parties in communicating information in accordance with the elements contained in the annex, for consideration by the SBSTA in November 2022.[1046] On adaptation finance, the decision:

> Urges developed country Parties and invites other Parties that provide resources on a voluntary basis, United Nations organizations, specialized agencies and other relevant organizations as well as bilateral and multilateral agencies to continue to mobilize support for adaptation activities in developing country Parties.[1047]

And invites and encourages, respectively, the GEF, to support developing countries in preparation and submission of the Adaptation Communications, and the GEF and Green Climate Fund, the Adaptation fund, among others to 'continue channelling support to developing country Parties for the implementation of their adaptation plans and actions in

[1041] Paris Agreement, Decision 9/CMA.1, para. 1.
[1042] ibid., Annex.
[1043] ibid., para. 2.
[1044] ibid., para. 14; 19/CMA.1, para. 23(b).
[1045] ibid., para. 4.
[1046] ibid., para. 15
[1047] Paris Agreement, Decision 9/CMA.1, Annex, para. 19.

accordance with the priorities and needs outlined in their Adaptation Communication.'[1048] These two points are important and interrelated for the broader scope of the thesis. The first point builds on the argument made in the previous section on the international aspect of adaptation but goes further in the sense that *any* organisation or agency are urged to assist developing Parties in adaptation action, which implicitly includes RFMO/As, and link adaptation funding to this assistance. This point will be discussed in context in chapter 4.

The final key Decision for adaptation in the Katowice Climate Package is Decision 11/CMA.1, which indicates various methodologies in adaptation. The Decision assigns that the Adaptation Committee and the Least Developed Countries Expert group will serve the Paris Agreement, and assigns any future work on adaptation to the existing institutions outlined in this chapter.[1049] Encourages institutions related to finance (including the operating entities of the Financial Mechanism of the UNFCCC and the Paris Agreement), technology development and transfer and capacity building to balance mitigation and adaptation.[1050] Institutions include the NWP (see section 3.2.2) including the expert group on oceans discussed in section 4, and NWP partner organisations to collaborate and engage with the Adaptation Committee to advance adaptation action through scientific and technical information. The Decision 'requests secretariat, under the guidance of the Adaptation Committee and the Least Developed Countries Expert Group and in collaboration with relevant stakeholders, to prepare synthesis reports every two years starting in 2020 on specific adaptation themes, focusing on relevant lessons learned and good practices in developing country Parties'.[1051] Importantly for the purposes of the thesis, the Decision:

> Urges developed country Parties and invites other Parties that provide resources on a voluntary basis, United Nations entities and other relevant organizations, as well as bilateral and multilateral agencies, to assist the least developed country Parties and other developing country Parties, drawing on the work of the Adaptation Committee, the Least Developed Countries Expert Group and other relevant bodies, as appropriate, in building or strengthening their enabling environments, policy frameworks, institutions and national public financial management systems so as to mobilize

[1048] ibid., paras. 20–21.
[1049] Paris Agreement, Decision 11/CMA.1, paras. 1–2.
[1050] ibid., para. 3.
[1051] ibid., para. 13.

> support for adaptation, in particular capacity-building, including as part of the process to formulate and implement national adaptation plans.[1052]

This supports the analysis made above on mobilising support on adaptation which brings in RFMO/As and other organisations related to the marine environment. Again, this point will be elaborated, with examples, in chapter 4. In addition, this provision and paragraph 19 of Decision 19/CMA.1 elaborates the setup of Articles 7(6) to 7(8) – the 'international' component of climate adaptation in greater detail, though does not name specific actors outside the UNFCCC ambit.

Overall, these developments do provide clarity for Parties in the form of a clear procedural framework for planning, implementing and reviewing adaptation action but remain general in the sense that they elaborate what countries could have but do not specify areas or sectors where adaptation should occur, or which Parties should focus on. This considered, these developments only further strengthen the obligation to adapt fisheries conservation and management in the sense that they should report any climate-related fisheries action through the Paris Agreement reporting mechanism.

3.4.4 Latest Developments: COP25, COP26 and Adaptation Action by Parties

This final subsection examines the latest developments in climate adaptation from COP25 and CMA2 in Madrid in 2019 and COP26 and CMA3 in Glasgow in 2021. The subsection then finishes with a 'snapshot' of the adaptation components of Parties NDCs, including Adaptation Communications, to give an idea of the engagement with the adaptation framework presented and discussed above.

At COP25 in Madrid, on top of the continued stressing on the urgency of advanced adaptation action efforts by all Parties and recognition of the need of support for developed country Parties to strengthen their adaptation efforts and the need for financial resources to do so, [1053] a request was made to the SBSTA to host a dialogue on the ocean and climate change 'to consider how to strengthen mitigation and adaptation action in this context', and this is

[1052] ibid., para. 23.
[1053] UNFCCC, Decision 1/CP.25, paras. 10–14.

discussed in greater detail in the next section.[1054] Parties were unsuccessful in adopting a decision recognising the recommendations made by the Adaptation Committee in its Annual Report.[1055] This primarily was due to disagreements on the importance between private and public funding.[1056] The Adaptation Committee also failed to agree on the two registries for Adaptation Communications,[1057] though this was resolved at COP26.[1058] Parties did reiterate that United Nations organisations and other relevant bi- and multilateral organisations (argued above to include RFMO/As) continue to mobilise support for adaptation.[1059] It was also confirmed that the current Green Climate Fund's modalities enable support for preparation and implementation of adaptation-related elements of the Paris Agreement and NDCs.[1060] At CMA2, Parties were called on to engage with the adaptation planning process and implementation of adaptation actions in line with Article 7(9) of the Paris Agreement.[1061] The Adaptation Committee were requested to 'consider approaches to reviewing the overall progress made in achieving the global goal on adaptation and to reflect the outcome of this consideration in its 2021 annual report', and alike the COP25 cover decision, reiterated the need for financial provisions to help developing States plan for adaptation and implement adaptation actions.[1062]

Considerable developments in climate adaptation were made at COP26 in Glasgow in November 2021. The COP26 cover decision, known as the 'Glasgow Climate Pact' recognised the role of protecting ecosystems in 'delivering benefits for climate change mitigation and adaptation'.[1063] It also emphasised the urgency of 'scaling up adaptation action and support, inducing finance, capacity building and technology transfer to enhance adaptive capacity, strengthen resilience and reduce vulnerability to climate change'.[1064] Urged parties to integrate adaptation into planning at all levels and urged the research community to 'further the understanding of global, regional and local impacts of climate change, response options and

[1054] ibid., para. 31.
[1055] UNFCCC, *Provisional agenda and annotations* FCCC/CP/2019/12, paras. 59–60.
[1056] IISD, Earth Negotiation Bulletin, *Summary report 2–15 December 2019* (2019), available at: <https://enb.iisd.org/chile-madrid-climate-change-conference-cop25/summary-report> at 7–8.
[1057] ibid.
[1058] Paris Agreement, Decision 21/CMA.3.
[1059] Paris Agreement, Decision 7/CP.25, para. 17; 6/CMA.2, para. 3.
[1060] UNFCCC, Decision 2/CP. 25, para. 16
[1061] Paris Agreement, Decision 1/CMA.2, para. 13.
[1062] ibid., paras. 14–17; specifically, in the context of the Green Climate Fund at Paris Agreement, Decision 6/CMA.2, paras. 4–6.
[1063] UNFCCC, Decision, 1/CP.26, preambular para. 10; Paris Agreement, Decision 1/CMA.3, preambular para. 7.
[1064] ibid., para. 6; 1/CMA.3, para. 5.

adaptation needs',[1065] and these points were reiterated in Decision 1/CMA.3.[1066] The Pact invited Parties to submit views on the report on the dialogue on the relationship between land and climate change adaptation matters and requested the SBSTA to prepare an informal summary report on that topic to be used by the Parties at COP27.[1067] Parties were requested to submit their Adaptation Communications by November 2022 ahead of the Global Stocktake.[1068]

Moving forward, COP26 saw the launch and establishment of the Glasgow-Sharm el-Sheikh work programme on the global goal on adaptation, adopted by Parties to the Paris Agreement.[1069] The work programme, carried out jointly by the SBSTA and the SBI, has the general mandate to help improve understanding and implementation of adaptation, between 2022 and 2024.[1070] It will do this through the holding of regular workshops and work on enhancing adaptation and support, methodologies and communication and reporting on adaptation priorities.[1071]

Turning to adaptation in practice, a snapshot of adaptation action undertaken by States as recorded in their last NDCs is given here by making use of the latest UNFCCC NDC Synthesis Report.[1072] Ahead of COP26, Parties were required to submit updated NDCs to the UNFCCC Secretariat during 2021. To assess Parties' progress and ambition in climate mitigation and adaptation, a Synthesis Report from 164 latest available NDCs by 191 Parties to the Paris Agreement as recorded in the interim registry as of 30 July 2021, and was made publicly available in September 2021. For reasons of space attention will only be paid to adaptation generally, and the extent to which the fisheries and the ocean is included in adaptation components of NDCs.

[1065] ibid., para. 6–9.
[1066] Paris Agreement, Decision 1/CMA.3, paras. 6–13.
[1067] ibid., para. 59.
[1068] Paris Agreement, Decision 1/CMA.3, para. 8.
[1069] ibid., para. 12.
[1070] Paris Agreement, Decision 7/CMA.3, para. 7.
[1071] The workshop timetable is available here: <https://unfccc.int/topics/adaptation-and-resilience/workstreams/glasgow-sharm-el-sheikh-WP-GGGA>.
[1072] UNFCCC, NDC Synthesis Report (n 1004); I offer analysis of an earlier version of the NDC Synthesis Report released in February 2021 in Mitchell Lennan, 'Climate and the Oceans, NDC Synthesis Report Suggests Greater Work to be done to Mainstream Marine Issues into Climate Adaptation' One Ocean Hub Blog Post (2021) available at: <synthesis-report-suggests-more-work-to-be-done-to-mainstream-climate-adaptation-and-oceans/>.

Generally, the Synthesis Report shows an increased focus on adaptation compared to earlier NDCs, indicating the increased importance felt by Parties.[1073] Adaptation-related information was included by most parties in their NDCs, and many Parties indicated they had enhanced their adaptation contributions.[1074] A few designating their adaptation components as Adaptation Communications in line with Paris Agreement Article 7(10).[1075] A few 'provided information organized around the elements identified in the annex to decision 9/CMA.1' which indicates at least some States are following available UNFCCC guidance on adaptation.[1076] Indeed, many Parties included a description of their process to formulate and implement NAPs as the main source of adaptation information for Parties and an important component of NDCs.[1077] Generally, NDCs contained detail on i) more integrated national frameworks for adaptation as opposed to descriptions of individual projects; ii) quantitative time-bound targets and indicator frameworks instead of open-ended adaptation objectives; and iii) mitigation and sustainable co-benefits for adaptation and other synergies between the two actions.[1078]

The Synthesis Report also indicated that adaptation efforts focused on food production and security,[1079] terrestrial, wetland and ocean ecosystems, human health, freshwater resources, coastal and low-lying areas and disaster risk management.[1080] However, less than 30% of the adaptation components submitted ahead of COP26 contained a reference to ecosystems (terrestrial and marine) as an adaptation priority.[1081] Of those that did, temperature increases, loss of marine biodiversity and ocean acidification were considered key adaptation priorities, all of which cause fish range shifts as outlined in chapter 1. The importance of increased adaptation research in coastal areas was also highlighted.[1082] Adaptation in coastal ecosystems was raised as a mitigation co-benefit, with planting mangrove and seagrass beds specifically mentioned. These act as a carbon sink, provide coastal protection, and habitat for juvenile fish species which promotes food security. Parties included the mitigation co-benefits of restoring coastal ecosystems in the formulation of NAPs.[1083] Moreover, 'some adaptation components

[1073] UNFCCC, NDC Synthesis Report (n 1004) para. 25
[1074] ibid., para. 132
[1075] ibid., paras. 24 and 154.
[1076] ibid., paras. 61 and 157.
[1077] ibid., paras. 155 and 160.
[1078] ibid., para. 156.
[1079] ibid., paras. 127 and 147.
[1080] ibid., paras. 26 and 158.
[1081] ibid., figure 10.
[1082] ibid., paras. 158–159.
[1083] ibid., para. 126.

outlined efforts to adapt ocean ecosystems to promote sustainable development while safeguarding oceans. Measures are focused on investing in ocean and "blue" economy and protecting marine and coastal ecosystems, with a focus on coral reefs and mangrove restoration'[1084] This particular point reflects recent research that questions the efficacy of coastal ecosystem restoration as a mitigation tool, and suggests it instead should be viewed as an adaptation action with mitigation co-benefits and protected and restored as an ecosystem in its own right for the multiple services they provide.[1085]

On fisheries specifically, just over 30% of NDCs included fisheries as a priority adaptation sector.[1086] Climate impacts were highlighted as impact on food security and the 'redistribution of marine fisheries' was specifically mentioned as an example.[1087] Reliance on fisheries as a climate-vulnerable sector was indicated in some NDCs, as was the need for sectoral vulnerability analysis in assessing adaptation needs.[1088] Economic diversification of the fisheries sector was given as an example as a mitigation co-benefits resulting from adaptation actions.[1089] For example, through improving energy efficiency through pricing signals and technology deployment in the fisheries industry.[1090] Importantly, the Synthesis Report raised that Parties NDCs indicated that in the face of climate change 'the measures for enhancing sustainability of fisheries involve research, diversification, capacity-building, sustainable management, habitat protection and financial instruments.'[1091] On financial instruments in fisheries, 'insurance against extreme events and establishing a minimum income for fishers' as contingency measures against extreme events or in conditions where adaptation is no longer possible.[1092] This is intriguing as it brings in the prospect of harnessing climate finance to promote adaptation and resilience in the fisheries sector, which at present is rather limited.[1093] On that point, some Parties provided information on financial support needs, with the report listing adaptation finance needed for 'activities related to water, agriculture, coastal

[1084] ibid., para. 168.
[1085] Phillip Williamson and Jean-Pierre Gattuso, 'Carbon Removal Using Coastal Blue Carbon Ecosystems Is Uncertain and Unreliable, With Questionable Climatic Cost-Effectiveness' (2022) 4 Frontiers in Climate; Xiaoguang Ouyang and others, 'Carbon Storage and Mineralization in Coastal Wetlands' in Xiaoguang Ouyang and others (eds), *Carbon Mineralization in Coastal Wetlands*, vol 2 (Elsevier 2022).
[1086] UNFCCC, NDC Synthesis Report (n 1004) para. 163.
[1087] ibid., para. 163.
[1088] ibid., para. 163.
[1089] ibid., paras. 63, 123–127.
[1090] ibid., paras. 125.
[1091] ibid., para. 163.
[1092] ibid., 173
[1093] See Guggisberg, (n 552).

protection and resilience', with fisheries being conspicuously absent from that list.[1094] Finally, cooperation on adaptation through international institutions or intergovernmental organisations, such as RFMO/As was not included in the report. The above analysis of the Synthesis Report indicates that there is still greater work to be done to mainstream all marine issues, not just fisheries, into climate adaptation.

3.5 Conclusions

This section further corroborates the argument that States do have an obligation to adapt their fisheries conservation and management to the effect of climate change. It sought to establish what is required of States to comply with their climate change adaptation obligations under ICL to clarify the scope and content of the obligation to adapt fisheries management to climate change. This section has illustrated that adaptation is a universal priority for States, demonstrated by a dedicated provision on adaptation within the Paris Agreement and the global goal on adaptation. However, although it is not quantified in same way as the mitigation goal despite the two now being given parity within the Paris Agreement. Although, as discussed in section 2, adaptation is subject-specific and difficult to quantify in comparison to climate mitigation. Methodologies to quantify (but not compare) adaptation efforts by Parties are still being worked out ahead of the Global Stocktake by the Adaptation Committee as the key body for adaptation within ICL. Developments after Paris have not further developed the adaptation goal. However, in terms of what Parties have to do in attempts to meet this goal, there is clear flexibility. The CAF takes a 'plan and implement' approach while the Paris Agreement takes a 'communicate and report' approach to adaptation. These two instruments are complimentary in that respect, with the CAF supporting a country-driven approach to adaptation, and the communicate and report approach of the Paris Agreement supports greater transparency and accountability. To that end, Adaptation Communications, and NDCs are the key mechanisms developed to address national adaptation to climate change. Adaptation finance is available for developing country Parties through the four funds under the UNFCCC, however funding for adaptation is not yet on equal footing with mitigation. Moreover, the Paris Agreement and its Rulebook has helped develop the 'international' aspect of climate adaptation, as well as provide clarity on the scope and content of the various forms an Adaptation Communication can take

[1094] UNFCCC, (n 1004) para. 196.

within an NDC. While the international component of adaptation is slowly being advanced through constituted bodies under the UNFCCC, despite there being clear evidence that Parties can exercise their international adaptation obligations through other international bodies outside the UNFCCC, such as through RFMO/As in a fisheries context, this requires further development and integration. Recent developments at COP26, including the establishment of the Glasgow-Sharm el-Sheikh Work Programme, ought to ensure continued development of adaptation to provide normative clarity and aid Parties in identifying their vulnerabilities, adaptation actions, needs and communicating those through their NDCs. Nonetheless, the climate regime does provide a legal framework for which climate adaptive fisheries management and conservation can be planned, communicated, and recorded in a standardised way internationally. Since the previous chapter clarified that States have an obligation to take measures to adapt fisheries management and conservation to the effects of climate change, this chapter so far has indicated that under the Paris Agreement, States have a hortatory obligation to report these measures through their Adaptation Communications.

On that note, the developments in the NDC synthesis report are promising in terms indicating that Parties are adapting their fisheries management and conservation to climate change through adaptation planning, reporting and implementation, it is clear that some Parties are acutely aware of the importance of the ocean, marine ecosystem and fisheries in adapting to the impacts of climate change. However, other Parties have not yet placed fisheries or oceans as a priority. However, considering the focus of ICL generally and adaptation on the national level, how Parties to the UNFCCC and the Paris Agreement begin to implement their climate obligations into activities far from shore in areas beyond national jurisdiction? Considering the wealth of scientific evidence of shifting fish stocks and the obligation international cooperation to adapt to this, either through bilateral cooperation or through RFMO/As highlighted in chapters 1 and 2 respectively, international fisheries law needs to adapt to this problem. Where and how does climate adaptation with a national focus fit into *international* fisheries management? Strengthening regional cooperation on adaptation is requested of Parties under Article 7(7) of the Paris Agreement, and this section has argued that the institutions referred to by that provision do include RFMO/As. The extent to which these organisations do this in practice is the subject of chapter 4. Considering the marked need to strengthen the relationship between climate adaptation and the ocean at the UNFCCC, the next section considers how the extent to which this can be achieved in light of recent developments.

4. Strengthening the Relationship between Climate Adaptation and the Ocean

Having spent considerable time in this chapter discussing adaptation within ICL as a discrete legal framework, it is worth reminding the reader that the research question of this thesis is to what extent do States have an international legal obligation to adapt international fisheries management practices to the effects of climate change? The purpose of the above sections in this chapter were to illustrate that climate adaptation law is still developing and evolving and will continue to do so in the short-term. In addition, considering the previous section concluded that the provisions on climate adaptation in ICL are considerably lower in obligation in comparison to climate mitigation, the targets of which are easier to quantify, maintain and record. However, these provisions do not exclude fisheries conservation and management, or the ocean more generally, inform adaptation action under the Paris Agreement in any way. This final section of the chapter on climate adaptation law analyses the links to the ocean and fisheries found within the international climate regime with a focus on adaptation. It therefore differs from the analysis offered in chapter two.

Despite being a well-developed body of international law, ICL's relationship with the ocean, is still rather nascent. There does of course exist a significant body of literature on the efficacy of the Paris Agreement and its relationship with other sectoral international legal instruments, including the law of the sea,[1095] international biodiversity law,[1096] and human rights.[1097] However, much of this is focused on climate mitigation, while adaptation and capacity building have been identified as clear gaps.[1098] Considering the global nature of climate change, the global adaptation goal and provisions in the Paris Agreement and other ICL instruments described above, the ICL regime is universal in scope and it should not be controversial to say that provisions in the ICL framework apply to marine spaces and ecosystems both within and beyond national jurisdiction. This considered, it is important to remember the argument made in chapter two that climate adaptation obligations under ICL apply to States in their activities on the high seas, particularly through their participation in

[1095] See wealth of literature cited in chapter 2.
[1096] Elisa Morgera, 'No need to reinvent the wheel for a human rights-based approach to tackling climate change: The contribution of international biodiversity law' in Erkki J Hollo, Kati Kulovesi and Michael Mehling (eds), *Climate Change and the Law* (Springer 2013) 350–390.
[1097] Alan Boyle, 'Climate Change, The Paris Agreement and Human Rights' (2018) 67 International and Comparative Law Quarterly 759.
[1098] Kilian Raiser and others, 'Is the Paris Agreement Effective? A Systematic Map of the Evidence' (2020) 15 Environmental Research Letters 083006.

RFMO/As. This section will explore the limited relationship between climate adaptation and the ocean and begins to develop this argument to be build-upon in the next chapter.

The first subsection discusses the necessary background of where the ocean and fisheries are included in ICL, then a brief history of the twenty-year policy discussion at the UNFCCC on the ocean/climate change nexus. The second subsection builds on the previous, outlining and analysing important developments at COP26 in Glasgow, and the Ocean-Climate Dialogue at SBSTA56 in June 2022, and then explores the prospect of future developments in the climate change regime. The final section explores available soft-law instruments tools to strengthen the relationship between adaptation, fisheries and the ocean including those available under the UNFCCC ambit and then those produced form other MEAs. This section briefly concludes ahead of conclusions for the whole chapter.

4.1 The Ocean/Climate Nexus at the UNFCCC

The impacts of climate change on the ocean and the importance of the ocean for life on earth and its role in climate regulation (otherwise known as the ocean/climate nexus) were discussed in chapter one. The need for an integrated approach to the ocean/climate nexus is clear, as failure to do so limits the effective protection of the marine environment, impedes international cooperation on both climate mitigation and adaptation. Chapter two highlighted where the ICL regime 'informs' marine environmental protection provisions under the law of the sea as well as international fisheries law, through the provision of generally agreed rules and standards. However, deeper links within international climate fora at the UNFCCC are needed to foster an integrated approach to tackling climate impacts on the marine environment. This subsection discusses the ongoing policy discussion on the ocean/climate nexus at the UNFCCC, including important steps forward which occurred during the COP26 negotiations in Glasgow in November 2021.

4.1.1 The Ocean and Fisheries in the Climate Regime

The references to the ocean and marine environment in ICL are few and far between. The UNFCCC defines the climate system as 'the totally of the atmosphere, hydrosphere, biosphere

and geosphere and their interactions',[1099] this definition applies to the UNFCCC's objective to protect the climate system in Article 2, as well as the Kyoto Protocol,[1100] and the Paris Agreement.[1101] Thus, the UNFCCC and the Paris Agreement do explicitly refer to the ocean, recognises the ocean/climate nexus through the inclusion of the hydrosphere and As mentioned in section 3.1, all UNFCCC Parties must prepare national inventories of GHG emissions from sources and removals by natural sinks,[1102] and report on GHG removal by those sinks.[1103] The ocean is given as an example of natural sinks in Article 4(1)(d) UNFCCC, and while the Kyoto Protocol makes no mention of the ocean but obliges Parties to the conserve sinks of GHGs of taking in to account their obligations under relevant international agreements.[1104]

To repeat from earlier in this chapter, the Paris Agreement mentions in the ocean in the Preamble noting the importance of 'ensuring the integrity of all ecosystems, including oceans'.[1105] In line with the objective of the Agreement to strike a balance between 'emissions by sources and removals by sinks',[1106] it places on Parties the binding obligation to 'conserve and enhance' sinks and reservoirs, which refers to the UNFCCC's examples of sinks.[1107] These provisions are limited in the sense that they are more focused on climate mitigation. Although, the greater mitigation efforts that are made, in particular the conservation an enhancement of sinks, through ecosystem restoration, we are less likely to need greater adaptation measures.[1108] Further, the ocean and its biodiversity are a component of climate regulation and contribute to the global carbon cycle that makes the ocean a sink. This considered, the reference to both sinks, ecosystems, and oceans indicates that the marine environment, and fisheries are included in the ICL remit in terms of climate mitigation, adaptation and finance. There are also the limited references and links to climate adaptation and the ocean or fisheries highlighted in section 3, and the general references to ecosystems made in the UNFCCC and Paris Agreement texts and the COP decisions included in section 3 which support this point.

[1099] UNFCCC, Art. 1(3).
[1100] Kyoto Protocol, Art. 1.
[1101] Paris Agreement, Art. 1.
[1102] UNFCCC, Art. 4(1)(a).
[1103] ibid., Art. 4(1)(b).
[1104] Kyoto Protocol, Art. 2(a)(ii), see section 3.3 of this chapter.
[1105] Paris Agreement, preambular para. 13; This provides important context to interpret and analyse the object and purpose of the Agreement by way of VCLT, Art. 31(1).
[1106] Paris Agreement, Art. 4(1).
[1107] ibid., Art. 5.
[1108] IPCC, (n 3) Summary for Policy Makers, paras. C.4.1–7.

One argument that supports that fisheries systems are included in ICL is through the lens of food production and security. The ocean's important role in providing nutrition, as well as regulation of the global climate, thus securing the material conditions for several human rights, was discussed in chapter 1. Both the UNFCCC and the Paris Agreement refer to food security and production within a climate change context. For example, the UNFCCC's objective states that emissions reduction should occur to that ecosystems may naturally adapt to climate change 'to ensure that food production is not threatened',[1109] and the Paris Agreement seeks to enhance the implementation of the Convention by '[i]ncreasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low [GHG] emissions development, in a manner that does not threaten food production'.[1110] The operative provisions of the Paris Agreement do not refer to food or fisheries, its Preamble 'recognis[es] the fundamental priority of safeguarding food security an ending hunger and the particular vulnerabilities of food production systems to the adverse effects of climate change.'[1111] Taking this and Article 7(9) of the Paris Agreement on adaptation planning which includes vulnerability assessments to determine adaptation actions accounting of vulnerable people, places and ecosystems,[1112] it becomes clear that ensuring food production is a component of adaptation action and for meeting the objectives of the UNFCCC and the Paris Agreement.[1113] Therefore it is imperative for States to include fisheries conservation and management to comply with their adaptation obligations under ICL and international fisheries law.

Since the focus of the next chapter is on high seas fisheries, it is worth establishing the extent to which the provisions of the UNFCCC and the Paris Agreement apply to the high seas or ABNJ. According to Bodansky, citing personal communications with government delegates at COPs over nearly three decades, '[i]t is incorrectly assumed within the UN climate change community that a State's NDC is territorially limited, and that States cannot claim credit under the climate change regime for mitigation and adaptation actions in areas beyond national jurisdiction. There is no textual basis, however, for this assumption.'[1114] Further, there is no limitation under UNFCCC Article 4.1(b) where measures to mitigate climate change can occur,

[1109] UNFCCC, Art. 2.
[1110] Paris Agreement, Art. 2(1)(b).
[1111] ibid., Preambular para. 10; see Elisa Morgera and others, *The Right to Water for Food and Agriculture* (FAO 2020) at 51–53.
[1112] Paris Agreement, Art. 7(9)(c).
[1113] See Hilal Elver and Nilüfer Oral, 'Food Security, Fisheries and Ocean Acidification: A Human Rights Based Approach' in David VanderZwaag, Nilüfer Oral and Tim Stephens (eds) *Research Handbook on Ocean Acidification Law and Policy* (Edward Elgar 2021) 85–87.
[1114] ibid.

and Parties are required to promote and cooperate conservation and enhancement of the oceans and other coastal and marine ecosystems.[1115] This general formulation does not restrict this requirement to national jurisdiction in any way. Additionally, the Paris Agreement does not explicitly prohibit extra-territorial mitigation measures,[1116] and considering the 'global' nature of the adaptation goal in Article 7 adaptation actions are not limited to the territory of any one Party. It has been argued that clarifying that ICL extends to ABNJ 'might not have much immediate effect, since it is unclear what measures, if any, are feasible'.[1117] This is true in the sense that both mitigation and adaptation actions are challenging or impossible to quantify in ABNJ. Nevertheless, fisheries are the exception to this, since in many cases the institutional capacity to implement, quantify, and attribute such measures exists in the form of RFMO/As. Therefore, the lack of a territorial restriction to the adaptation (and indeed mitigation) provisions of the Paris Agreement supports the argument that coastal States should include fisheries and oceans adaptation components within their NDCs, and any State who participates in high seas fishing should prioritise/encourage/promote adaptation through their participation within RFMO/As.

Finally, though not the focus of this thesis, the ocean has been included in ICL through the official recognition by UNFCCC Parties in 2010 of ocean acidification as a "slow onset event" which may result in loss and damage.[1118] Ocean acidification was also highlighted in the UNFCCC 2013–2015 review in terms of climate mitigation.[1119] Parties have been invited to work through the United Nations and other institutions, specialised agencies and processes, to promote coherence in approaches to address loss and damage from climate change, including ocean acidification as a slow onset event.[1120] Thus far, the WIM has not addressed ocean acidification directly, but may well do in the future in light of recent developments at COP26 outlined in the next section.

This subsection has argued that the provisions of the Paris Agreement do apply to the ocean, marine biodiversity, and fisheries. To that extent they apply to the climate mitigation

[1115] UNFCCC, Art. 4.1(e).
[1116] Although Parties wishing to implement extra-territorial mitigation measures under Art. 6 must get authorisation from that State, Art. 6(3).
[1117] Bodansky, (n 3) 335.
[1118] UNFCCC, Decision 1/CP.16 para. 25, footnote 1.
[1119] UNFCCC, *The 2013–2015 Review*, (2015), available at: <http://unfccc.int/science/workstreams/the_2013-2015_review/items/ 6998.php>.
[1120] UNFCCC, Decision 2/CP.19 para. 12.

and adaptation targets within States' NDCs, and financial pledges made by States. However, it has been argued that the 'UN climate change regime should more clearly include in its ambit mitigation and adaptation actions undertaken in a State's [EEZ] or on the high seas, including actions to conserve and enhance oceans sinks.'[1121] This is supported by the fact that there has been very little engagement on ocean issues at the UNFCCC until very recently, with the ocean only being brought in to the climate fold at COP26 in 2021. This is addressed in the next subsection.

4.1.2 Bringing the Ocean into the Climate Fold at the UNFCCC

The enthusiasm to include the ocean more prominently in climate-related action within all levels of the UNFCCC framework comes off the back of over a decade's worth of discussion both within and outside the UNFCCC arena and academia. Take for example, David Freestone's oft-quoted statement from 2009 comparing the ocean to the 'Cinderella of the UN Climate Negotiations. Even though the world's oceans constitute the biggest single sink of carbon dioxide and represent more than 30% of the global carbon cycle, no one has asked them to the Ball.'[1122] Indeed, progress has been slow to achieve inclusion of the ocean within the UNFCCC. This subsection presents the background of the efforts to include the ocean in the UNFCCC framework up until COP26.

The Manado Ocean Declaration signed by delegates at the World Ocean Conference on 14 May 2009 recognised the importance of the ocean/climate nexus, and the "need to consider ocean dimensions to inform adaptation and mitigation strategies" it invited parties to 'consider how the coastal and ocean dimension could be appropriately reflected in their decision' at the UNFCCC Copenhagen COP15 scheduled later in the same year.[1123] Following from that momentum, the first 'Oceans Day' was held at COP15 on 14 December 2009.[1124] These were held annually up until COP22 then renamed 'Ocean Action Days'.[1125] These are

[1121] Bodansky, (n 3) 334.
[1122] Freestone, (n 142) 383.
[1123] Manado Ocean Declaration, (Manado, Indonesia, 14 May 2009), paras 19–20 available at: <https://www.gc.noaa.gov/documents/051409-manado_ocean_declaration.pdfhttps://www.gc.noaa.gov/documents/051409-manado_ocean_declaration.pdf>.
[1124] For a summary of that event, see: <https://rocainitiative.files.wordpress.com/2017/11/summary-oceans-day-at-copenhagen.pdfhttps://rocainitiative.files.wordpress.com/2017/11/summary-oceans-day-at-copenhagen.pdf>.
[1125] See Roadmap to Oceans and Climate Action (ROCA) Initiative, 'Oceans Action Days' no date, available at: <https://roca-initiative.com/oceans-action-days/https://roca-initiative.com/oceans-action-days/>.

generally high-level panel discussions which aim to 'mobilise the ocean agenda at the UNFCCC',[1126] featuring contributions from various NGOs, as well as United Nations bodies relevant to the ocean, including FAO, and the Intergovernmental Oceanographic Commission of UNESCO, for example.

In 2015 in Paris, Chile sponsored the first 'Because the Ocean' declaration signed by 23 States at COP21.[1127] The Declaration stressed the collective legal obligation on all states under UNFCCC Art. 4.1(d) concerning cooperation in the conservation and enhancement of sinks, including the ocean and marine ecosystems. In addition, the declaration supported the proposal for a special report by the IPCC on climate impacts on the ocean, the need to meet the targets of SDG14, and established the commitment to meet as a group to promote the ocean at future COPs.[1128] A second declaration was launched at COP22 in Marrakech the following year had 39 signatory States by the end of COP23 and reaffirmed the pledges of the first declaration, as well as encouraged UNFCCC Parties to consider submitting NDCs that promote ambitious mitigation and adaptation actions which limit the adverse effects of climate change on the ocean.[1129] Fiji held the Presidency at COP23, and launched the 'Ocean Pathway Initiative' on Oceans Action Day.[1130] The Ocean Pathway Initiative sought to 'call attention to the critical links between the ocean and climate change, and to present a strategy for including oceans in the UNFCCC process'.[1131] The Pathway also aimed to secure and agenda item at the UNFCCC by 2019; aimed for oceans to be included in Parties' NDCs; and 'aims to create a window for the ocean within existing UNFCCC financial mechanisms to ensure climate change funding can support the adaptation work required for healthy oceans'.[1132] The day itself also involved a number of high-level discussions and presentations on the ocean/climate nexus and ocean-based action in mitigation and adaptation.[1133]

[1126] See ROCA, 'Oceans Action Day at COP 24' no date, available at: <https://roca-initiative.com/oceans-action-day-at-cop-24/https://roca-initiative.com/oceans-action-day-at-cop-24/>.
[1127] Because the Ocean Declaration, Paris, (2015), available at: <http://www.vardagroup.org/wp-content/uploads/2016/10/Because-the-Ocean-Peru.pdf>.
[1128] ibid.
[1129] Second Because the Ocean Declaration, Marrakech, (2016), available at: <https://www.becausetheocean.org/second-because-the-ocean-declaration/https://www.becausetheocean.org/second-because-the-ocean-declaration/>.
[1130] See IISD, *Ocean Pathway Launched at COP 23* (2017), available at: <https://sdg.iisd.org/news/ocean-pathway-launched-at-cop-23/>.
[1131] ibid.
[1132] ibid.
[1133] ibid.

2019 can be considered a transformational year for the ocean/climate nexus discussion at the UNFCCC. After concluding in 2018 that future NWP thematic areas should include oceans, coastal areas and ecosystems,[1134] the SBSTA established the NWP expert group on oceans.[1135] By instruction of the SBSTA, during COP25 the NWP held a Focal Point Forum on the ocean.[1136] The background paper for the forum highlighted redistribution of marine biodiversity as a knowledge gap, with further research needed on 'identification of adaptation limits and the capacities of systems to adapt'.[1137] It also highlighted examples of funds and financing opportunities to advance fisheries and marine ecosystem-based adaptation.[1138] As well as examples of approaches in building resilience of the fisheries sector to climate change in the Caribbean and the Pacific regions.[1139] Importantly, it highlighted the need to 'build the capacity of regional institutions to coordinate work on regional and transboundary issues and to support national efforts'[1140] and enhance 'funding and other support to address transboundary issues e.g. shared fisheries, sargassum influxes, MPA networks'.[1141] This is important as it indicates awareness within the UNFCCC of the issues of marine species redistribution and the need for regional cooperation to adapt and address to the challenges it presents.

Outside the UNFCCC, as part of the strategy developed by the Ocean Pathway Process, in February 2019 the Brussels Declaration on Climate Change and Ocean Preservation was signed by over 30 States. [1142] The Brussels declaration *inter alia* committed to the SDGs; expressed concern regarding the findings of the IPCC SROCC that current Parties' NDCs were not enough to meet the 1.5ºC temperature goal; calls on UNFCCC Parties to engage in the Ocean Pathway Partnership and the 'Because the Ocean' Declaration; and include ocean-

[1134] SBSTA, *Report of the SBSTA on the first part of its forty-eighth session, held in Bonn from 30 April to 10 May 2018*, UN Doc. FCCC/SBSTA/2018/4 (3 July 2018), para. 21.
[1135] SBSTA, *Report of the SBSTA on its fifty-first session, held in Madrid from 2 to December 2019*, UN Doc. FCCC/SBSTA/2019 (16 March 2020), para. 17.
[1136] ibid., para. 17; United Nations Climate Change, '13th Focal Point Forum of the Nairobi Work Programme on the ocean' available at <https://unfccc.int/ event/13th-focal-point-forum-of-the-nairobi-work-programme-on-the-ocean> and IISD, 'NWP Explores Knowledge Gaps in Ocean Adaptation' (2019) available at: <https://sdg.iisd.org/news/nwp-explores-knowledge-gaps-in-ocean-adaptation/https://sdg.iisd.org/news/nwp-explores-knowledge-gaps-in-ocean-adaptation/>.
[1137] UNFCCC, *Adaptation of the Ocean, Coastal Areas and Ecosystems - Scoping Paper on Closing Knowledge Gaps and Advancing Adaptation - A background paper for the Nairobi work Programme 13 Focal Point Forum to be held at COP25, Madrid, Spain* (2019) available at: <https://unfccc.int/documents/230928> 17.
[1138] ibid., 23.
[1139] ibid., 28.
[1140] ibid., 55.
[1141] ibid., 57.
[1142] Brussels Declaration on the Ocean and Climate Change, (2019) available at: <https://climat.be/doc/CliChaOcePre_Declaration_19-02-2019.pdf>.

related action in their NDCs, and Adaptation Communications and emissions reduction strategies.[1143] In September that year, the IPCC SROCC was launched – the findings of which relevant to this thesis can be found in chapter 1. A final point on the significance of the several high-level political declarations: It is beyond the scope of the thesis to enter into discussion on the legal force of these declarations, though one must acknowledge that they are not legally binding. Though as rather simple policy documents, they could be regarded to sit on the outer spectrum of 'soft' law.[1144] Either way, they have over time facilitated States acknowledgement of the worsening state of the climate crisis and its specific impact on the ocean, and allowed States to reaffirm their commitment to existing legal and governance instruments which exist to address the impacts. Thus, they still have some normative force in clarifying State's obligations on ocean-based climate action in ICL. While carrying limited legal weight or effect, they have helped to shape the policy discussion on climate and oceans at the UNFCCC and have been helpful in unifying States with the same interests and concern into negotiating positions at COPs. This snail-pace momentum did start to pay-off somewhat at COP25 in Madrid.

Though generally regarded as unsuccessful,[1145] the ocean was promoted heavily by the Chilean Presidency at COP25 in Madrid. Chile, as the main sponsor of Because the Ocean Initiative and a member of the Ocean Pathway, used the position as President to label COP25 as the 'Blue COP'. This labelling sought to highlight the ocean/climate nexus and bring Parties attention to the findings of the IPCC Special Report on the Ocean and the Cryosphere. A high-level report was also released in the first week of COP25 highlighting the impacts of climate change on the ocean economy.[1146] The Presidency's efforts were recognised in the cover decision as going to great length to highlight the importance of the ocean 'as an integral part of the Earth's climate system, and of ensuring the integrity of ocean and coastal ecosystems in

[1143] ibid.; See also IISD, *High-level Conference Issues Declaration on Oceans and Climate Change* (21 February 2019).
[1144] See Kenneth W Abbott and Duncan Snidal, 'Hard and Soft Law in International Governance' (2000) 54 International Organization 421; and discussion on soft law in section 2.
[1145] This is due to the fact that, despite being the longest COP ever, Parties were unable to agree on and finalise the 'Rulebook' on Article 6 of the Paris Agreement. See: Carbon Brief, *COP25: Key outcomes agreed at the UN Climate talks in Madrid* (2019), available at: <https://www.carbonbrief.org/cop25-key-outcomes-agreed-at-the-un-climate-talks-in-madridhttps://www.carbonbrief.org/cop25-key-outcomes-agreed-at-the-un-climate-talks-in-madrid>.
[1146] Steve Gaines, and others (eds) *The Expected Impacts of Climate Change on the Ocean Economy* (World Resources Institute, 2019), available at: <https://www.oceanpanel.org/sites/default/files/2019-12/expected-impacts-climate-change-on-the-ocean-economy.pdfhttps://www.oceanpanel.org/sites/default/files/2019-12/expected-impacts-climate-change-on-the-ocean-economy.pdf>.

the context of climate change'.[1147] In terms of action, the SBSTA was requested to begin an informal dialogue on the ocean and climate change, to consider how to strengthen both mitigation and adaptation in an ocean context, and to prepare an informal summary report to inform the dialogue.[1148]

Due to the postponement of COP26 to November 2021, the SBSTA informal dialogue was convened in Bonn on 2–3 December 2020. The output from the informal dialogue came in the form of an informal summary report published by the SBSTA in late April 2021 with the focus of how to consider strengthening adaptation and mitigation climate action at the interface between the climate and the ocean.[1149] The report highlighted the absence of the ocean from the policy discussion on climate change at the UNFCCC, and noted the 'interest of Governments in strengthening understanding of and action on ocean and climate change adaptation and mitigation.'[1150] After the release of that summary report, a joint COP26 Presidency Event held on 29 June 2021 indicated that several UNFCCC Parties:

> [C]alled for a strong political signal from COP26 on the ocean, emphasising the impacts of climate change for ocean, the need to raise climate ambition as a result, the importance of ocean action to address climate change, and the need to better integrate ocean-climate issues within UNFCCC. Some parties specifically advocated for decision text on the ocean in 1/CP.26.[1151]

There were also calls to make full use of international fora to deliver climate goals, and "further integration and consideration of the ocean-climate nexus" and including this in the text of said COP decision.[1152] Several participants supported a reoccurring ocean-climate dialogue, and that the dialogue should help deliver ocean-climate action in developing countries 'particularly in the realms of adaptation and mitigation, mobilizing finance and the capacity building role of ocean science and technology transfer for vulnerable coastal communities'.[1153] Other Parties

[1147] UNFCCC, Decision 1/CP.25 para. 30.
[1148] ibid., para. 31.
[1149] UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA), Ocean and Climate Change Dialogue to Consider How to Strengthen Adaptation and Mitigation Action, Informal summary report by the Chair of the Subsidiary Body for Scientific and Technological Advice (2021) available at: <https://unfccc.int/sites/default/files/resource/SBSTA _Ocean_Dialogue_SummaryReport.pdf.>.
[1150] ibid., paras. 3–4.
[1151] UNFCCC, Joint COP26 Presidency Event – Informal Consultation on Oceans and Climate (2021) available at: <https://unfccc.int/sites/default/files/resource/Joint%20COP26%20Presidency%20Event%20Summary.pdfhttps://unfccc.int/sites/default/files/resource/Joint%20COP26%20Presidency%20Event%20Summary.pdf>.
[1152] ibid.
[1153] ibid., para. 6.

called for a balanced treatment on ocean and land issues in the future COP26 text, and at a national level 'a call for Parties to include ocean mitigation and adaptation solutions in their national climate plans, prioritising ocean [nature-based solutions] including the preservation of mangroves and seagrass, and the promotion of blue carbon and MPAs. Other Parties made calls for regional efforts and leadership through commitments and projects, including the idea of regional NDCs'.[1154] Ahead of the negotiations, a NWP briefing paper for COP26 stressed that 'adaptation action must integrate considerations of biodiversity into forest and grassland biomes to build resilience, protect life on land and in the ocean, and foster sustainable land management – priorities for countries and global frameworks alike.'[1155] The briefing paper also called for integrated approaches to adaptation action, particularly in terms of cooperation on transboundary issues.[1156] COP26 and its outcomes are discussed below.

4.2 COP26 and the Ocean: The Glasgow Climate Pact

This momentum continued in the run up to and during the negotiations at Glasgow in November, with the third Because the Ocean Declaration being launched on day one of COP26.[1157] The motto 'ocean action is climate action' was repeated during side events throughout the negotiations.[1158] The end result of the negotiations was a package of overarching decisions adopted by Parties to the UNFCCC,[1159] its Kyoto Protocol,[1160] and the Paris Agreement,[1161] known collectively as the 'Glasgow Climate Pact'. Although the Pact is not formally legally binding, it comprises a set of international negotiated and agreed policy commitments by the Parties to the UNFCCC and the Paris Agreement to promote and achieve

[1154] ibid., paras. 7-9.
[1155] UNFCCC, *Nairobi Work Programme Briefing paper on biodiversity* (2021) available at: <https://unfccc.int/documents/310685> 4.
[1156] ibid., 3.
[1157] See 'High level call for an ambitious ocean outcome at COP26' (2021), available at: <https://www.becausetheocean.org/high-level-call-for-an-ambitious-ocean-outcome-at-cop26/>.
[1158] See, 'COP26: Ocean action is climate action – Five key takeaways from the Glasgow climate talks' Economist Group's World Ocean Initiative, (2021), available at: <https://ocean.economist.com/governance/articles/untitled-cop26-ocean-action-is -climate-action>.
[1159] UNFCCC, Decision 1/CP.26.
[1160] Kyoto Protocol, Decision 1/CMP.16.
[1161] Paris Agreement, Decision 1/CMA.3.

the objectives of those treaties.[1162] This subsection offers analysis of the Pact and its significance for the ocean, with a focus on adaptation and fisheries.[1163]

The Pact directly refers to the need to ensure integrity of ocean ecosystems in its Preamble.[1164] In addition, decision 1/CP.26 also makes direct reference to the:

> importance of protecting, conserving and restoring natures and ecosystems including […] marine ecosystems, to achieve the long-term global goal of the Convention by acting as sinks and reservoirs of greenhouse gases and protecting biodiversity, while ensuring social and environmental safeguards.[1165]

These references link to the United Nations Decade on Ecosystem Restoration (2020–2030),[1166] and as elaborated in chapter 1, linking ecosystem restoration to climate adaptation and mitigation 'has the potential to facilitate effective climate action and the protection of several human rights'.[1167] This is reflected in an adaptation context later in the decision which recognises that the protection, conservation and restoration of ecosystems reduces vulnerability to climate change impacts through the services they provide.[1168] The decision also encourages Parties to take an integrated approach to achieve this, which supports the central argument of the thesis,[1169] and indicates the importance of using tools available from the UNFCCC and from other MEAs, such as the CBD and those adopted under the auspices of FAO's Committee on Fisheries as discussed in chapter 2. An earlier draft of the decision was more specific and direct, and recognised that the report from the SBSTA ocean and climate change dialogue 'highlighted the need for an integrated approach to strengthen ocean-based action and climate

[1162] UNFCCC, Art. 7(2)(g); Paris Agreement, Art. 16(4).
[1163] Parts of this subsection are published in two blog posts published immediately after COP26 and a short article published shortly thereafter: Elisa Morgera and Mitchell Lennan, 'COP26: What news for the ocean?' One Ocean Hub, (2021), available at <https://oneoceanhub.org/cop26-what-news-for-the-ocean/>; Elisa Morgera and Mitchell Lennan, 'COP26: Reflections on human rights at the ocean-climate nexus' The Global Network for Human Rights and the Environment, no date, available at <https://gnhre.org/community/cop26-reflections-on-human-rights-at-the-ocean-climate-nexus/>; Lennan and Morgera (n 25).
[1164] UNFCCC, Decision 1/CP.26, preambular para. 7; 1/CMA.3, preambular para. 7.
[1165] ibid., 1/CP.26, para. 21.
[1166] UNGA, *United Nations Decade on Ecosystem Restoration (2021–2030)* Resolution adopted by the General Assembly on 1 March 2019 UN Doc. A/RES/73/284.
[1167] Lennan and Morgera, (n 25) at 141.
[1168] UNFCCC, Decision 1/CP.26, paras. 50–51.
[1169] See Mitchell Lennan, Integrated and Inclusive Ocean Governance is Essential to Tackling Climate Change (One Ocean Hub 2021) available at: <https://oneoceanhub.org/publications/integrated -and-inclusive-ocean-governance-is-essential-to-tackling-climate-change>.

change under the UNFCCC'.[1170] This supports the argument for an integrated approach made in this thesis in light of the cross-cutting nature of climate impacts on fisheries and the marine environment.

The Pact invites 'the relevant work programmes and constituted bodies under the UNFCCC to consider how to integrate and strengthen ocean-based action in their existing mandates and workplans and to report on these activities with the existing reporting processes, as appropriate'.[1171] In terms of adaptation, this integrates the ocean into the institutions discussed earlier in the chapter, including the Adaptation Committee, the Adaptation Fund, the NWP expert group on oceans, the Least-Developed Countries Expert Group, as well as the new Glasgow-Sharm el-Sheikh Work Programme. All of which now have a mandate to integrate the marine issues relevant to the Parties in to their workplans and processes. As well as the GCF support investment to adapt to climate change in an ocean context board requested to 'continue to enhance support for the implementation of adaptation projects and programmes' [1172] Generally, the request of all bodies and work programmes under the UNFCCC to report back to COP27 in November 2022 'provides a timeframe and form of accountability, and could pave the way for an ocean-focused COP decision next year',[1173] and meaningful work on specific ocean issues, including fisheries. In addition to adaptation institutions, other UNFCCC institutions on climate finance, technology transfer and capacity building which can help strengthen resilience, reduce vulnerabilities and increase understanding of adaptation in a marine context. In addition, the WIM can also be considered a relevant institution in the context of this decision. While the relevance of loss and damage in the context of high seas fisheries is not particularly clear as yet, this could prove promising in addressing loss and damage from climate change in the marine environment in a national context – for example, loss of fish stocks and revenue/livelihoods from a developing State. Overall, the technical work of the UNFCCC bodies in identifying priority areas for ocean-based action will be done with Parties cooperation, 'to allow for monitoring and support of ocean-based action for mitigation, and to coordinate adaptation measures'.[1174]

[1170] Draft COP decision proposed by the president, Version 10/11/2021 05:48, available at: <https://unfccc.int/documents/309078> para. 58.
[1171] UNFCCC, Decision 1/CP.26, para. 60.
[1172] Paris Agreement, Decision 11/CMA.3, para. 8.
[1173] Lennan and Morgera, (n 25) 164.
[1174] ibid.

The Pact '[a]lso invites the Chair of the [SBSTA] to hold an annual dialogue, starting at the fifty-sixth session of the [SBSTA] (June 2022), to strengthen ocean-based action and to prepare an informal summary report thereon and make it available to the [COP] at its subsequent session'.[1175] This is a key development, and allows for the participation of both Parties and non-Party stakeholders in identifying key areas of ocean-based climate action for the UNFCCC to address. The June dialogue is discussed in subsection 4.2.2 below.

On technology transfer, the Technology Executive Committee was invited to continue making use of events such as Technology Day in 2020 and 2021 to promote innovative approaches on adaptation technologies related to ocean and coastal adaptation.[1176] Increased attention to ocean-based action in the work of UNFCCC bodies may deepen the understanding of related technology transfer under ICL, including for fisheries-based adaptation purposes.

On finance, it is important to note first of all that the four multilateral climate funds under the UNFCCC do support projects which aid least-developed States to adapt their fisheries sectors to climate change, however several vulnerable countries are not receiving financial support.[1177] It has been indicated that these funds are insufficient in terms of transparency, making it difficult to assess exactly how many applications are submitted for projects on fisheries and climate change,[1178] this makes it unclear as to whether several applications are rejected, or few applications are made for projects on this topic. For example the, despite funding projects under the thematic area of Ecosystems and Ecosystem Services, the Green Climate Fund only directs 2% of its funds on ocean-related projects.[1179] No explicit reference was made to the ocean or fisheries in the finance decisions of the Glasgow Climate Pact, and there is a concerning omission of SDG 14 (life below water) from the COP26 decision on matters related to the Standing Committee on Climate Finance, however SDG 2 (zero hunger) is included, which links to the food security made argument above.[1180] While climate

[1175] ibid., para. 61.
[1176] Paris Agreement, Decision 15/CMA.3, para. 10.
[1177] Guggisberg, (n 552).
[1178] ibid.
[1179] Statement by the Commonwealth Secretariat, Baroness Scotland, 'COP26 Commonwealth Pavilion Friday 5th November 2021 afternoon session' (2021), at 2:54:15, available at: <https://www.youtube.com/watch?v=yBVHHiQv4hM&t=9483s>; Green Climate Fund, *Simplified Approval Technical Guidelines, Ecosystems and Ecosystem Services*, no date, available at: <https://www.greenclimate.fund/sites/default/files/document/sap-technical-guidelines-ecosystems-and-ecosystem-services.pdf>.
[1180] UNFCCC, Decision 5/CP.26, Annex II, para. 69.

finance is not *per se* linked to the scope and content of the obligation to adapt in international fisheries law, climate finance can help aid in planning of and implementing climate adaptive fisheries measures. As such in light of ocean-related developments at COP26, ocean and fisheries issues should be centred in climate finance initiatives. In any case, linkages between climate finance and fisheries at all scales require further support by States and is a notable research gap.[1181]

4.2.2 Guidance Supporting Adaptation and the Glasgow Climate Pact

Considering the above components of the decision, the Glasgow Climate Pact integrates the ocean into all areas of work under the UNFCCC for the first time. However, this integration is done in a generic way. There is no definition of 'ocean-based action', no key issues or priority areas are identified, nor is any guidance provided. This is not particularly problematic in the context of adaptation as a range of supplementary guidance produced under the FAO, the CBD, and the UNFCCC, are available. These are discussed below in chronological order.

In 2013 the LEG invited international actors to draft sectoral guidelines to complement the UNFCCC NAP Technical Guidelines, discussed in section 3.[1182] In response, the FAO published supplementary NAP guidelines on addressing agriculture, forestry and fisheries in NAPs.[1183] These aim to aid least-developed States in reducing vulnerability in these sectors to this through within the formulation and implementation of NAPs and enhance the integration of adaptation in development policies, programmes and plans in these sectors through step-by-step guidance.[1184] This may explain the lack of inclusion of fisheries in NAPAs and NAPs (highlighted in section 3.4.2) prior to the publication of these guidelines. However, since they were endorsed prior to the Paris Agreement, they have an LDC specific focus in respect of adaptation.

[1181] See Lennan and Morgera, (n 25).
[1182] UNFCCC Least Developed Countries Expert Group, *National Adaptation Plans - Technical guidelines for the national adaptation plan process* (UNFCCC, 2012) <https://unfccc.int/topics/adaptation-and-resilience/workstreams/national-adaptation-plans-naps/guidelines-for-national-adaptation-plans-naps>.
[1183] FAO, *Addressing Agriculture, Forestry and Fisheries in National Adaptation Plans: Supplementary Guidelines* (2017).
[1184] ibid.

Supplementary NAP guidelines with an exclusive fisheries and aquaculture focus were produced by FAO in 2020.[1185] These include human rights language and highlight the food security issue that climate change may make fish stocks inaccessible to groups who use them as an 'emergency safety net' when agricultural conditions are poor.[1186] Moreover, the supplementary guidelines are not only to aid inclusivity of fisheries vulnerabilities and priorities in the development NAPs, but to be used in conjunction with FAO fishing instruments such as the Code (especially the EAF) and the SSF Guidelines, as discussed in chapter 2. Indeed, although focused at national level (bearing in mind ICL takes a country-driven approach), the guidelines are a helpful example of an integrated approach in fisheries, climate change, biodiversity law. Indeed, these do aid in the implementation of the Code, but are primarily aimed at the reporting process under the Paris Agreement, but are technical guidance and have not been developed, endorsed or adopted by the FAO's Committee on Fisheries, and so for the purpose of the fisheries provisions of UNCLOS and UNFSA, cannot be considered generally recommended international standards for the purposes of fisheries conservation and management.

There are also a range of guidelines adopted under the CBD on climate change and biodiversity, 'which provide multilaterally agreed language on approaches to identify and address potential and actual threats that climate change, as well as climate change response measures, pose to the conservation and sustainable use of biodiversity', including marine biodiversity.[1187] For example the Voluntary Guidelines on Ecosystem-Based Approaches to Climate Change adaptation and Disaster Risk Reduction.[1188] These guidelines explain the value of inclusive and participatory EbA,[1189] and aid States in identifying and implementing EbA, including in a marine context. This limits the need to develop new guidelines under the UNFCCC ambit since they already offer a mutually supportive interpretation of both international climate and biodiversity law,[1190] and to that end, can provide the generally

[1185] FAO, *Addressing Fisheries and Aquaculture in National Adaptation Plans* (FAO 2020). <http://www.fao.org/documents/card/en/c/ca2215en>.
[1186] Ibid. at viii.
[1187] Lennan and Morgera, (n 12) at 141.
[1188] CBD, *Voluntary Guidelines for the Design and Effective Implementation of Ecosystem-Based Approaches to Climate Change adaptation and Disaster Risk Reduction* (CBD 2019), available at <https://www.cbd.int/doc/publications/cbd-ts-93-en.pdfhttps://www.cbd.int/doc/publications/cbd-ts-93-en.pdf>; See CBD, Decision 14/5, Annex I.
[1189] See definition of EbA (ecosystem-based adaptation) at section 3.1 of this chapter.
[1190] Morgera, (n 454).

recommended international rules and standards which are necessary for States in interpreting the fisheries provisions of UNCLOS and UNFSA.[1191]

The above materials are complemented by the newly published NAP technical guidelines,[1192] jointly produced with the Green Climate Fund and Least-Developed Countries Expert Group, on coastal adaptation and nature-based solutions for the implementation of NAPs were highlighted. These guidelines play similar role to the FAO Fisheries NAP guidelines discussed above and focus on coastal adaptation and nature-based solutions. Their aim is to assist least-developed Parties in preparing proposals for the GCF for climate adaptation projects with a marine or coastal focus, specifically to:

- Clarify the entry points and financial instruments to enhance access to coastal and marine [nature-based solution] opportunities in the GCF; and,

- Provide a specifically coastal EbA and [nature-based solution] lens that take into account the GCF's requirements and priorities, as definiens in the GCF Programming Manual and the GCF Updated Strategic plan, as well as the standards that ensure environmental integrity of nature-based approaches in coastal zones.[1193]

While these NAP supplementary technical guidelines are more general and focused on coastal projects, they complement the FAO Fisheries NAP guidelines and the CBD guidelines. Should a Party integrate fishery adaptation priorities into their NAP or Adaptation Communication in their NDCs, the GCF guidelines provide a clear methodology to seek funding from the GCF to implement EbA measures or nature-based solutions. Alike the FAO and CBD Guidelines, the GCF guidelines also take a complimentary human-rights based approach noting, for example that coastal restoration projects must 'incorporate livelihood opportunities such as sustainable fisheries opportunities including proper training based on cultural norms and sustainability, at an individual and community level.'[1194] Indeed, these guidelines help better integration of (at least coastal) sustainable fisheries in to NAPs and other Adaptation Communications in NDCs,

[1191] See relevant discussion in chapter 2; *South China Sea Arbitration*, paras. 945–946.
[1192] UNFCCC, *Coastal Adaptation and Nature-Based Solutions for the Implementation of NAPs: Considerations for GCF Proposal Development* (UNFCCC 2021) available at: <https://unfccc.int/sites/default/files/resource/Ocean%20Policy%20Brief%20v1.24.03.2021.CB%20(5).pdfhttps://unfccc.int/sites/default/files/resource/Ocean%20Policy%20Brief%20v1.24.03.2021.CB%20(5).pdf>.
[1193] ibid., at 2.
[1194] ibid., 7; See FAO NAP Fisheries Guidelines human rights language quoted above.

and add normative content to the general obligation to adapt fisheries management to the effects of climate change. The next subsection discussed the outcome of SBSTA 56 in June 2022.

4.2.2 SBSTA 56

As noted above, the COP requested the SBSTA Chair to produce an informal summary report of the SBSTA's Ocean and Climate Change Dialogue to be utilised by Parties at COP27.[1195] At the time of writing, this is not publicly available and will only be published shortly before the COP27 negotiations begin. However, an informal dialogue on strengthening ocean-based action on climate change was streamed live online,[1196] which allows for initial analysis of the dialogue to be provided here.[1197]

Ahead of the Dialogue, the SBSTA Chair invited Parties and non-party stakeholders to submit inputs via the submission portal to inform the dialogue.[1198] A submission co-authored by the author highlighted the need to i) Strengthen the nexus between the ocean, climate change, biodiversity and human rights; ii) Direct climate finance to ocean-based solutions including climate adaptation and mitigation through the UNFCCC financial mechanisms; and iii) Fostering a human-rights based approach for nature-based solutions to climate change adaptation and mitigation.[1199] A key recommendation made in the submission, based on work undertaken as part of research for this thesis, was that:

> A key point of discussion at the SBSTA should be how to harness existing CBD guidelines to ensure policy coherence with any tools, guidance, decisions or other action taken by the SBSTA or any other UNFCCC body on ocean-based action. This also ensures consistency with the

[1195] 1/CP.26, para. 61
[1196] A recording of the Dialogue can be viewed on the UNFCCC website available at: <https://unfccc.int/event/ocean-and-climate-change-dialogue-0https://unfccc.int/event/ocean-and-climate-change-dialogue-0>.
[1197] See also Ocean & Climate Platform, 'The Ocean and Climate Change Dialogue, Synthesis Report' no date, available at: <https://ocean-climate.org/wp-content/uploads/2022/06/Synthesis-Report_SBSTA56_Ocean-and-Climate-Dialogue_15_06_22.pdf>.
[1198] UNFCCC, 'The Ocean' no date, available at: <https://unfccc.int/topics/oceanhttps://unfccc.int/topics/ocean>.
[1199] Mitchell Lennan and others, *The One Ocean Hub Written Evidence to the UNFCCC* (2022), available at: <https://www4.unfccc.int/sites/SubmissionsStaging/Documents/202203240955---One%20Ocean%20Hub%20Submission_UNFCCC%2024March2022.pdf>.

> environmental provisions of the UN Convention on the Law of the Sea, as they can provide generally agreed international rules and standards necessary for interpreting those provisions.
>
> Moreover, the SBSTA should explore direct partnership and dialogues with regional fisheries management organisations [or arrangements], regional seas conventions, [FAO], and human rights bodies on information sharing, cooperation and collaboration on key issues at the ocean-climate-human rights nexus within those organisations' mandates.[1200]

The summary report of the forty-five submissions received by the secretariat does not refer to these specific points.[1201] However, the report contained a dedicated section on fisheries, although this focused on mitigation action through reducing fuel consumption and eliminating harmful fishing subsidies, as well as reiterating the importance of fisheries to small subsistence communities, with no reference to adaptation.[1202]

On to the discussions during the dialogue itself, which will focus on mainly fisheries and adaptation. Generally, points raised included strengthening ocean-based action through integration of ocean climate mitigation and adaptation measures in Parties' NDCs.[1203] Blue carbon was mentioned throughout the dialogue, including the fact that fewer than 20% of Parties with blue carbon ecosystems have included their role in adaptation and mitigation within their NDCs. The importance of integrating other MEAs and inter-institutional cooperation in implementing ocean-based action was also raised by the Secretariat of the Ramsar Convention on Wetlands of International Importance.[1204] Focusing on fisheries, FAO stressed that climate adaptation is context and place-specific, and effective management and conservation of fisheries is the best way to address climate change impacts. i.e., healthy fisheries are in and of themselves a climate adaptation measure and should be considered a nature-based solution. On adaptation and finance in fisheries, the NWP expert group identified a general knowledge on adaptation in a marine context. In particular it noted the adaptation finance gap on actions at the ocean/climate nexus and directed the dialogue to consider the GCF EbA guidelines, which were discussed in the previous subsection. For the context of this

[1200] ibid., 4.
[1201] SBSTA, *Ocean and Climate Change Dialogue 2022, Information Note by the Chair* (2022), available at: <https://unfccc.int/sites/default/files/resource/Ocean%20and%20Climate%20Change%20Dialogue%202022_Information%20note.pdf>
[1202] ibid., paras. 41–43.
[1203] See Lennan, (n 1069).
[1204] Ramsar, 2 February 1971 in force 21 December 1975 996 UNTS 245.

thesis, it is important to note the absence of any regional fisheries body or RFMO/A during the dialogue.

4.3 Summary Conclusions

This section has further corroborated the argument that the climate regime provides normative content to the obligation to adapt to climate change in fisheries conservation and management. However, this time, this section has demonstrated that there is now scope for future normative developments on this front due to historic developments at COP26.

While the relationship between international fisheries and international climate adaptation law is limited, however these limitations can be addressed through integrated approach and through greater inter-institutional cooperation. Recent developments, particularly the inclusion of the ocean in all areas of work under the UNFCCC as a result of the Glasgow Climate Pact are promising. While COP26 fell short of a dedicated ocean and climate change specific decision, and it seems this was kicked down the river Clyde to the next COP in Sharm el-Sheikh in November 2022. However, the elements in the Glasgow Climate Pact appear generally to include what was requested by the who called for a strong political signal on the ocean from COP26, and blocks of parties, which communicated to the UK Presidency support from an ocean outcome in the COP decision text.[1205] The inclusion of the ocean in reports by adaptation and other institutions, in conjunction with the annual dialogue on the ocean-based action, mean that the ocean will play a role in formal climate change processes. This should prove promising and lead to an initial decision on the ocean/climate nexus, and future COP decisions focusing on the oceans, including those more focused on adaptation, finance, loss and damage. This would help achieve the objective of 'ocean-based action' as in the draft COP decision.

Finally, the ocean-based climate action priorities identified in the summary report of the ocean-climate dialogue at SBTSA 56 will only be part of the picture ahead of COP27. It will be during the multilateral negotiations in November that will demonstrate the extent to

[1205] See Ocean Protect, 'COP26 – Update on Ocean Negotiations' <https://www.oceanprotect.org/2021/11/10/cop26-update-on-ocean-negotiations/>.

which Parties make use of the report and integrate it into decisions at COP27, along with reports from UNFCCC bodies and programmes as required by the Glasgow Climate Pact.

5. Conclusions

The purpose of this chapter was to clarify if obligations under ICL supply normative content to the general international legal obligation on States to adapt fisheries conservation and management to the effects of climate change. It can conclude that yes, some normative content is provided through adaptation planning and reporting through the climate regime. The chapter established this by i) defining key concepts undefined in ICL, including adaptation, adaptive capacity, resilience and vulnerability; ii) providing a historical analysis of adaptation as found in the United Nations climate treaties; and iii) exploring the extent to which the ocean has been included in the UNFCCC generally, and in an adaptation context in light of recent developments at COP26 and the Ocean Climate Dialogue at SBSTA 56.

In doing so, it has demonstrated that, in response to mounting scientific evidence to the growing urgency of adaptation, the prioritisation of adaptation within ICL has changed over time, from a purely developing country issue to a global goal. The global nature of adaptation crystallised with the adoption of the Paris Agreement containing a dedicated article on adaptation (Article 7). Meaning that all Parties to the Paris Agreement – regardless of their economic status – have climate adaptation obligations. However, these adaptation obligations are primarily focused on reporting. Since international legal research on the ocean/climate nexus has primarily focused on climate mitigation rather than adaptation, the thesis so far has identified that ICL does supply normative content to the obligation to adapt.

That said, one could argue that a limitation in climate adaptation obligations under ICL fitting in to the provisions of Part XII of UNCLOS is that, unlike mitigation targets, there is no quantifiable target for adaptation to argue it as a ‘standard’. However, the standard in this context is that the adaptation obligations under ICL are a set of procedural obligations in which States must consider every aspect of their activities in a climate adaptation context, including fisheries. The fisheries connection has been further strengthened by the importance of ocean-based adaptation stressed by the IPCC, and the broader scientific community, along with the clear mandate of adaptation bodies and work programmes under the UNFCCC to include (so far undefined) ocean-based action into all areas of their work. Moreover, the establishment of

the Glasgow-Sharm el-Sheikh Work Programme on adaptation, in conjunction with the requirement of UNFCCC bodies and work programmes should help further develop the normative content of climate adaptation in a marine context.

This chapter has shown that the Paris Agreement has also developed the international dimension of climate adaptation through the obligations to cooperate on international efforts. Specialised UN organisations such as FAO, and the bi- and multilateral organisations as specified in the Paris Rulebook are encouraged to support Parties in implementing their adaptation actions. This implicitly includes RFMO/As constituted under the UN ambit and those outside that ambit, respectively. Fisheries are also brought into the adaptation fold by references to socioeconomic and ecological systems in sustainable management of natural resources, as well as references to food production systems within the Paris Agreement.

Finally, this chapter has also shown how the ocean is now directly included in the UNFCCC and Paris Agreement's provisions and policy discussion at COPs. However, it is unlikely that fisheries specifically will be dealt with in any meaningful way in UNFCCC fora. Therefore, it is argued here that oceans as a general umbrella term within the UNFCCC is likely to remain, with sectoral issues discussed with relevant actors in more dedicated fora. To that end, it was disappointing to see no RFMO/As, regional seas agreements or any international fisheries bodies present at the ocean-climate dialogue at SBSTA 56. The role of FAO in strengthening inter-institutional cooperation between RFMO/As and the UNFCCC cannot be understated here, and it is clear, based on the discussion in chapter two and this chapter, that the FAO Committee on Fisheries would be the appropriate forum to develop a legally binding or voluntary instrument on fisheries and climate change.

It is an obvious point that international fisheries law and the law of the sea is more clearly suited to address climate adaptation as the framework through which adaptation. Climate adaptation law, and ocean-based action at the UNFCCC now have the opportunity to act as a policy driver to implement climate adaptation in international fisheries. International climate law does this through its framework of tools, reporting, dialogues and intersessional meetings and annual COPs. To this end, a welcome development would be the involvement of RFMO/As in actively participating in future ocean climate dialogues at UNFCCC intersessional meetings. This would be with the view to strengthen inter-institutional cooperation and has the potential to bring in the relevant bodies from all areas of the UNFCCC – particularly the adaptation

committee, the NWP and the Glasgow-Sharm el-Sheikh Work Programme – and other relevant stakeholders in to FAO's Committee on Fisheries for the development of internationally recommended standards in the form of guidelines on climate adaptation (or climate change more generally) in international fisheries. The demand for which was identified in chapter 2, and the suggested content of which are provided in the conclusions. These guidelines could follow the approach taken by the FAO during the development of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries (discussed in chapter 2), which had a legitimate and inclusive development process, involved key stakeholders, and integrates cross-cutting issues including climate change and human rights. Finally, considering that climate adaptation law will develop in the short-term in the next few years, and the ongoing policy discussion on climate change and the oceans at the UNFCCC, there is a small, time-bound window of opportunity to integrate fisheries, and the ocean more generally, into adaptation discourse at the international level, and the thesis thus far has demonstrated that there is a legal obligation to do so. This would help strengthen the linkages between adaptation and the oceans and guide the hand of States to consider ocean issues in their Adaptation Communications – in whatever form these take.

Moving forward, since this thesis has argued that adaptation obligations apply to States in *international* fisheries conservation and management, climate adaptation must operate through the correct systems and frameworks to be effective, and the intergovernmental frameworks for managing fisheries on the highs seas are RFMO/As, the next chapter will therefor examine climate adaptation within this context.

CHAPTER FOUR: Climate Adaptation in High Seas Fisheries

The Role of Regional Fisheries Management Organisations and Arrangements

1. Introduction

Chapter one outlined the paradigm-shifting impacts of climate change on global fish stocks and marine ecosystems. It identified the need to address the jurisdictional and managerial problems caused by shifting fish stocks, particularly those that straddle waters between the national jurisdiction of one or more coastal States and the high seas/ABNJ.[1206] On that basis, it introduced the argument for adaptive international fisheries management and conservation in the face of climate change. Based on an analysis of the international legal framework applicable to global marine capture fisheries, chapter two argued that States have a general legal obligation to adapt both their international and national fisheries management to the effects of climate change under what is understood as international fisheries law. In clarifying the scope and content of this obligation, chapter three explored at length the concept of climate change adaptation from a normative perspective as it is found in international climate change law. It also examined the extent to which this discrete legal framework applies to the marine environment. It concluded that adaptation obligations under the climate change regime apply to fisheries and other activities in the marine environment both within and beyond national jurisdiction. As such, they do inform the general obligation to adapt fisheries management and conservation to the effects of climate change – including on the high seas. Further, recent, and ongoing policy developments at the UNFCCC have the potential bring greater effect to the collective obligation to cooperate between the bodies and work programmes of the UNFCCC which address adaptation. In addition, this thesis has put forward the argument that there is a need for further clarification of the obligation to adapt in an international fisheries context and that this normative clarity could come from the development of fisheries and climate change guidelines adopted under the auspices of FAO and its Committee on Fisheries. The suggested substantive detail of these normative guidelines will be put forward in the conclusions of the thesis.

This chapter focuses on the practice of RFMO/As in the context of climate adaptation and climate change generally. Highlighted already in section 2.2.1, the difference between an RFMO and an RFMA is that RFMOs are established with a formal organisation and are administrated by a secretariat, whereas RFMAs are established by an agreement (which may

[1206] The high seas are defined negatively by UNCLOS Art. 86 as 'all parts of the sea that are not included in the exclusive economic zone, in the territorial sea or in the internal waters of a State, or in the archipelagic waters of an archipelagic State'.

not necessarily be legally binding) where no formal organisation is established, but whose Parties do meet regularly to adopt and review legally binding CMMs.[1207] A 'more recent problem for RFMO[/A]s' as the intergovernmental organs which regulate the conservation and management of fish stocks on the high seas and (sometimes) in adjacent EEZs, is the 'change in the distribution patters of the stocks that they manage caused by the warming of the oceans'.[1208] Issues raised include cooperation between RFMO[/A]s and coastal States regarding transboundary stocks, (re)allocation of responsibilities between neighbouring RFMO[/A]s and other regional fisheries bodies, data sharing, and 'disruption for previously agreed criteria on TACs'.[1209] Against that background, they are regarded as the 'preeminent institutions of international fisheries law'.[1210] Which cements their role as 'preeminent vehicles for regional fisheries regulation',[1211] their actions at a regional level on climate change has the potential to influence other RFMO/As. Molenaar notes, citing the pioneering of the EAF in the CAMLR Convention,[1212] and their initial work on IUU fishing,[1213] that:

> pro-active and pioneering measures and approaches initiated within RFMO/As are often subsequently elevated to the global component of international fisheries law. Once these measures and approaches have become global minimum standards, they form the benchmark that compels "straggling" RFMOs to "upgrade" their constitutive instruments and practices.[1214]

Though exclusively highlighting the work of CAMLR and CCAMLR in this context, Molenaar's argument merits the focus of this final chapter. The chapter concerns climate adaptation from a practical perspective through examination of actual and potential adaptive fisheries management and general response to climate change within RFMO/As. This undertaking explores both "how" and "if" States are interpreting and exercising the obligation to adapt fisheries management and conservation to the effects of climate change identified in

[1207] Churchill, Lowe and Sander, (n 414), 575–582; Note that there is no generally accepted definition of an RFMO or RFMA, UNFSA Art. 1(1)(d) defines 'arrangement' as 'a cooperative mechanism established with the Convention and this Agreement by two or more Stats for the purpose, *inter alia*, of establishing conservation and management measures in a subregion or region for one or more straddling fish stocks or highly migratory fish stocks.'
[1208] ibid., 579.
[1209] ibid.
[1210] Erik Molenaar, 'Regional Fisheries Management Organizations' in Marta C Ribero Loureiro Bastos and Tore Henriksen, (eds) *Global Challenges and the Law of the Sea* (Springer 2020), 82–109, 82.
[1211] ibid., 83.
[1212] CAMLR Convention, Art. 2(b) (3)(b) and (c).
[1213] See, CCAMLR, *Report of the Sixteenth Meeting of the Commission* (1997) <https://meetings.ccamlr.org/en/ccamlr-xvi>, para 2.1 and Annex 5, paras 1.2 cited in Molenaar, (n 1210).
[1214] Molenaar, (n 1210),84.

subsequent chapters. It also seeks to provide evidence of States' compliance with the obligation to adapt through their conduct as members of these organisations or arrangements. Considering the conclusions of chapter three,[1215] examining the extent to which States have and should exercise their obligation to adapt fisheries conservation and management to the effects of climate change through RFMOs aids in answering the thesis research question.[1216] It does so because it demonstrates States' interpretation of, and compliance with, the obligation to adapt fisheries management to a changing climate. This study will involve examining various climate adaptive practices within RFMOs and their legal basis, including the recent suggested utilisation of climate finance. There exists a rather modest body of legal and scientific literature on this topic, which makes the general argument that RFMOs (and RFMAs) are by-and-large unprepared for the impacts of climate change.[1217] This chapter seeks to build upon this small body of literature from an integrated legal perspective.

This chapter takes the following structure. After first introducing RFMO/As, it then discusses their use of science and the challenges these institutions face with regards to climate change (section 2). It then explores the extant actions related to climate adaptation (or climate change more generally) within RFMO/As as evidence of compliance with the obligation to adapt identified in previous chapters through three case studies which focus specifically on Resolutions, CMMs, and current (or future requested) scientific work on specifically on climate change. Following that, options RFMO/As to improve in climate adaptive fisheries management are critically discussed (section 3). The chapter then concludes that, as illustrated in the three case studies, States which are members of RFMO/As are beginning to exercise their obligation to adapt fisheries management to climate change, though progress is slow despite clear science. This is illustrated through increasing climate-change related action and through the fact that recent decisions by RFMO/As have included direct reference to the UN Climate treaties and the Glasgow Climate Pact, which supports the findings from previous chapters of this thesis its central argument.

[1215] In particular: 'While the international component of adaptation is slowly being advanced through constituted bodies under the UNFCCC, despite there being clear evidence that Parties can exercise their international adaptation obligations through other international bodies outside the UNFCCC, such as through RFMO/As in a fisheries context, this requires further development and integration.' Chapter 3 of this thesis, section 3.5.
[1216] 'To what extent do States have an international legal obligation to adapt international fisheries management practices to the effects of climate change?'.
[1217] Rayfuse, (n 41); Stephens, (n 1110); Pentz and Klenk, (n 14); Pentz and others, (n 14); McDonald and Torrens, (n 45); Molenaar, (n 32).

2. Regional Fisheries Management Organisations or Arrangements (RFMO/As)

This section provides a general overview of RFMO/As specifically including their function, purpose, and general challenges with respect to the conservation and management of international fisheries on the high seas. It then discusses the use of science in RFMO/A decision making, and the general challenges RFMO/As face vis-à-vis the effects of climate change.

Through Article 8 of the UNFSA, the members of the international community that fish on the high seas have confirmed their preference for RFMO/As as the appropriate organs for high seas fisheries conservation and management. RFMO/As have both a conservation and management mandate and can adopt legally binding CMMs. These include such measures as determining a TAC of a stock in their management area, and to proportionately allocate that TAC between participating States in the form of a quota.[1218] With this general mandate, RFMO/As are 'at the forefront of international efforts to achieve the conservation and sustainable utilisation of fish stocks'.[1219] In that respect, they are also the vehicles through which adaptive management measures to the effects of climate change must be undertaken. The RFMO/As in existence (see table 1 below for acronyms, full titles, and reference to constitutive instruments) have varying specific remits or mandates which can be distinguished by geographical or species coverage. Some manage exclusively or mainly shared (straddling or discrete high seas fish stocks) and are "area-based" in their management in the sense that they have a geographically defined area of the world's ocean under their remit.[1220] These include, for example, CCAMLR, CCBSP, GFCM, NAFO, NEAFC, SEAFO, SIOFA and SPRFMO which manage non-highly migratory and transboundary fish species. The mandate of these RFMO/As effectively covers 'residual species'[1221] within a set geographic area. That considered, influx of new species into a geographic area under the management of a non-tuna RFMO/A would not necessarily result in a governance gap per se, but issues around unregulated fishing, quota allocation and data sharing with a neighbouring RFMO/A or a coastal State could potentially arise. Conversely, there are five 'tuna' RFMOs with the mandate conserve and manage highly migratory tuna or tuna-like species which include CCSBT, IATTC, ICCAT, IOTC and WCPFC. These tuna RFMOs cover by-and-large the entirety of

[1218] As clarified in the introduction, there are other regional fisheries bodies which do not have a management mandate or a commission, which together with RFMO/As make up the term 'regional fisheries bodies' but will not be discussed here for reasons of space.
[1219] Harrison, (n 20) 226.
[1220] See FAO, Regional Fisheries Bodies Map Viewer (n 491).
[1221] Molenaar, (n 1210) 87.

global commercially exploited tuna stocks, in addition, these RFMOs aim to coordinate their CMMs and scientific research through joint meetings known as the 'Kobe Process'.[1222] That considered, gaps in governance may not necessarily arise with tuna RFMOs considering their near-universal coverage both in terms of tuna (and tuna-like) stocks and geography. The prevention of gaps would be helped if Kobe Process meetings included climate change on their agenda, which to date they have not. There are also anadromous (e.g., salmon, trout) fisheries management organisations. These are the North Atlantic Salmon Conservation Organisation,[1223] the North Pacific Anadromous Fish Commission,[1224] and the Pacific Salmon Commission,[1225] but since fishing for anadromous species on the high seas is prohibited,[1226] they are not discussed here. In addition, RFMO/As that have their convention area exclusively in the EEZs of coastal States, such as the International Pacific Halibut Commission are not included in this chapter. Finally, the International Whaling Commission,[1227] is not included in this chapter since despite being effectively run as an RFMO in the 'classic' sense,[1228] a moratorium has been in place for the taking and treating of whales since 1982,[1229] and in addition to fact the focus of this thesis on commercially exploited fish stocks, is also outside the scope of this chapter.

[1222] Rayfuse, (n 472) 442.
[1223] Established by the Convention for the Conservation of Salmon in the North Atlantic Ocean, Reykjavik, 2 March 1982, in force 1 October 1983, 1338, UNTS 33 (NASCO).
[1224] Established by the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean, Moscow, 11 February 1992, in force 16 February 1993, TIAS No. 11465 (NPAFC).
[1225] Established by the Treaty between the Government of the United States of American and the Government of Canada Concerning Pacific Salmon, Ottowa, 28 January 1985, in force March 1985, 1469, UNTS 537 (NASCO).
[1226] NPAFC, (n 1224) Art. III (1)(a); NASCO, ibid., Art. 2 (1).
[1227] International Convention for the Regulation of Whaling, Washington D.C., 2 December 1946, in force 10 November 1948, 161 UNTS 17 (ICRW).
[1228] Malgosia Fitzmaurice, *Whaling and International Law* (Cambridge University Press 2015) 57.
[1229] ICRW (n 1227), Schedule.

Acronym	Full name
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources.[1230]
CCBSP	Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea[1231]
CCSBT	Commission for the Conservation of Southern Bluefin Tuna.[1232]
GFCM	General Fisheries Commission for the Mediterranean.[1233]
IATTC	Inter-American Tropical Tuna Commission.[1234]
ICCAT	International Commission for the Conservation of Atlantic Tunas.[1235]
IOTC	Indian Ocean Tuna Commission.[1236]
NAFO	Northwest Atlantic Fisheries Organization.[1237]
NEAFC	North-East Atlantic Fisheries Commission.[1238]
NPFC	North Pacific Fisheries Commission.[1239]
SEAFO	The South East Atlantic Fisheries Organization.[1240]
SIOFA	Southern Indian Ocean Fisheries Agreement[1241]
SPRFMO	South Pacific Regional Fisheries Management Organization.[1242]
WCPFC	Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean.[1243]

Table 1. Acronyms and titles of Regional Fisheries Management Organisations or Arrangements referred to in this chapter.

[1230] CAMLR Convention (n 659).
[1231] Established by the Convention on the Conservation and Management of the Pollock Resources in the Central Bering Sea, Washington D. C., 16 June 1994, in force 8 December 1995, available at: <https://www.ecolex.org/details/treaty/convention-on-the-conservation-and-management-of-pollock-in-the-central-bering-sea-tre-001217/https://www.ecolex.org/details/treaty/convention-on-the-conservation-and-management-of-pollock-in-the-central-bering-sea-tre-001217/>.
[1232] Established by the Convention for the Conservation of Southern Bluefin Tuna, Canberra, 10 May 1993, in force 10 May 1994, 1819 UNTS 359.
[1233] GFCM Agreement, (n 653).
[1234] Convention for the Strengthening of the Inter-American Tropical Tuna Commission Established by the 1949 Convention Between the United States of American and the Republic of Costa Rica, Washington D.C., 27 June 2003, in force August 2010, 224 OJ L 24.
[1235] Established by the International Convention for the Conservation of Atlantic Tunas, Rio, 14 May 1966, in force 21 March 1969, 673 UNTS 63.
[1236] Established by the Agreement for the Establishment of the Indian Ocean Tuna Commission, Rome, 25 November 1993, in force 27 March 1996, 1927 UNTS 329 (IOTC Agreement).
[1237] Established by the Convention on future multilateral co-operation in the North-west Atlantic Fisheries, Ottawa, 24 October 1978, in force 1 January 1979, 1135 UNTS 369.
[1238] Originally established by the North-East Atlantic Fisheries Convention, London, 24 January 1959, in force 27 June 1963, 486 UNTS 157, replaced by the Convention on Future Multilateral Cooperation in the North-East Atlantic Fisheries, London 18 November 1980, in force 17 March 1982, 1285 UNTS 129.
[1239] Established by the International Convention between the United States of America, Canada and Japan for the high seas fisheries of the North Pacific Ocean, Tokyo, 9 May 1952, in force 19 June 1953, 205 UNTS 65.
[1240] Convention on the conservation and management of fisheries resources in the South East Atlantic Ocean, Windhoek, 20 April 2001, in force 13 April 2003, 221 UNTS 189.
[1241] Southern Indian Ocean Fisheries Agreement, Rome, 7 July 2006, in force 21 July 2021 2835 UNTS 409.
[1242] SPRFMO Convention, (n 662).
[1243] Created by the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, Honolulu, 5 September 2000, in force 19 June 2004, 275 UNTS 43 (WCPFC Agreement).

Some RFMO/As, through their constitutive instruments, have enshrined both the precautionary and ecosystem approaches.[1244] Others have formally implemented these through amendments of their constitutive instruments or through formal resolutions as a result of the UNFSA or recommendations from FAO instruments. Molenaar notes that while RFMO/As are 'largely autonomous bodies' they can be expected to 'give serious consideration' to recommendations by the UNGA, FAO's Committee on Fisheries, informal consultations on States Parties to the Fish Stocks Agreement and the (Resumed) Fish Stocks Agreement.[1245] As discussed in chapter two, the recent outcomes of all of these multilateral meetings have mentioned climate change and adaptive fisheries management, so under Molenaar's reasoning RFMO/As should be considering climate change matters over the past few years.

RFMO/As have several general limitations which must be considered prior to considering the challenges they face as a result of climate change. These include limitations in the competencies of RFMO/As, primarily the issue of pacta tertiis and the omnipresent issue of exclusive flag State jurisdiction combined with certain States being unwilling or unable to exercise enforcement jurisdiction on vessels flying their flag.[1246] RFMO/As have also been criticised regarding their general effectiveness in exercising their mandates of fisheries management, including the extent to which they implement the precautionary approach science-based stock management measures as well as compliance measures.[1247] Churchill and others highlight that some RFMO/As simply do not have the scientific knowledge available to make informed CMMs, or have been unable to adopt such measures due to political deadlock – a reminder that this issue is not fully a legal challenge, and that decision making within RFMO/As is immersed in politics.[1248] Moreover, TACs may often be set considerably higher that scientific advice due to the political compromise to reach consensus (in the case of some RFMO/As) in decision making on quota allocation, thus undermining the object and purpose of these organisations to conserve and manage fisheries effectively.[1249] Further, there is lack of standardisation on quota allocation 'often at the heart of poor decision making'.[1250] To add,

[1244] CAMLR, Arts. 2 and 15; SPRFMO Convention, Art. 3.
[1245] Molenaar, (1210) 87.
[1246] Rayfuse, (n 472).
[1247] Mervin Ogawa and Joseph Anthony L Reyes, 'Assessment of Regional Fisheries Management Organizations Efforts toward the Precautionary Approach and Science-Based Stock Management and Compliance Measures' (2021) 13 Sustainability 8128.
[1248] Churchill, Lowe and Sander, (n 414) 578.
[1249] ibid.
[1250] ibid.; Erik Molenaar, 'Participation, Allocation and Unregulated Fishing: The Practice of Regional Fisheries Management Organisations' (2003) 18 The International Journal of Marine and Coastal Law 457.

any decision made may be undermined by an 'opt-out' procedure found in several RFMO/As where a member may simply object to the measure and not be bound by it.[1251] Finally, many RFMO/As have issues with serial non-compliance, and the impacts of IUU fishing within their management areas are well documented.[1252] The importance of monitoring, control and surveillance measures by flag States and RFMO/As are understood to be important in enforcing CMMs and tackling illegal activity by fishing vessels on the high seas and in waters of coastal States.[1253]

As discussed in chapter two, fisheries conservation and management decisions must be based on the best available science.[1254] Most RFMO/As possess a scientific committee which provides the scientific advice on which CMMs are established. However, unlike rather than a general overview of peer-reviewed scientific literature on the topic, 'RFMOs scientific bodies rely on scientific papers prepared specifically for their working meetings as a primary source of information for the formulation of management advice'.[1255] This point is important as these prepared reports are primarily stock assessments for the stocks managed by that RFMO/A, rather than a review of published peer-reviewed scientific literature similar to the one presented in chapter 1 of this thesis. In addition, as mentioned earlier in this chapter with regards to decision-making with RFMO/As these scientific reports can be undermined through political interference.[1256] The scope and content of those scientific papers may not account for climate change effects, or any shifts outside of RFMO/As management jurisdictions, and indeed this information may be removed or watered down due to political pressure.[1257] Some NGOs have argued, based on success stories, that all RFMO/As should cooperate through science-management dialogue groups in order to facilitate scientific exchange between managers and decision makers with a view to ensuring sustainable fishing.[1258] Indeed it is pertinent that

[1251] ibid.
[1252] Defined by the FAO in IPOA-IUU (n 539) para. 3.1; and further clarification of those definitions is provided in Martin Tsamenyi, Blaise Kuemlangan, and Matthew Camilleri, 'Defining Illegal, Unreported and Unregulated (IUU) Fishing' in FAO, 'Report of the Expert Workshop to Estimate the Magnitude of Illegal, Unreported and Unregulated Fishing Globally' (FAO 2015) 24–37, available at: <http://www.fao.org/3/a-i5028e.pdf>.
[1253] ibid., 579.
[1254] UNCLOS Art. 61(2) and 119(1)(a); See chapter 2.
[1255] Tom Polacheck, 'Politics and Independent Scientific Advice in RFMO Processes: A Case Study of Crossing Boundaries' (2012) 36 Marine Policy 132, 133.
[1256] ibid.
[1257] ibid.
[1258] See Pew Charitable Trusts, 'To Strengthen Fishery Management, RFMOs Should use Science-Management Dialogue Groups (Pew 2022), available at: <https://www.pewtrusts.org/en/research-and-analysis/issue-briefs/2022/05/to-strengthen-fishery-management-rfmos-should-use-science-management-dialogue-groups>.

cooperation through such a mechanism would take into account climate change and its effects, and share best practices of how to include these issues into fish stock assessments.

Climate change and its impacts are a relatively new issue for RFMO/As. Considering the discussion in the two previous chapters concerning the requirements of a legal system to implement and facilitate adaptation, it feels pertinent to highlight the general view that 'these regimes are often considered to be deficient in the essential capacities for adaptive, integrated governance and management to effectively support the resilience of marine ecosystems in an increasingly dynamic, climate change challenged environment.'[1259] According to Rayfuse, RFMO/As are faced with two forms of challenges brought about by climate change. Firstly, these organisations incur jurisdictional challenges resulting from the shift in distribution of fish stocks they manage - this is of particular concern as RFMO/As convention areas/management areas exist as geographically static and defined units on the high seas. Secondly, they incur managerial challenges 'relating to the incorporation of climate change into their management processes',[1260] and the fact that climate change disrupts the criteria for TACs and quota allocation since fish may move out of an RFMO/As geographical area into the EEZ of a coastal State, into neighbouring RFMO/As remit, or to a different location within that RFMOs management area. However, as put forward above, the issue is perhaps not one of a governance gap, but potentially unregulated fishing should CMMs for a 'new' species are not in place. Pentz and others' assessment of RFMO/As in the face of climate change led to four recommendations to move forward in managing high seas fisheries in the face of climate change, these were:

1) Prioritizing organizational performance evaluation from a climate change perspective;
2) Reforming enforcement and monitoring process;
3) Increasing MPA installation;
4) And incorporating greater analysis of decision-making processes in the assessment of RFMOs.[1261]

[1259] Rayfuse, (n 41) 251; Michael Lockwood and others, 'Marine Biodiversity Conservation Governance and Management: Regime Requirements for Global Environmental Change' (2012) 69 Ocean & Coastal Management 160.
[1260] Rayfuse, (n 41) 250.
[1261] Pentz and others, (n 14) 17.

While the first three recommendations serve the function of improving adaptive capacity of RFMO/As, the fourth 'is a call for more research on a critical but understudied aspect of international fisheries governance.'[1262] This chapter, and the thesis more broadly, contributes to that call, by examining the role that international climate law can play in transforming international fisheries law and governance.

Only a few RFMO/As established after the adoption of the UNFSA have developed a clear stance on the regulation of new fisheries in line with Article 6(6) of UNFSA through explicit provisions in their convention texts,[1263] or through cooperative management between neighbouring organisations, arrangements, or States. Though some do take account of associated and dependent species in their management practices, as required by UNCLOS and the UNFSA. Organisations such as CCAMLR take a more holistic, ecosystem-oriented approach in their mandate, though this is facilitated by specific provisions in its constitutive instrument as discussed in chapter 2 of this thesis. It should also be noted that little other activity occurs within the CCAMLR management jurisdiction which thus allows that organisation the "freedom" to make particular decisions where other RFMO/As may be more limited. Against this background, Engler's critical review of RFMO/A practices in the face of climate change and in the context of the ecosystem approach highlighted several issues. First, climate change has been addressed by scientific bodies of RFMO/As in an ad hoc fashion 'with relatively low priority', that the institutional capacity to address climate change is limited, and 'institutional cooperation with climate data and research institutions has not been pursed despite explicit recommendations' by the UNFSA Review Conference and others.[1264] Second, climate change is merely 'implicit' in stock assessments, which 'avoids the contentious issue of attribution' prompting serious concern whether this approach 'is sufficient to understand and prepare for the different paths in which climate change may affect the work of RFMO/As beyond stock assessment and TAC setting'.[1265] Third, there has been a marked lack in comprehensive planning, even within CCAMLR, the more ecosystem-centric of the RFMO/As. Fourth, long-term climate adaptation strategies are virtually non-existent despite

[1262] ibid.
[1263] Caddell, (n 6) 295; these RFMOs are: WCPFC, Art. 6(5), SEAFO, Art. 20, SPRFMO, Art. 28, NPFC, Art. 3.
[1264] Cecilia Engler, 'Transboundary Fisheries, Climate Change, and the Ecosystem Approach: Taking Stock of the International Law and Policy Seascape' (2020) 25 Ecology and Society 43; See Report of the resumed Review Conference on the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, New York, 23-27 May 2016, UN Doc A/CONF.210/2016/5, Annex, A(3)(iii); A(5)(b).
[1265] ibid., Pentz and Klenk, (n 14).

urges from the UNGA for RFMO/As to enhance their cooperation.[1266] In terms of performance reviews, for example:

> Climate change has been mentioned in performance reviews as an issue requiring a management response.[1267] Despite these acknowledgements, RFMOs have pursued management strategies that implicitly respond to climate change (e.g., sustainable management of fisheries is assumed to be sufficient to address climate impacts) rather than explicitly addressing climate change by installing adaptation policies targeting specific impacts.[1268] Expanding the reach of performance reviews to include climate change as a primary area upon which RFMO[/A]s are assessed could drive change in these organizations.[1269]

It could be argued from the above that several RFMO/As perhaps do not view climate change as a discrete environmental challenge, and instead seem to view climate change as a stressor, or as an issue of inter-annual variation of 'weather', [1270] rather than a serious existential issue that requires long term planning and cooperation as obliged by international law through *inter alia* the ecosystem approach and precautionary principle, as argued throughout this thesis. This is problematic as it fails to account for climate change specifically in the scientific work which informs CMMs. Stock assessments may rely on historical catch data, however, relying on historical data to inform precautionary fisheries management is an issue as climate change adds a dimension of uncertainty that cannot necessarily be accounted for under this approach, particularly when stocks shift.[1271] A recent study has shown that decisions by some RFMO/As do consider climate change scientific and policy developments (i.e., IPCC reports and

[1266] ibid.; UNGA, *Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and Related Instruments* Resolution adopted by the General Assembly 11 December 2018 UN Doc. A/RES/73/125, paras. 13 and 14.

[1267] CCAMLR, CCAMLR Performance Review Panel: Report. 1 September 2008. Available online at: <https://www.ccamlr.org/en/system/files/e-Prfrm%20Review%20Report%20Jun09_0.pdfhttps://www.ccamlr.org/en/system/files/e-Prfrm%20Review%20Report%20Jun09_0.pdf>, 2008; CCSBT Performance of the CCSBT 2009–2013: Independent Review.
from: <http://www.tuna-org.org/Documents/2014_CCSBT_Independent_Performance_Review.pdf>.

[1268] Mark Axelrod, 'Climate change and global fisheries management: linking issues to protect ecosystems or to save political interests?' (2011) 11 Global Environmental Politics 64.

[1269] Pentz and others, (n 14) 17.

[1270] Brian Pentz and Nicole Klenk, 'Understanding the limitations of current RFMO climate change adaptation strategies: the case of the IATTC and the Eastern Pacific Ocean' (2020) 20 International Environmental Agreements: Politics, Law and Economics 21.

[1271] Ray Quay, 'Anticipatory governance: A tool for climate change adaptation' (2010) 76 Journal of the American Planning Association 496.

UNFCCC COP decisions), and this attention has increased over time since 2002.[1272] Although the majority of these RFMO/A decisions have been focused on the 'learning' aspect of climate issues, rather than active management decisions in response to climate change, and 'action' measures were virtually non-existent prior to 2007.[1273] This does indicate an increasing interest on climate-focused science to inform CMMs, which in turn could facilitate adaptation (see figure 2).

[REDACTED]
Figure 2. 'Cumulative count of institutional response by tier. TAR - IPCC Third Assessment Report; AR4 - IPCC Assessment Report 4; AR5 - IPCC Assessment Report 5' reproduced from Sumby (2021).[1274]

Finally, there is evidence that RFMO/As do respond to other environmental concerns in areas outside of climate change. For example, tropical tuna RFMOs where use of fish aggregation devices (artificial objects which float or are anchored to the seabed to attract fish) is prolific and results in high rates of bycatch, have adopted measures to reduce the environmental impacts of when these devices are abandoned or lost.[1275] However, the effectiveness of these measures through compliance and enforcement requires further study.[1276] Reflecting on the fact that chapter three discussed the concept of climate resilience from both an ecological and legal perspective, and it is clear that there is issue both with the robustness and adaptability of pelagic marine ecosystems, and the adaptability of the institutions which are responsible for the conservation and management of species within those ecosystems. The next section presents an analysis of a selection of climate change adaptation measures undertaken by RFMO/As as evidence of compliance with the obligation to adapt fisheries management and conservation to the effects of climate change.

[1272] Jonathan Sumby and others, 'Hot fish: The response to climate change by regional fisheries bodies' (2021) 123 Marine Policy 104284.
[1273] ibid.
[1274] ibid.
[1275] Robin Churchill, 'Just a Harmless Fishing Fad—or Does the Use of FADs Contravene International Marine Pollution Law?' (2021) 52 Ocean Development & International Law 169.
[1276] ibid.

3. RFMOs and Climate Change Adaptation

This section focuses on climate adaptation measures by RFMO/As. It is based on a select analysis of RFMO practice through the lens of the duty to cooperate within the obligation to adapt fisheries conservation and management to the effects of climate as identified in chapter two. The section first examines the few climate change measures (or measures which related to climate change) adopted by these organisations (section 3.1). It then discusses strengthening inter-institutional cooperation with the aim of creating the enabling conditions to adapt to the effects of climate change (section 3.2). Finally, it briefly discusses the potential pathways forward (section 3.3), before concluding (section 3.4).

3.1 Adoption of Climate Change Resolutions and CMMs

Though this chapter covers both RFMOs and RFMAs, at the time of writing, there is only one RFMO which has adopted specific climate change CMMs (CCALMR), and there are only two RFMOs who have adopted climate change resolutions (IOTC and WCPFC). These RFMOs and their action on climate change are analysed in the three dedicated subsections below. Given the important and furthest advanced work of CCAMLR, they are addressed first (section 3.1.1), followed by the IOTC (section 3.1.2) and WCPFC (section 3.1.3).

3.1.1 Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)

CCAMLR is responsible for the conservation and management for four fish species,[1277] in their Convention Area,[1278] including the regulation of commercial catches of those species. The object and purpose of the Convention on the Conservation of Antarctic Marine Living Resources, which established CCAMLR,[1279] is the conservation and sustainable use of all

[1277] These are Patagonian toothfish, Antarctic toothfish, mackerel icefish and Antarctic krill, see CCAMLR website, *Fisheries* (no date) <https://www.ccamlr.org/en/fisheries/fisheries>.
[1278] Consisting of 'as consisting of all waters bounded by the Antarctic Continent to the south, and to the north by a line starting at 50°S 50°W; thence due east to 30°E longitude; thence due north to 45°S latitude; thence due east to 80°E longitude; thence due south to 55°S latitude; thence due east to 150°E longitude; thence due south to 60°S latitude; thence due east to 50°W longitude; thence due north to the starting point.' CCAMLR website, *Convention Area* (no date) <https://www.ccamlr.org/en/organisation/convention-areahttps://www.ccamlr.org/en/organisation/convention-area>; See CAMLR Convention, Art. I.
[1279] CAMLR Convention, Art. VII.

Antarctic marine living resources,[1280] apart from whales and seals.[1281] Importantly any 'harvesting or associated activities' in the Convention Area must be undertaken in line with the Convention's provisions and its conservation principles, including i) prevention of depleting any harvested population to below 'stable levels of recruitment'; ii) maintaining ecological relationships between species harvested and dependent and related species; and iii) which merits quotation in full:

> Prevention of changes or minimisation of the risk of changes in the marine ecosystem which are not potentially reversible over two or three decades, taking into account the state of available knowledge of the direct and direct impact of harvesting, the effect of introduction of alien species, the effects of associated activities on the marine ecosystem and of the effect of environmental changes, with the aim of making possible the sustained conservation of Antarctic marine living resources.[1282]

Consider this provision in light of the fact that the planet is locked-in to, at the very least, 1.5°C of planetary warming, and the wealth of knowledge of climate change impacts on the ocean documented in successive IPCC reports and presented in the context of marine species redistribution in chapter one. Indeed, from an evolutionary lens the term 'prevention of changes' could be interpreted to include climate mitigation, and 'minimisation of the risk' can be read in this context as the implementation of adaptive measures in order to prevent overexploitation of species. This would include both species that are 'native' to the Convention Area and those which have entered the Convention Area due to climate-induced migration. CCAMLR is empowered with a range of competencies to give effects to its objective and principles, and these competencies can facilitate adaptive management to the effects of climate change, including facilitation of research and gathering of catch and effort statistics, identification of conservation needs and analysis of the effect of those conservation measures, formulation, adoption and revision of CMMs on the basis of the best scientific evidence available, designation of spatial, temporal and biological criteria for fishing within the Convention Area.[1283] CCAMLR 'decisions of substance' by members are made by consensus.[1284] In addition, CCAMLR has possesses a scientific committee whose function is

[1280] ibid., Art. II.
[1281] ibid., Arts. I(2); VI.
[1282] CAMLR Convention, Art. II(3)(c) (own emphasis).
[1283] ibid., Art. XI, see in particular a non-exhaustive list of conservation measures in Art. XI(2).
[1284] ibid., Art. XII.

inter alia to 'establish criteria and methods to be used for determinations concerning the conservation measures'.[1285]

Against that background, CCAMLR comes to the fore again in context of adoption of climate change related CMMs. CCAMLR has adopted an array of comprehensive CMMs for fisheries in their Convention Area, including MPAs, environmental measures and catch limits for target and bycatch species.[1286] CCAMLR Parties regularly discuss climate change as an agenda item at annual meetings of the Commission.[1287] This subsection analyses the evolution of CCAMLR decision making in the face of climate change. This includes CCAMLR resolutions, CMMs, scientific work, and issues with decision making.

CCAMLR has discussed climate change impacts at several meetings over the years and adopted its first resolution on climate change in 2009,[1288] and its second in 2022.[1289] The initial focus of this section will be on the first resolution and subsequent developments before turning to the second. The language of the 2009 resolution is rather weak. It 'urges increased consideration of climate change impacts in the Southern Ocean to better inform CCAMLR management decisions', and only encourages Parties to participate in scientific initiatives on climate change, which many were likely doing so already.[1290] In addition to encouragement of dissemination of scientific research on Antarctic climate change and environment to UNFCCC delegates at UNFCCC COP15,[1291] the resolution also requests the Charmain of the Commission to formally contact the President of the UNFCCC COP:

[1285] ibid., Art. XIV, XV.
[1286] For a comprehensive list of CCAMLR CMMs which are in force at the time of writing, see CCAMLR, *Schedule of Conservation Measures in Force 2022/2023* (2022) <https://www.ccamlr.org/en/document/conservation-and-management/schedule-conservation-measures-force-2022/23> or; CCAMLR, *CCAMLR Conservation and Management Measures* (no date) <https://cm.ccamlr.org/>.
[1287] See, for example, CCAMLR, *Report of the thirty-ninth meeting of the commission* (2020) <https://www.ccamlr.org/en/system/files/e-cc-39-rep.pdfhttps://www.ccamlr.org/en/system/files/e-cc-39-rep.pdf> 44–49; CCAMLR, *Report of the forty-first meeting of the commission* (2022) <https://meetings.ccamlr.org/en/meetings/ccamlrhttps://meetings.ccamlr.org/en/meetings/ccamlr> 43–49.
[1288] CCAMLR, Resolution 30/XXVIII *Climate Change* (2009) <https://cm.ccamlr.org/sites/default/files/r30-xxviii_5.pdf>.
[1289] CCAMLR, Resolution 36/41*Climate Change* (2022) <https://cm.ccamlr.org/en/resolution-36/41-2022>.
[1290] ibid., para. 1–2.
[1291] ibid., para. 3.

> to express that the CAMLR Commission considered that an effective global response by the UNFCCC is urgently needed to address the challenge of climate change in order to protect and preserve the Southern Ocean ecosystems and their biodiversity.[1292]

This is an example of inter-institutional cooperation which aids States in fulfilling their obligation to cooperate in adapting their fisheries management and conservation activities to the effects of climate change. That said, noting the observations of the author during the 2022 Ocean-Climate Dialogue at the UNFCCC intersessional meetings in Bonn (discussed in chapter 3), there has been little to no active participation of any RFMO, RFMA, or RFB during UN Climate Change meetings so far.

Moving beyond the 2009 resolution, there have been considerable developments within the operational framework of CCAMLR on climate change, including the Scientific Committee, of which all CCAMLR Parties are Members.[1293] This is primarily the result of the emergence of RFMO/A and other RFB performance reviews in response to international pressure from NGOs, and Members of the FAO Committee on Fisheries.[1294] As background, these reviews assess RFMO/A performance against a set criteria,[1295] with the objective to

[1292] ibid., para. 4.
[1293] See CCAMLR, *Scientific Committee* (no date) <https://www.ccamlr.org/en/science/scientific-committee-0>.
[1294] See, FAO *Report of the 26th FAO Committee on Fisheries Session,* (FAO 2005), paras 111–112; UNGA, *Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and Related Instruments* Resolution adopted by the General Assembly (29 November 2005), UN Doc. A/RES/60/31, para.60; UNGA, *Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and Related Instruments* Resolution adopted by the General Assembly (8 December 2006), UN Doc. A/RES/61/105, para. 73; UNGA, *Report of the resumed Review Conference on the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*, New York, 22-26 May 2006, UN Doc. A/CONF.210/2006/15, Annex, para. 32(j); UNGA, *Report of the resumed Review Conference on the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*, New York, 24-86 May 2010, UN Doc. A/CONF.210/2010/7, Annex, para II(d); Marika Ceo and others, *Performance Reviews by Regional Fishery Bodies: Introduction, Summaries, Synthesis and Best Practices. Volume I: CCAMLR, CCSBT, ICCAT, IOTC, NAFO, NASCO, NEAFC*, FAO Fisheries and Aquaculture Circular No. 1072 (FAO, 2012); Susanna Fuller and Kathryn Schleit, 'The Future of Managing Fisheries and the Global Commons through Regional Fisheries Management Organizations: Steps toward Global Stewardship' in International Ocean Institute -Canada (eds.) *The Future of Ocean Governance and Capacity Development - Essays in Honor of Elisabeth Mann Borgese (1918-2002)* (Brill, 2018) 361–366, 363–365.
[1295] See UNGA A/RES/61/105 ibid., which suggested the use of transparent criteria based on provisions of UNFSA and other relevant instruments, best practice of RFMO/As and 'some element of independent evaluation and that the results are made publicly available' noting that NEAFC had recently completed a performance review, para. 73; FAO has provided a list of criteria in Ceo and others (2012) ibid. Appendix 1, 85, and Péter Szigeti and

highlight best practice, areas which require attention and raise issues where RFMO/As may need clearer guidance from international organisations such as FAO.[1296] In 2010 States and regional economic integration organisations were encouraged individually and collectively through RFMO/As to undertake a performance review by 2012 and to undertake such reviews on a regular basis (i.e., every 5 years).[1297] More recently the 2016 and 2023 UNFSA Review Conferences reiterated this call and recommended performance reviews include some element of independent evaluation, that best practice guidelines be developed for performance reviews, and that mechanisms for follow-up actions including implementation of recommendations be established.[1298] CCAMLR decided to undertake its first performance review in 2007,[1299] in which the Review Panel noted CCAMLR's awareness of the impacts of climate change and the challenges it presents in relation to delivering its mandate and recommended that '[a]ppropriate precautionary approaches and responses to adverse environmental conditions, including climate change, should be developed and adopted'.[1300] Since then a CCAMLR Membership agreed to undertake a second performance review,[1301] which highlighted a number of positive developments since the publication of the first performance review. This included the establishment of agenda on climate change both CCAMLR and the Scientific Committee on climate change.[1302] The scientific work of CCAMLR has evolved over time to include considerations of climate change. This is primarily due to the recommendations of the second performance review, which included recommendations to – together with collaborative partners – 'deliver an initial assessment of the status, trends and possible future trajectories of

Gail Lugten, *The Implementation of Performance Review Reports by Regional Fishery Bodies, 2004–2014*, FAO Fisheries and Aquaculture Circular No. 1108 (FAO, 2015), 5–6, see also Annex 4 for performance review criteria specifically for tuna RFMOs under the Kobe Process 80–83.

[1296] See, Bianca Haas and others, 'The influence of performance reviews on regional fisheries management organizations' 76 ICES Journal of Marine Science (2019) 2082–2089.

[1297] UNGA, (n 1294) Annex, para. II(d).

[1298] UNGA, (n 522) Annex, para. B(2); UNGA, *Report of the resumed Review Conference on the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*, New York, 22-26 May 2023, UN Doc. A/CONF.210/2023/6, Annex, para. B(2). Please note that the wording in these two reports is identical.

[1299] CCAMLR, *CCAMLR Decision to Undertake a Performance Review of the Organisation* in CCAMLR, *Report of the Twenty-Sixth Meeting of the Commission*, Hobart, Australia 22 October - 2 November 2007, CCAMLR-XXVI, <https://meetings.ccamlr.org/en/ccamlr-xxvi> Annex 7.

[1300] CCAMLR, *Performance Review Panel Report* (1 September 2008) <https://www.ccamlr.org/en/organisation/first-ccamlr-performance-review> 52–53.

[1301] CCAMLR, *CCAMLR Decision to Undertake a Performance Review of the Organisation* in CCAMLR, *Report of the Thirty-Fifth Meeting of the Commission*, Hobart, Australia 17–28 October 2016, CCAMLR-XXXV, <https://meetings.ccamlr.org/system/files/e-cc-xxxv_0.pdf> Annex 8.

[1302] CCAMLR, *Second Performance Review of CCAMLR – Final Report of the Panel*, (31 August 2017), CCAMLR-XXXVI/01, para. 11(vii).

Antarctic marine living resources, and the interactions of fisheries with them.'[1303] Moreover, a key recommendation is that the 'Scientific Committee evaluate options for ecosystem-based management of all CCAMLR fisheries, taking into account ecosystem and climate change'[1304]

In terms of inter-institutional cooperation, the Second Performance Review's recommendation for:

> More pro-active communication be undertaken by the Commission and its Members, particularly with respect to engaging with other international organisations, regional bodies, and international processes, with a view to ensuring that CCAMLR is recognised as, and maintains its position as, the pre-eminent forum for the conservation of Antarctic marine living resources in the region.[1305]

Indeed, this recommendation is promising from a climate change cooperation perspective, and it is interesting that the recommendation is equally focused on the members of CCAMLR as well as the organisation itself. Interestingly, pressure from contracting Parties on CCAMLR to adapt management to the effects of climate change is clear from this statement by Norway:

> CCAMLR will find it challenging to implement an effective, adaptive, ecosystem-based approach to management without taking into consideration global warming and its effect on the distribution and abundance of krill, other harvested species, and those species that depend on them. Rapid changes in the ecosystem conditions will affect fisheries strategies and CCAMLR must show capacity to adapt to changes in factors such as species composition, distribution, and abundance.[1306]

However, this pressure is not uniform across CCAMLR's membership and has led to proposals on climate change being blocked in the past. For example, in 2018, Australia, on Norway's behalf and CCAMLR's Intersessional Correspondence Group on Climate Change proposed a Climate Change Response Work Programme (CCRWP) in response to the recommendations of CCAMLR's second performance review.[1307] The purpose of the CCRWP was to act as a:

[1303] ibid., paras. 30–32.
[1304] ibid., para. 33–35.
[1305] ibid., paras. 67–68.
[1306] ibid.,CCAMLR, (n 1287) 45,;; Norway is a contracting party to CCAMLR having ratified the Convention 6 December 1983.
[1307] CCAMLR, (n 827) para. 8.7 CCAMLR, (n 1302) Recommendation 6 and para. 26 where the CCRWP is explicitly mentioned.

> mechanism for identifying and revising goals and specific actions by the Commission and the Scientific Committee to support efforts within the Antarctic Treaty system to prepare for, and build resilience to, the environmental impacts of a changing climate and the associated implications for the governance and management of the Southern Ocean and the conservation of Antarctic marine living resources.[1308]

Most members of CCAMLR approved of the adoption of the proposal, noting that 'consideration of climate change is an integral part of decision making across the Commission'.[1309] However the Commission was unable to reach consensus and the CCRWP did not go forward, the report of the 2018 meeting indicates that '[t]wo Members expressed concern over duplication of work taking place in other forums.'[1310] The forums were not specified, but could mean the UNFCCC. This example is illustrative of the difficulties of mainstreaming climate change into decision making in RFMO/As and other intergovernmental organisations. (Geo)political issues coupled with the consensus-based decision making under CCAMLR has blocked climate action within this fora, and while the thesis has argued that there is a legal duty to adapt fisheries conservation and management to the effects of climate change, some States may not share that view for a whole range of different (and non-legal) reasons and therefore implementation at an institutional level may be replete with challenges depending on the decision-making process and structure of the institution. Aside from guidance from FAO on fisheries and climate change, further legal developments mentioned in the conclusion of the thesis may help crystallise this duty to adapt. Of course, since this issue is not wholly a legal one, political and diplomatic efforts will all play a part in breaking deadlock or lack of consensus in mainstreaming and implementing climate-based decision making.

[1308] CCAMLR, (2018) ibid., para. 8.7.
[1309] ibid., para. 8.9.
[1310] ibid., para. 8.11.

3.1.2 The Indian Ocean Tuna Commission (IOTC)

As outlined in chapter one, tropical regions of the ocean are projected to experience a decrease in fisheries catch potential of three times or more by the end of this century.[1311] Both the temperate and tropical Indian Ocean are expected to experience an increase in temperature and decrease in oxygen in the coming years with projected negative ecosystem effects.[1312] The effects of changes of temperature and oxygen on the spatial and vertical distribution of tuna species in the Indian Ocean are well documented by research conducted outside of tuna RFMO stock assessments.[1313] Specifically, climate change is shifting the thermal habitat – and consequently the distribution – of several tuna species southwards in the Indian Ocean towards the CAMLR Convention Area.[1314] These changes in distribution are estimated to change the value of tuna catch and where that value is appreciated, with consequences for the livelihoods and income of fishers who depend on it. [1315]

The IOTC,[1316] is a tuna RFMO with its area of competence in the Indian Ocean,[1317] which hosts the second-largest tuna fishery in the world. The IOTC has 31 Members,[1318] and 16 tuna and tuna-like species under its management mandate.[1319] As discussed in chapter two, FAO has the competence to produce and adopt fisheries conventions and agreements.[1320] The Agreement Establishing the IOTC was adopted by FAO in 1999, and membership is exclusive to Members and Associate Members of FAO (including regional economic integration

[1311] IPCC, (n 3), 505.
[1312] ibid., 543.
[1313] See, chapter 1 and, for example Sibylle Dueri, *Impacts of climate change and ocean acidification on Indian Ocean tunas* (Développent Durable & Relations Internationales, 2017) available at <https://www.iddri.org/sites/default/files/PDF/Publications/Hors%20catalogue%20Iddri/tuna-climate%20change%20indian%20oceanEN.pdf>; FAO 'Biological characteristics of tuna' (no date) <https://www.fao.org/fishery/en/topic/16082/en%23Distribution>.
[1314] Specifically, skipjack, yellowfin, bigeye and albacore species of tuna, see: Alistair J Hobday, 'Ensemble Analysis of the Future Distribution of Large Pelagic Fishes off Australia' (2010) 86 Progress in Oceanography 291.
[1315] Dueri, (n 1313).
[1316] Established by the Agreement for the Establishment of the Indian Ocean Tuna Commission (adopted 25 November 1993, entered into force 27 March 1996) 1927 UNTS 329 (IOTC Agreement).
[1317] IOTC Agreement, Art. II; Amended from to 30°E 20°E in 1999 to eliminate a gap in the boundary between the IOTC and ICCAT, see: Report of the Fourth Session of the Indian Ocean Tuna Commission, Kyoto, Japan 13–16 December 1999, UN Doc. IOTC/S/04/99/R[E] (2000).
[1318] Area of competence and members of the Commission can be viewed at: FAO Regional Fisheries Bodies Map Viewer, 'Indian Ocean Tuna Commission' (IOTC) (no date) available at <https://www.fao.org/figis/geoserver/factsheets/rfbs.html?rfb=IOTC&extent=-62.3828125,-106.6796875,222.3828125,86.6796875&center=80,-10&zoom=0&prj=4326>.
[1319] IOTC Agreement, Annex B; IOTC, 'Competence: Area & Species (no date) available at <https://iotc.org/about-iotc/competence>.
[1320] FAO Constitution (n 530), Art. XIV.

organisations i.e., the European Union), situated in wholly or partly within the area of competence.[1321] The objective of the Commission is to 'promote cooperation among its Members with a view to ensuring, through appropriate management, the conservation and optimum utilization of stocks covered by this Agreement and encouraging sustainable development of fisheries based on such stocks'.[1322] The IOTC Agreement lists a series of obligations on the Commission in the form of functions and responsibilities to achieve its objectives in accordance with the relevant principles found in UNCLOS.[1323] This includes: review of conditions and trends of fish stocks under its remit; encourage, recommend and coordinate research applicable to those stocks; adopt CMMs to ensure the conservation of stocks and promote the objective of optimum utilisation; [1324] and continuously review 'the economic and social aspects of the fisheries based on the stocks covered by this Agreement bearing in mind, in particular, the interest of developing coastal states'.[1325] Moreover, supporting the argument in chapter three that the international adaptation provisions of the Paris Agreement, in particular Article 7(8) which implicitly includes FAO and any RFMO/A constituted under its ambit, and encourages their work to support all Parties to implement their adaptation obligations in respect of their adaptation priorities.[1326] In addition, the scope of this provision is broadened when read with the Paris Rulebook to implicitly include RFMO/As outside of the UN/FAO ambit to provide resources to mobilise support for developing country Parties in implementing adaptation action.[1327]

Despite having provisions stating otherwise, IOTC decisions and recommendations are generally done by consensus,[1328] however the IOTC Agreement states that decisions are to be adopted by a simple majority,[1329] with the exception hat legally binding CMMs adopted by its Members by a two-thirds majority vote by all Members present at the time of the vote,[1330]

[1321] IOTC Agreement, Art. IV(1).
[1322] ibid., Art. V(1).
[1323] See chapter 2.
[1324] IOTC Agreement, Art. V(2); Subject to Art. IX on Procedures Concerning Conservation and Management Measures.
[1325] ibid., Art. V(2)(d).
[1326] See chapter 3.
[1327] 9/CMA.1, Annex, para. 19; 11/CMA.1, para. 23; see chapter 3 of this thesis.
[1328] As is the case with most other RFMO/As, see Ted McDorman, 'Implementing Existing Tools: Turning Words Into Actions – Decision-Making Processes of Regional Fisheries Management Organisations (RFMOs)' (2005) 20 The International Journal of Marine and Coastal Law 423, 428; and Valentin Schatz and Maia Perraudeau, 'Virtual Voting in RFMOs: A Procedural Odyssey at the Indian Ocean Tuna Commission' (2023) 20 International Organizations Law Review 305.
[1329] IOTC Agreement, Art. IX(1).
[1330] ibid., Art. VI(2).

however there is also an opt-out option for Members on any CMM.[1331] Searching the term 'climate change' among the IOTC's resolutions and CMMs did not return a single result in the compendium of active CMMs, as of December 2021.[1332] However, a draft proposal on climate led by Maldives was put forward ahead of the 26th meeting of the Parties to the IOTC in early 2022.[1333] This referred directly to the latest IPCC Sixth Assessment Report, including the fact that climate change is causing the redistribution of fish stocks, made use of human rights language by expressing concern that redistribution 'negatively affects the equitable distribution of food provisioning services as fish stocks shift from lower to higher latitude regions'.[1334] Importantly, the proposal also highlighted the inequity of this phenomenon as reflected by the IPCC:

> The report further highlights the particular risks to small islands, where impacts are forecasted to be felt more keenly. For small island developing states, where fisheries remain one of the main livelihood activities and source of food security, the implications go beyond an economic crisis; the cumulative impacts of climate change pose an existential threat for such states.[1335]

To that end, the draft resolution notes the fact that 'most tuna RFMOs have given little consideration to climate change and its impacts', and while some work on tuna and climate change has been done at an individual State level, there is little multilateral coordinated effort so far. Reference is also made to the WCPFC Resolution on Climate Change (discussed in the next subsection below). The aims of the proposal were to:

> 1. Support the long-term sustainability of all IOTC species, their associated by-catch species, and species belonging to the same ecosystem or dependent on or associated with the target stocks.
>
> 2. Contribute to improving our understanding of the impact of climate change on tuna stocks and the ecosystems of which they are part.

[1331] ibid., Art. IX(5).
[1332] IOTC, Compendium of Active Conservation and Management Measures for the Indian Ocean Tuna Commission (2021), available at <https://www.iotc.org/cmms>.
[1333] IOTC, On Climate Change as it Related to the Indian Ocean Tuna Commission IOTC-2022-526-PropO_Rev1 <https://www.iotc.org/documents/climate-change-maldives-et-al>.
[1334] ibid., at 1.
[1335] ibid.

> 3. Build the capacity of developing State [Cooperating non-Contracting Parties], in particular, Least Developed States and Small Island Developing States, to address the impacts of climate change on tuna stocks and fisheries, through the improvement of climate science in such states.[1336]

This draft proposal is useful insofar as it provides context to the successfully adopted climate change resolution by the IOTC, adopted at the 26th Session in May 2022.[1337] It reflects the overall objective of the Commission as well as the ecosystem approach, and as discussed throughout this thesis reflects the needs of developing States and their reliance on healthy, resilient fish stocks particularly in the face of climate change. This also reflects the provisions of Articles 24(2) and 25 UNFSA, which requires Parties to give recognition to the requirements of developing States discussed above,[1338] and have been described analogous to the common but differentiated responsibilities principle best known in international climate law.[1339] This highlights a linkage between international fisheries and principles of climate change law generally, and also reflects the point made above on the encouragement by the Paris Agreement of international organisations to aid developing States in adapting to climate change.

Turning to the actual resolution adopted by the IOTC, Resolution 22/01 on Climate Change as it Relates to the Indian Ocean Tuna Commission,[1340] was adopted under Article IX of the IOTC Agreement and is binding on Parties to the IOTC. The Preamble refers to the initiatives of the UNFCCC and the Paris Agreement to address the impacts of climate change, as well as the work of the IPCC and Scientific and Working Parties of the IOTC to assess climate change impacts on tuna stocks within the convention area. It also refers to the ecosystem approach in Article 5 UNFSA, and the aims of the UNFSA to 'avoid adverse impacts on the marine environment, preserve biodiversity, maintain the integrity of marine ecosystems and minimise the risk of long-term or irreversible effects of fishing operations.[1341] Alike the explanatory note of the draft resolution, it reiterates the findings of the Sixth IPCC Report, and the fact that the impacts of shifting fish stocks as a result of climate change

[1336] ibid.
[1337] Report of the 26th Session of the Indian Ocean Tuna Commission, Seychelles, 16-20 May 2022 UN Doc. IOTC–2022–S26-R[E], available at <https://www.iotc.org/documents/report-26th-session-indian-ocean-tuna-commission>.
[1338] Section 2.2.
[1339] Sinan and others, (n 458).
[1340] IOTC, *Resolution 22/01 on Climate Change as it Relates to the Indian Ocean Tuna Commission*, May 2022.
[1341] ibid., Preamble.

'increasing the need for climate-informed transboundary management and cooperation'.[1342] Finally, the Preamble recalls concerns from the IOTC's Working Party on Tropical Tuna and the Scientific Committee on the issue of shifting tuna stocks and on the need to understand climate impacts on tropical tuna.

Though brief, the body of the Resolution indicates the IOTC has agreed that the Commission, when developing *inter alia* CMMs will take into account to the fullest extent possible scientific information from the 'Scientific Committee *and other relevant international processes* on the potential impacts of climate change on tuna stocks, bycatch and species belonging to the same ecosystem or dependent on or associated with tuna stocks.'[1343] This reflects of course both the ecosystem and precautionary approach, and also brings in information from other scientific bodies, which could include the work from the IPCC, FAO and from Scientific Committees of other RFMOs. Thus, it creates a form of accountability insofar as it prevents the Commission from being limited to being informed by scientific work (i.e., stock assessments) conducted by the IOTC Scientific Committee only. This is especially important considering the fact that climate change is shifting fish stocks out of geographically fixed management areas which may limit the efficacy of fish stock assessments and modelling conducted within that area only. What is also interesting is the acknowledgement of other international processes when compared with the issues certain Members of CCAMLR raised regarding concern of duplication. Through the Resolution, the Commission is then obliged to support further research on 'relationship between climate change, tuna fisheries and tuna stocks, bycatch ecosystem or dependent on or associated with the tuna stocks, including research to inform potential measures to mitigate and/or adapt to climate change impacts'.[1344] This provision reflects the discussion in chapter 3 on mitigation-adaptation co-benefits, and indicates potential for future climate change measures to focus on co-benefits from an ecosystem perspective. In terms of the research question of the thesis, it also demonstrates State's exercising the obligation to adapt through cooperation and use of the best available science.

The Resolution places two key obligations on the IOTC Scientific Committee, namely that 'when requested by the Commission' the Committee are to advise on 'the potential impacts

[1342] ibid.
[1343] ibid., para. 1
[1344] ibid., para. 2.

of climate change on highly migratory fish stocks and any related impacts on the economies, food security and livelihood of CPCs in particular developing States among them Least Developing States and Small Island Developing States.'[1345] Again, this is a direct reflection of the connectivity between UNFSA Articles 24 and 25 and international climate change obligations. The Committee is also obliged to consider the interaction between fishing activities and climate change and advise the Commission thereto on the implications of those activities on the conservation and management of tuna stocks.[1346]

There are also some interesting developments concerning the role of the Executive Secretary in mainstreaming climate change into the work of the IOTC. Firstly, the IOTC Executive Secretary aims to 'upon the availability of supplementary funds, shall undertake capacity-building programs in particular in the developing coastal States among them the Least Developed States and Small Island Developing States, to improve climate change science and the understanding of climate change impacts on tuna stocks, bycatch and species belonging to the same ecosystem or dependent on or associated with the tuna stocks.'[1347] Which further reflects the common but differentiated responsibilities component discussed in this section. Secondly, a particularly interesting fact is that the Resolution indicates that '[t]he IOTC Executive Secretary shall seek funding for the implementation of climate change related scientific works and capacity building programs through various funding mechanisms such as the Global Environmental Facility, World Bank and others for the implementation of this resolution.'[1348] This again links to the conclusion of chapter three on the likely growing trend of climate finance for ocean-based climate adaptation (or mitigation) action. It demonstrates that there is a clear desire from developing States to operationalise climate and other forms of finance to comply with the obligation to adapt fisheries management to climate change at the international level. Importantly, the resolution does not place the burden of meeting the cost of this extra research on the developing State members of the IOTC who are, as explained throughout the thesis, most likely to feel the economic and social effects of the impacts of climate change on the tuna stocks they exploit.

[1345] ibid., para. 3.
[1346] ibid., para. 4.
[1347] ibid., para. 5.
[1348] ibid., para. 6.

It is too early to say at the time of writing what the influence of this resolution may well be, considering it is just a few months old. However, it provides a clear indication that climate change is now integrated into the work of the IOTC, and that this resolution reflects the developments at the UNFCCC level, namely the integration of the ocean into the climate change regime, and the implicit inclusion of RFMOs in the adaptation provisions of the Paris Agreement. The resolution's provision on finance is of particular interest as requests and similar requests in the future may help bridge the (marine) adaptation funding gap by UNFCCC funding bodies identified in chapter three. Finally, another RFMO created under the FAO ambit is the GFCM, which to date has not passed any climate-related resolution or CMM. However, based on the arguments here and in chapter 3, it would be prudent for this particular RFMO to agree on a climate change resolution in light of States obligations to adapt fisheries management to climate change.

3.1.3 The Western and Central Pacific Fisheries Commission (WCPFC)k

Another promising example is the adoption by the Western and Central Pacific Fisheries Commission (WCPFC) of a resolution on climate change in 2019.[1349] The objective of WCPFC is 'to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the Western and Central Pacific Ocean'.[1350] The text of the Convention does not mention climate change, however; this was addressed at the Commission's 2019 meeting through the adoption of the resolution on climate change.[1351] This states the intention of the WCPFC to '[c]onsider the potential impacts of climate change on highly migratory fish stocks in the Convention area', and 'support further development of science on the relationship between climate change and target stocks', and *inter alia* take into account scientific information into its CMMs.[1352] This resolution does not mention shifting fish stocks, however does take an ecosystem approach through reference to non-target stocks etc. While this resolution reflects the argument that obligations under international fisheries law and applicable principles in international environmental law oblige States to adapt their fisheries management practices to climate change through RFMO/as, the resolution does not

[1349] *Resolution on Climate Change as it Relates to the Western and Central Pacific Fisheries Commission,* Resolution 2019-01.
[1350] WCPFC, Art. 2
[1351] McDonald and Torrens, (n 45).
[1352] Resolution 2019-01 (n 1349).

reflect the links made in chapter three regarding climate change and international fisheries in the way that IOTC Resolution 22/10 does. This could indeed be because the WCPFC Resolution was passed prior to the agreement of the Glasgow Climate Pact and as such does not attempt a more integrated approach with international climate law and fisheries.

3.2 Strengthening Inter-Institutional Cooperation

Cooperation, which has been used as a 'red thread' in linking high seas fisheries management and climate adaptation obligations throughout this thesis, particularly in the conclusions of chapter three, is discussed in this section.

3.2.1 Between RFMOs

Some RFMOs have upheld the duty to cooperate in their constitutional instruments, for example the SPRFMO,[1353] and CCAMLR[1354]. An example of inter-RFMO cooperation in a case of both overlapping jurisdiction and stocks shifting their migratory range is between CCAMLR and the CCSBT.[1355] In this case, the two RFMOs adopted an agreement in 2015 to resolve the question of which organisation's CMMs would apply to vessels fishing for southern bluefin tuna in the CAMLR convention area.[1356] The agreement contained provisions on reciprocal data and information exchange relevant to each organisation's management area and the stocks within it.[1357] Rosemary Rayfuse notes that CCAMLR has undertaken this effort with other RFMOs 'whose geographical competence borders the CAMLR Convention Area'.[1358] Another example involves the NEAFC and NAFO, who in 2001 agreed a management agreement on a stock of oceanic redfish which had migrated between the NEAFC convention

[1353] Convention on the Conservation and Management of High Seas Fisheries Resources in the South Pacific Ocean (SPRFMO) (2009), Art. 3.
[1354] CAMLR, Preamble.
[1355] See Rayfuse, (n 41) 252–3.
[1356] ibid.
[1357] Arrangement between the Commission for the Conservation of Southern Bluefin Tuna and the Commission for the Conservation of Antarctic Marine Living Resources of 20 October 2015, CCAMLR-XXVII/09, <https://www.ccamlr.org/en/ccamlr-xxviii/09https://www.ccamlr.org/en/ccamlr-xxviii/09>.
[1358] Rayfuse, (n 41); See CCAMLR, 'Cooperation' (no date) <https://www.ccamlr.org/en/organisation/cooperation-others>.

area into NAFO's.[1359] Both organisations share management of the stock, where NEAFC sets the TAC, and NAFO receives a quota of that TAC.[1360]

The above two examples are helpful in showing that inter-RFMO cooperation is possible for management of stocks which may cross organisation managerial boundaries in future. In addition, RFMOs also cooperate with one another in a matter of other subjects, including in the prevention of illegal, unreported and unregulated fishing. This can take the form in establishment of joint measures, which involve information exchange on vessels which engage in illegal activities.[1361] RFMOs have also concluded Memoranda of Understanding to ensure cooperation on a range of topics.[1362] Such action can serve as a template for future cooperation on climate adaptation, provided these organisations receive pressure from their contracting Parties. Not only do RFMOs not necessarily cooperate with each other, there is limited cooperation between RFMOs and other organisations to facilitate cross-sector cooperation for MPAs, for example, and this sector-focused approach limits the integrated management of fisheries,[1363] and thus the implementation of effective climate adaptation measures.

3.2.2 Between RFMOs and MEAs

Having already stressed the need for inter-institutional cooperation between RFMOs and the UNFCCC, particularly the new SBSTA Ocean and Climate Dialogue, this section focuses on the improvements that could be made between RFMOs and the CBD. In terms of strengthening cooperation, CBD Parties have recognised that RFMO/As:

> are the competent bodies to manage fisheries and, depending on the situation in different regions, should have roles to play in addressing the impacts of fisheries on biodiversity, notes the need for further improvement and implementation of the ecosystem approach in fisheries management by enhancing the capacity of these fisheries management organizations, constructive inter-agency collaboration, and full and meaningful participation by a wide range

[1359] ibid., 235.
[1360] ibid.; *Report of the NAFO/NEAFC Joint Working Group on Oceanic Redfish*, 13–14 February 2001, NAFO FC Doc. 01/3.
[1361] See James Harrison, 'Key challenges relating to the governance of regional fisheries' in Caddell and Molenaar (n 6) 73, 97.
[1362] ibid.
[1363] Erinosho and others (n 15).

> of experts on biodiversity, indigenous and local communities, taking into consideration Articles 8(j) and 10(c) of the Convention, and relevant stakeholders, as appropriate, in the fisheries management process.[1364]

CBD Parties have also invited "fisheries management bodies at national and regional levels in collaboration with [FAO], to ensure that biodiversity considerations are a part of their work" with a view to collaborate with these bodies. However, Caddell notes that "the CBD has thus far placed little emphasis on the development of collaborative partnerships with individual RFMOs".[1365] The CBD has competence to do this, having concluded more than 250 partnership agreements (memoranda of cooperation or understanding) with FAO, various international secretariats, NGOs, government departments, and other stakeholders.[1366] In line with the findings of the thesis, the CBD decisions have put the onus on States to actively participate within RFMO/As to take greater account of biodiversity (and climate change impacts on it) through improved implementation of the ecosystem approach to fisheries management.

The current draft of the post-2020 biodiversity framework[1367] builds on the Strategic Plan for Biodiversity 2011–2020[1368] and lays out the international plan for broad-based action in transforming society's relationship with biodiversity.[1369] This new framework will replace the Aichi targets. One of the new draft targets is particularly relevant to fisheries and climate change:

> Target 8. Minimize the impact of climate change on biodiversity, contribute to mitigation and adaptation through ecosystem-based approaches, contributing at least 10 GtCO2e per year to global mitigation efforts, and ensure that all mitigation and adaptation efforts avoid negative impacts on biodiversity. [1370]

[1364] CBD, Decision XI/18, para. 2.
[1365] Caddell, (n 572) 151.
[1366] For full details of CBD partnership agreements (251 at time of writing), see: <https://www.cbd.int/agreementshttps://www.cbd.int/agreements>.
[1367] CBD Secretariat, *First Draft of the Post-2020 Global Biodiversity Framework* (2021), available at: <https://www.cbd.int/conferences/post2020https://www.cbd.int/conferences/post2020>.
[1368] CBD, Decision X/2.
[1369] CBD, Decision X/29, Annex, para. 1.
[1370] CBD Secretariat, *First Draft of the Post-2020 Global Biodiversity Framework* (2021), available at: <https://www.cbd.int/conferences/post2020>.

As a rather general document, it is unsurprising that neither fisheries or RFMO/As are mentioned specifically. However, in order to achieve the objectives of the new biodiversity framework, integration of ocean-biodiversity-climate and human rights law are key, as is collaboration with RFMO/As in implementing these objectives in the context of international fisheries. This begs the question as to whether the CBD *should* engage in partnership arrangements with RFMOs to improve responses to climate change in international fisheries management and conservation or continue with the FAO and State-led approach. With the point made above that RFMO/As appear more receptive to climate change due to recent developments, greater coordination through CBD partnership with RFMO/As, including representatives from these organisations participating as observers in CBD and UNFCCC COPs, and further research into potential avenues for improved integration is welcome.

4. Conclusions

This chapter has explored climate adaptation through analysis of measures undertaken by RFMO/As to adapt their fisheries management to climate change. In doing so, it established that States are interpreting the obligation to adapt fisheries management and conservation to the effects of climate change identified in previous chapters, as well as providing evidence of States compliance with the obligation. It has indicated that some States as members of RFMO/As are exercising their obligations to adapt fisheries management to climate change through RFMO/As, and offered analysis of key developments – particularly at the IOTC – where RFMO/As have passes climate change resolutions in order to integrate climate adaptation into their management practices. It is clear that despite there being a legal basis for States to implement adaptive management practices, there is still limited action and greater efforts need to be made to strengthen the link between climate change and international fisheries management and conservation. The IOTC's climate resolution, the first 'post-Glasgow' resolution from an RFMO/A that focuses on climate change, has demonstrated a clear link with international climate law through clear implementation of common but differentiated responsibilities and through the utilisation of climate finance mechanisms. Whether other RFMO/As will follow suit is yet to be seen, however, despite there being a legal obligation to adapt fisheries management to climate change, there is of course a practical necessity to do so since the effects of climate change on fisheries dynamics are already being observed. It is possible that some RFMO/As will follow the IOTC's example, which is illustrative of Molenaar's argument that (some) RFMO/As can act as positive agents of change and that they do take recommendations from the UNGA or FAO seriously. One potential drawback is the fact that most RFMO/As generally make their decisions on CMMs by consensus - an issue here is that members may be able to stymie progress on climate change within a particular RFMO/A, as was illustrated by the CCAMLR attempt to establish a climate change working group. That said, progress at the UNFCCC level on ocean-based climate action could prove promising at promoting a more integrated approach and considering that the IOTC climate change resolution made direct reference to the UN climate treaties, this is an important step forward.

In addition, the FAO is paramount in the context of moving climate action in RFMO/As forward. As suggested throughout this thesis, for example, FAO could call on RFMOs to take climate change into account in their science and CMMs, cooperate with one

another where necessary. Indeed, from the basis of the global goal of adaptation in the Paris Agreement, a joint goal of climate adaptation in high seas fisheries, supported by the international community through FAO, could help strengthen cross-organisation cooperation and help identify blind spots. This has been suggested outside the context of fisheries, in climate adaptation in transboundary water basins, i.e.., ensuring cooperation that is comprehensive and a coherent basin-wide management regime to ensure resilience to climate change.[1371] Guidelines from FAO on climate change and fisheries would be very welcome, the content of such guidelines is discussed in the conclusions of the thesis.

Finally, by contrast with climate mitigation, Molenaar notes that, despite FAO's attention to climate-change mitigation and fisheries for more than a decade, however, no RFMO/As seem to have acted in this regard. That might be due to lack of political support, but it could also be related to the mandates of RFMO/As and how they are viewed by their members. Some measures for reducing emissions by fishing vessels, for instance, on fuel content and efficiency, clearly fall within the mandate of the [International Maritime Organisation].'[1372] RFMO/As could adopt their own measures to reduce emissions from fishing vessels, though could face objection by their members due to the competence of the International Maritime Organisation.[1373] In addition, Harrison stressed that change in RFMOs comes from horizontal cooperation, is unlikely to come from 'top-down' implementation, and States stress that RFMO/As are independent organisations.[1374] However, they are intergovernmental and controlled by State Parties. Considering the urgency of the issue and the need for action, radical reform is not an option, and the limited time available would be better spent utilising the tools and instruments already at hand.[1375]

[1371] See Sergei Vinogradov and Patricia Wouters, 'Adaptation regulatory regimes to address climate change challenges in transboundary water basis: Can multilateral regionalism help?' 29 (202) RECIEL 406 (2020)..
[1372] Molenaar, (n 32) 281.
[1373] ibid.; SPRFMO, *Report of the 7th (2019) Annual SPRFMO Meeting*, at paras. 139–142.
[1374] James Harrison, 'Key challenges relating to the governance of regional fisheries' in Caddell and Molenaar (n 6), 73, 102;1361) Citing comments reported in Report of the Secretary-General to the 2016 Resumed Fish Stocks Agreement Review Conference, UN Doc A/CONF.210/2016/1 of 1 March 2016, para. 250.
[1375] Harrison, ibid.

CONCLUSIONS

The research question of this thesis asked, 'to what extent do States have an international legal obligation to adapt international fisheries management and conservation to the effects of climate change?'. This legal question was developed in response to the fact that most marine species are changing the dynamics of their location, often both spatially and temporally in response to the warming and acidification of the ocean by shifting their range poleward to higher latitudes, or into deeper waters to their preferred environmental conditions. This results in redistribution of species from their historical locations causing jurisdictional issues and complications for the management and conservation of fish populations as they move across traditionally static boundaries.

Chapter one demonstrated that generally, shifting fish stocks across management jurisdictions can cause exacerbation of fisheries conflicts and the creation of new ones, undermines fixed ABMTs such as MPAs, and loss of ecosystem goods and services with food security and human rights implications for communities reliant on the ocean. This is an acute problem for the conservation of transboundary fish stocks which move between coastal States' EEZs and the high seas. Since effective conservation and management of transboundary fish stocks requires cooperation to be successful (i.e., avoid overexploitation). However, the scientific literature review highlighted the prevailing view that the intergovernmental bodies responsible for high seas fisheries management, RFMO/As, appear by-and-large unprepared for dealing with issues pertaining to shifts in fish stock distribution and other climate-related impacts. Despite the growing wealth of scientific literature assessed in chapter one indicating that climate-driven shifts of marine species represent a global governance issue, requiring an adaptive response, international legal scholarly attention to these challenges is lagging.

Chapters two and three analysed the obligations under international fisheries law and international climate change law, respectively. The thesis put forward the argument that there is a general positive obligation on States under international law to adapt their fisheries management and conservation to climate change. Arguably, in order to be fully compliant with existing obligations on the management and conservation of fisheries under international fisheries law, States must take climate change fully into account when taking and implementing decisions. To comply with existing obligations under both international fisheries law and climate change law fully, there is a need to implement climate-resilient and adaptive fisheries

conservation management measures. The thesis also argued that the climate adaptation obligations in the international climate regime indicate that climate adaptation obligations under the UNFCCC and the Paris Agreement do indeed apply to international fisheries, including on the high seas. Further, the adaption provisions of the Paris Agreement implicitly include intergovernmental bodies with a fisheries remit. This includes both RFMO/As and FAO insofar as they recommend these institutions to aid States in implementing their adaptation obligation under the climate regime. This, in conjunction with the official inclusion of the ocean into the international climate regime by way of the Glasgow Climate Pact, and the new formal process of the ocean climate dialogue at the UNFCCC SBSTA indicate the scope for inter-institutional cooperation between RFMO/As, FAO and the UNFCCC to address and clarify the scope and content of the obligation to adapt fisheries management to climate change. This is of particular importance since it is evident from chapter four that there is still limited engagement and action with climate change at the RFMO/A institutional level, despite there being a clear legal duty and practical need to adapt.

It is obvious that neither the climate change or the law of the sea legal frameworks has all the answers or solutions to the challenges posed by climate change to international fisheries. However, the two regimes can work synergistically to inform one another, while integrating key principles and obligations from the CBD and other MEAs analysed in chapter 2, including guidance from COP decisions. It is of course up to States to include fisheries in the adaptation components of their NDCs, however the encouragement to do so since the formal integration of the ocean into the UNFCCC policy discussion has become stronger. States who participate in RFMO/As can channel their own adaptation plans and aid the development of adaptation pathways within that organisation or arrangement. In this way, those States are then exercising their obligation to adapt their fisheries management and conservation to the effects of climate change. The success of this may vary from RFMO/A to RFMO/A, depending on its makeup, management area, geopolitical situation and decision-making structure. While in some RFMO/A for a progress is being made, and contracting Parties are urging greater efforts by the scientific committees of these organisations to consider the impacts of climate change to inform their management decisions. Indeed, it is a positive development that RFMO/A resolutions on climate change since COP26 have mentioned the Glasgow Climate Pact explicitly. However, greater work is still to be done on international adaptive action in fisheries both within and beyond national jurisdiction.

This thesis has made several original contributions to the literature. Existing international legal research on shifting fish stocks – and climate change and fisheries generally – has focused exclusively on obligations under UNCLOS and UNFSA and had not taken an evolutive approach to interpreting these obligations through systemic integration or soft law instruments. Until now, the international legal literature on the topic had not engaged with obligations under other MEAs relevant to the ocean, including the CBD, CMS, and importantly the UN climate treaties. To that end, this approach is a novel and original contribution. A second contribution is to the nascent literature on the interaction between the law of the sea and climate change adaptation under the UN climate treaties, since thus far much of the focus in the literature has been on law of the sea and climate change mitigation. The thesis critically analysed the extent to which international fisheries law, through supportive interpretation of other relevant MEAs places on States an obligation to adapt fisheries conservation and management to the effects of climate change. The content of that obligation informed by generally recommended international minimum standards in terms of fisheries, and generally accepted international rules and standards with regards to the protection and preservation of the marine environment (which has been confirmed to encompass the conservation and management of fisheries). These rules and standards include the adaptation provisions of the Paris Agreement (i.e., the reporting obligations as a rule and work towards the global goal on adaptation as a standard). States are required to base management decisions on the best science available, implement the precautionary principle and ecosystem approach and cooperate through RFMO/As or bilaterally should a fish stock shift jurisdiction. To that end, States are obliged to design and implement an adaptation plan for fisheries management to comply with existing international fisheries law obligations fully. A third contribution is to the literature on international climate law and the ocean generally, with regards to fisheries specifically through analysis of international climate change law considering the historic recent developments at COP26 which will have long lasting effects for the law and governance of the ocean and climate change. Finally, the thesis demonstrated the limited implementation of climate change obligations by States through RFMO/As, though this may change in the near future in light of ocean-climate developments at the UNFCCC. This could be improved by more integrated scientific approaches, and inter-institutional cooperation between RFMO/As, and MEAs, as well as further guidance from FAO on fisheries and climate change discussed below.

With these original contributions in mind, a key recommendation stemming from the findings of the thesis, is that to strengthen inter-institutional cooperation in the face of climate

change, the opportunity for dialogue on climate change and the ocean more broadly exists through the ocean-climate dialogue at the SBSTA held in Bonn annually in June. FAO participates in these meetings directly as an observer, however to date there has been limited to no participation of any regional fisheries body or regional seas convention. FAO's role here cannot be understated, and another recommendation is that in light of the developments at COP26, the FAO Committee on Fisheries should, as soon as possible, begin to develop guidelines on climate change and fisheries with the aim to producing – at the very least – voluntary guidelines on climate change and fisheries. The exact scope and content of these guidelines will be the subject of negotiation. Ideally, however, based on the findings of this thesis, the guidelines should generally: i) acknowledge that adaptation is place and context specific; ii) highlight that adaptation should be viewed as an ongoing and iterative process; iii) specify that that adaptation measures will require an evaluation of success; iv) specify that transboundary issues will need to be considered when developing an adaptation strategy for any fishery; v) highlight the existing FAO guidance in existence on adaptation generally, climate change impacts on fisheries and aquaculture, how to integrate fisheries into NAPs or adaptation communications, and examples of best practices. For States specifically, the guidelines should: i) reiterate the obligations under international fisheries law with respect to climate change and reference to the UN climate and biodiversity treaties – without creating any new obligations on States, since this is not what FAO guidelines actually do; ii) reiterate good practice examples and encourage States to include fisheries adaptation in their reporting under the Paris Agreement; iii) clarify that all the provisions in the Code of Conduct for Responsible Fisheries should be read in a climate change context – as should other FAO instruments; iv) provide guidance of (or refer to existing guidance) on data poor fisheries, vulnerability assessments, preparedness and risk assessment for adaptation measures, as well as guidance on evaluating the success of adaptation measures; v) encourage inter-State cooperation and cooperation with regional fisheries bodies on data sharing and establishing co-management measures on climate resilient fisheries. For regional fisheries bodies (not just RFMO/As) specifically, depending on their mandates, the guidelines should encourage: i) flexible conservation and management measures to promote resilience; ii) coordination and cooperation between regional fisheries bodies on a range of activities including best practices and data sharing including the inclusion of climate change in the stock assessments that help determine CMMs – this could be done formally through the Regional Fisheries Body Secretariats' Network; iii) include climate change as a key component of a performance review; iv) consider institutional adaptation based on the outcome of said performance review;

v) strengthen existing methods of cooperation between regional fisheries bodies; vi) consider climate change impacts within all aspects of their mandate, including the inclusion of climate change as a permanent agenda item and establishment of working groups on climate change; and vii) showcase a range of examples as to how regional fisheries bodies can achieve these recommendations. Finally, the guidelines should follow a rights-based approach and should be developed in a participatory and inclusive manner. This could follow the same process as the SSF Guidelines discussed in chapter 2 and would be negotiated with meaningful participation from regional fisheries bodies, the UNFCCC adaptation bodies (i.e., the Nairobi Work Programme, Adaptation Committee, and Glasgow Sharm el-Sheikh Work Programme) to provide normative clarity on what is required on States RFMO/As, and other regional fisheries bodies in terms of cooperation and collaboration in adaptation in fisheries management. It could also include an integrated approach of relevant MEAs, such as those analysed in chapter 2, to clarify the scope and content of adaptation in fisheries through relevant principles and approaches. Moreover, mitigation aspects should also be considered in the developments of the guidelines, especially with the participation of the International Maritime Organisation. It may be the case that the suggestions above are too prescriptive, and the guidelines may be negotiated down into a set of principles that reiterate cooperation in climate adaptive and resilient fisheries management, i.e., they would provide guidance on interpreting the provision of the Code of Conduct on Responsible fisheries in a climate change context.

The findings of this thesis open up a new direction for future research. For example, there is significant scope for international human rights law scholarship and practice. Chapter one identified food security, climate justice and intergenerational equity issues regarding shifting fish stocks and climate impacts on the ocean more broadly that merit deeper investigation from a human rights law perspective using the findings of this thesis as a base. Second, considering the recent Human Rights Council Decision on the Torres Straight Islanders Case - where Australia was found to have failed to implement an adaptation programme to ensure long term habitability of the Torres Straight Islands;[1376] This indicates that failure to adapt to climate change, including adaptation planning and funding, may constitute a breach of human rights as it is a failure by the State to discharge its positive obligation to adapt.[1377] These questions were not addressed due to lack of space and choice of

[1376] Human Rights Committee, *Views adopted by the Committee under article 5 (4) of the Optional Protocol, concerning communication No. 3624/2019* (2022) UN Doc. CCPR/C/135/D3624/2019.
[1377] ibid.

scope in the thesis, but merit further scholarly investigation and may have implications for international human rights scholarship and practice. Finally, the suite of advisory opinions on climate change at the ITLOS, ICJ and Inter-American Court on Human Rights may shed light on State obligations with regards to the conservation and management of fisheries and other marine living resources in the face of climate change.

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