

Foreword

Oceans & Climate Change: Calling for Holistic Conversation

*Jordan Diamond, Holly Doremus & Ronán Long**

Altered weather patterns, exacerbated drought and flood cycles, increased incidence of wildfires, melting glaciers—we frequently hear about how human-induced climate change is affecting everyday life and the world around us. But the attention frequently focuses on terrestrial impacts, stopping at the coastline with observance of rising sea levels. The oceans are not insulated from the effects of climate change, however. Far from it. The oceans are the single largest carbon sink on the planet, absorbing roughly one quarter of all anthropogenic carbon dioxide emissions since the start of the Industrial Revolution.¹ Although they may be less directly visible to land-dwellers like human beings, the impacts of climate change on the oceans are highly significant, ecologically and economically.

Global ocean governance regimes have been slow to respond to the climate change challenge. There have been few governance changes explicitly directed at the effects of climate change, and even those few have approached the risks in a siloed and jurisdictionally fragmented way. Recognition of the need for a more integrated and coordinated response is growing at several international fora,

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1. Monika Rhein et al., *Observations: Ocean*, in 5 INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE (IPCC) 2013: THE PHYSICAL SCIENCE BASIS 292 (2013); Philippe Ciais et al., *Carbon and Other Biogeochemical Cycles*, in 5 INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE (IPCC) 2013: THE PHYSICAL SCIENCE BASIS 467 (2013).

including the United Nations, and under existing regulatory regimes applicable to ocean-based activities. But these initiatives need to be enhanced by rigorous academic scholarship on the contentious issues associated with bringing about greater convergence between the climate change and ocean regulatory regimes and policy frameworks. To accelerate progress, the Law of the Sea Institute at UC Berkeley, the World Maritime University, and the Korea Institute of Ocean Science and Technology invited international experts and leading scholars to discuss and debate some of the key issues at a conference at the World Maritime University in Malmö, Sweden in August 2017.²

With a view to fostering lively debate and chartering new pragmatic solutions, we invited conference participants to envision international, regional, and select domestic governance initiatives related to oceans and climate change. The goal was to explore best practices, identify governance gaps, and assess potential or existing linkages between the myriad of regulatory and policy frameworks that subsist at various levels and in relation to different sectors. The result was a narrative map of relevant law and policy initiatives and how they link to existing legal regimes and broader climate change efforts. While the emphasis was on international law and policy, vital cross-cutting issues included the role of technology, of capacity-building, of integrated ocean management such as marine spatial planning, and of multi-lateral, regional, and sectoral institutions. These themes reflected recognition that no single discipline, sector, or State can effectively address the impacts of climate change on the ocean and of ocean activities on climate change on its own.

The conference deliberations took place at a time when several important international initiatives were underway, offering room for optimism about a paradigm shift. For example, the Intergovernmental Panel on Climate Change is preparing a special report on oceans, climate change, and the cryosphere for publication by September 2019.³ That report, which will compile the best available scientific information, should provide a robust platform for further global action on oceans and climate change. Meanwhile, discussion is ongoing regarding the implementation of United Nations Sustainable Development Goal 14, which calls on the global community to “[c]onserve and sustainably use the oceans, seas and marine resources for sustainable development.”⁴ However, “[t]he increasingly adverse impacts of climate change (including ocean acidification), overfishing and marine pollution are jeopardizing recent gains in protecting portions of the world’s oceans.”⁵ And in September 2018, the United

2. The conference was made possible by primary sponsorship from the Korea Institute of Ocean Science and Technology (PE99692), with cooperating sponsorship from the Korea Research Institute of Ships and Ocean Engineering. We deeply appreciate their generous support for this initiative.

3. IPCC, *Special Report on the Ocean and Cryosphere in a Changing Climate*, https://www.ipcc.ch/meetings/session45/Decision_Outline_SR_Oceans.pdf (last visited May 19, 2018).

4. G.A. Res 70/1, ¶¶ 14.1–14.7 (Oct. 21, 2015).

5. UN Secretary-General, *Progress towards the Sustainable Development Goals*, ¶ 18, UN Doc. E/2017/66* (May 11, 2017).

Nations will convene the first session of its Intergovernmental Conference to negotiate an international agreement on the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction. Meaningful action on marine biodiversity cannot exclude consideration of climate impacts. Nongovernmental institutions are also addressing relevant issues; for example, the International Law Association Committee on International Law and Sea Level Rise is considering critical questions about the legal ramifications of rising oceans, and the Global Ocean Forum has developed a Strategic Action Roadmap on Oceans and Climate for 2016–2021. Other developments include the appointment of Peter Thomson as the United Nations Special Envoy for the Ocean, as well as the launch of the Ocean Pathway Partnership, which calls governments around the world for a common action on ocean protection.

This special issue of *Ecology Law Quarterly* draws from the experts that gathered for the August 2017 conference. Covering topics from the impact of fisheries on climate change to the altered norms of dispute resolution in the climate change era, the authors examine how evolving conditions affect resources, areas, communities, and activities that we have traditionally managed individually on a sector basis. We wish to express our sincere thanks to the student editorial team of *Ecology Law Quarterly*, who worked tirelessly to produce this issue on a rapid timeline without sacrificing the excellence for which the journal has long been recognized. Most of all, we are grateful that the authors contributed their expertise in analyzing these important issues and hope we are witnessing but the beginning of a global dialogue on these issues.

OCEAN ACIDIFICATION

The first topic addressed is ocean acidification. Carbon dioxide emissions from human activity have increased atmospheric carbon dioxide levels by more than 40 percent since the start of the Industrial Revolution;⁶ it is estimated that the oceans have absorbed roughly one quarter of the carbon dioxide emitted.⁷ The added carbon dioxide has changed the chemical balance of the oceans—since the mid-1700s the pH of the world’s ocean surface water has decreased an average of 0.1, which may sound small but implies a 26 percent increase in average ocean acidity.⁸ Increased acidity affects the reproductive processes and metabolism of numerous ocean organisms, including the ability of corals, shelled mollusks, and some plankton to build calcium carbonate shells and other rigid structures.⁹

6. Dennis L. Hartmann et al., *Observations: Atmosphere and Surface*, in 5 INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS 161 (2013).

7. Monika Rhein et al., *supra* note 1, at 260; Philippe Ciais et al., *supra* note 1, at 467.

8. Monika Rhein et al., *supra* note 1, at 300; Carles Pelejero et al., *Paleo-perspectives on Ocean Acidification*, 25 TRENDS IN ECOLOGY & EVOLUTION 297, 300, 332–33 (2010).

9. Victoria J. Fabry et al., *Impacts of Ocean Acidification on Marine Fauna and Ecosystem Processes*, 65 ICES J. MARINE SCIENCES 414, 420–22 (2008).

Professor Nilufer Oral asks whether the current international legal regimes provide an adequate basis for effectively responding to the global challenge of ocean acidification. Diving deeply into the requirements of the UN Framework Convention on Climate Change and the UN Convention on the Law of the Sea, Professor Oral articulates the view that ocean acidification is not squarely addressed by either of these cornerstone instruments. Moving forward, she suggests that the UNFCCC provides the most effective vehicle for catalyzing action on ocean acidification because it emphasizes the collective action needed to address this global problem. A key step will be including ocean acidification science in the establishment of carbon dioxide reduction goals.

BIODIVERSITY & CLIMATE CHANGE

The next, and closely related, topic is the conservation of marine biodiversity in the face of climate change. While humanity has documented many aquatic flora and fauna, many more species remain undiscovered in the marine environment. Marine biodiversity not only captures the imaginations of people around the world, but also spurs innovation in sectors such as medicine and engineering and is critical for ecosystem functionality.¹⁰ Increasingly, however, the effects of climate change, including rising ocean temperatures, acidifying waters, and other chemical changes, are causing physiological stress, altering species interactions, and increasing the impacts of other human-caused stressors.¹¹

Professor Robin Warner explores the potential for establishing an environmental impact assessment requirement for ocean areas beyond national jurisdiction, an issue under active negotiation at the United Nations in the form of a legally binding instrument for conserving biodiversity in areas beyond national jurisdiction. After reviewing the current state of both broadly-applicable and sector-specific environmental impact assessment requirements outside of national waters, Professor Warner examines the elements needed for that instrument to catalyze meaningful assessment. She concludes that the instrument under development could both strengthen recognition of the impacts of climate change on the oceans and provide a best-practice example for other contexts.

FISHERIES & CLIMATE CHANGE

How fisheries governance can and should respond to climate change is an immediate and critical issue. Climate disruption is already profoundly impacting fisheries, through changes in ocean temperature and chemistry, altered fish stock ranges, and disruption of nutrient upwelling locations, among other effects. Yet

10. *Marine Biodiversity - A Vital Resource*, WORLD OCEAN REVIEW, <http://worldoceanreview.com/en/wor-1/marine-ecosystem/biodiversity/> (last visited May 23, 2018).

11. See Lisa A. Levin & Nadine LeBris, *The Deep Ocean Under Climate Change*, 350 SCIENCE 766, 766–68 (2015); Thomas Wernberg et al., *An Extreme Climatic Event Alters Marine Ecosystem Structure in a Global Biodiversity Hotspot*, 3 NATURE CLIMATE CHANGE 78, 81 (2012).

ocean harvested fish are an essential food source for much of the global population, as well as an important economic resource, with a total global market value in the vicinity of \$140 billion.¹² As the global population continues to grow, demand for fish is expected to rise, but climate disruption may reduce fish stocks such that they cannot meet this increased demand. Stocks that many communities rely on for food security, especially in Asia and in developing countries, are at grave risk.¹³

Professor Rosemary Rayfuse analyzes progress in integrating climate change considerations into management of Antarctic fisheries. There is increasing consensus that the most effective way to manage fish stocks is through an ecosystem-based approach, but management bodies around the world continue to wrestle with effective implementation. The Commission on the Conservation and Management of Antarctic Marine Living Resources is at the forefront of regional conservation management, and an early adopter of the ecosystem approach. In her contribution, Professor Rayfuse analyzes the Commission's strategies, successes, and remaining challenges when it comes to incorporating climate change impacts into its efforts to implement ecosystem-based management, especially regarding the fisheries within its purview.

THE ARCTIC

This special issue next moves to the other pole, the Arctic. The magnitude of climate change in the Arctic so far exceeds that anywhere else on Earth. While the Antarctic is managed as a global commons, the Arctic is largely under individual sovereign control and subject to competing unsettled national claims. The five Arctic Ocean littoral nations—the United States, Canada, Russia, Norway, and Denmark (Greenland)—are joined by Iceland, Sweden, and Finland in constituting the Arctic Council as a forum for regional discussion, with other nations also claiming interests in Arctic Ocean resources.

Henri Féron looks holistically at the legal issues catalyzed by climate change in the Arctic. Moving from economic impacts to environmental considerations and finally security matters, the author examines key legal questions currently under consideration, the applicable instruments, and why progress is so difficult. Mr. Féron posits that many of these gaps in the current governance framework require multilateral agreements to move forward, agreed to either by the Arctic nations or, in some cases, requiring broader adoption. He suggests that a “package deal” Arctic Treaty that addresses numerous gaps at

12. *Global Seafood Trade Expansion Slows Despite Continuing Production Growth*, UN FOOD & AGRIC. ORG. (May 19, 2017), <http://www.fao.org/in-action/globefish/market-reports/resource-detail/en/c/887756>.

13. See, e.g., Rowena Valmonte-Santos et al., *Fisheries Sector under Climate Change in the Coral Triangle Countries of Pacific Islands: Current Status and Policy Issues*, 67 MARINE POLICY 148, 148–49 (2016); Pedro Valadas Monteiro, *Fisheries and Climate Change: Inevitability or Prophylaxis? Contributing to a Necessary Debate*, 74 CROAT. J. FISHERIES 130, 133 (2016).

once could propel the Arctic to an integrated management framework comparable to that seen in the Antarctic.

DISPUTE RESOLUTION

The final topic discussed is the critical question of dispute resolution for climate change litigation in the marine context. International law sets out a complex and sophisticated legal order for the ocean that seeks to balance competing interests in the uses of the seas and the resources that they support. The effects of climate change give rise to uncertainty, which in turn fuels conflicts over access to resources, as well as disagreement about the scope and content of responsibility for adaptation and mitigation measures under both the climate change and law of the sea frameworks.¹⁴

Professor Seokwoo Lee and Lowell Bautista address this paradigmatic issue through the lens of the current state of relevant doctrines and analysis of recent implementation. They first explore the state of the doctrine of marine environmental protection within international ocean law, including the pivotal Annex VII South China Sea arbitration award that emphasized the importance of proactive versus reactive approaches. They contrast that doctrine with the current practice in marine contingency planning in the Asia-Pacific, which has been largely reactive. This leads to an examination of legal questions surrounding making a claim and establishing causation, among others. Professor Lee and Mr. Bautista suggest that because the UN Convention on the Law of the Sea includes a duty to peacefully settle disputes regarding its provisions,¹⁵ it may provide a compelling venue for climate change damage litigation, including the possibility of a non-binding Advisory Opinion from the International Tribunal for the Law of the Sea.

CONCLUSION

The articles in this special issue offer a compelling sample of the critical questions that sit at the intersection of ocean governance and climate change. There are, of course, many other issues, including (among others) the role of marine activities in climate change mitigation (e.g., reducing shipping emissions), how to enable effective coastal adaptation (e.g., increasing coastal resilience), how to address human displacement caused by climate change (including internal displacement), and the legal framework for coordinating scientific and social scientific research (e.g., the framework for sharing information). We hope the expert analyses here will help catalyze cross-cutting conversations about these additional issues. Only by holistically considering the

14. Catherine Redgwell, *UNCLOS and Climate Change*, 106 PROC. ANN. MEETING (AM. SOC'Y INT'L L.) 406, 406–09 (2012).

15. United Nations Convention on the Law of the Sea art. 279, *opened for signature* Dec. 10, 1982, 1833 U.N.T.S. 397 (entered into force Nov. 16, 1994).

causes and effects of climate change on ocean resources and ecosystems can we hope to develop the legal framework, scientific understanding, and communal will to take global action to address them in a pragmatic and effective manner.

