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REVIEW ESSAY

Adapting the Law of Fish and Wildlife to the Science of Climate Change

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I

Few things have been more frustrating and disappointing in the modern history of environmental law and policy, including that specifically applicable to terrestrial and marine species around the world, than the failure to take account of and respond to climate change.¹ The science of climate change is far from being an exclusively American achievement.² But, perhaps because the United States was born of the Age of Enlightenment, few countries have evidenced a more persistent and determined effort to ground the legitimacy of and authorities for their public policies for resources on science and reason. And perhaps that also goes a long way to explain why the recent outpouring, we might well call it a deluge, of scholarship pleading for resources law and policy to be adapted to the realities of climate change has been more assiduous, voluminous, and incredulous in the United States than in other countries.³

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¹ JONATHAN VERSCHUUREN, *ENVIRONMENTAL LAW & CLIMATE CHANGE*, 2 vols. (2015).

² BERT BOLIN, *A HISTORY OF THE SCIENCE & POLITICS OF CLIMATE CHANGE: THE ROLE OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE* (2007).

³ Richard J. Pierce, Jr., *Legal Disputes Related to Climate Change Will Continue for a Century*, 42 ENVTL. L. 1257-1274 (2012); *GLOBAL CLIMATE CHANGE & U.S. LAW* (Michael Gerrard & Jody Freeman eds. 2d ed. 2014); *THE LAW OF ADAPTATION TO CLIMATE CHANGE: U.S. & INTERNATIONAL ASPECTS* (Michael Gerrard & Kristina Fischer Kuh eds. 2012).

The truth of the matter is that the United States has reaped enormous benefits, almost unbelievable wealth, in fact, for more than two hundred years, from putting its resources to productive use by first asking what can be known about them and then putting that knowledge to work.⁴

This was the enlightenment impulse that caused the early republic to send expeditions westward for continental exploration.⁵ It is what impelled the United States Navy to take a serious interest in scientific research beginning in the early nineteenth century.⁶ It prompted the American states and then the federal government to create knowledge-based agencies, such as geological and biological surveys, towards the end of the nineteenth century, laying the instrumental groundwork for a Progressive land policy for minerals, forests, and eventually parks.⁷ Science was also the basis for harnessing and channeling scarce water resources and using them to reclaim a divided west.⁸ And let us remember that most of America's largest and greatest state universities began life as land grant colleges, where the chief objectives were the advancement of agricultural science and engineering and then, through extension, a transformation in the productivity of America's farms and the wealth of American farmers.⁹

Indeed, the economic development of the United States has always rested, and *very* successfully so, on an acute appreciation of how to make the best science the handmaiden of good laws and policies for turning a continental country's abundant nature into wealth.¹⁰ From the perspective of history, then, what is fast becoming the

⁴ Harry Scheiber, *Success and Failure in Science-Politics Interactions: Cases from the History of California Coastal and Ocean Studies, 1945-1973*, in NATIONAL RESEARCH COUNCIL, *IMPROVING INTERACTIONS BETWEEN COASTAL SCIENCE & POLICY: PROCEEDINGS OF THE CALIFORNIA SYMPOSIUM 97-122* (1995)

⁵ WILLIAM H. GOETZMANN, *EXPLORATION & EMPIRE: THE EXPLORER & THE SCIENTIST IN THE WINNING OF THE AMERICAN WEST* (1966).

⁶ STEPHEN J. DICK, *SKY & OCEAN JOINED: THE U.S. NAVAL OBSERVATORY 1830-2000* (2003); A. HUNTER DUPREE, *SCIENCE IN THE FEDERAL GOVERNMENT: A HISTORY OF POLICIES & ACTIVITIES* (1957).

⁷ MARY C. RABBITT, *THE UNITED STATES GEOLOGICAL SURVEY: 1879-1989* (USGS Circular 1050, 1989); SAMUEL P. HAYS, *CONSERVATION & THE GOSPEL OF EFFICIENCY: THE PROGRESSIVE CONSERVATION MOVEMENT, 1890-1920* (1974); Joseph L. Sax, *Parks, Wilderness, and Recreation*, in *GOVERNMENT & ENVIRONMENTAL POLITICS: ESSAYS ON HISTORICAL DEVELOPMENTS SINCE WORLD WAR TWO 115-140* (Michael J. Lacey ed. 1989); KAREN ORREN & STEPHEN SKOWRONEK, *THE SEARCH FOR AMERICAN POLITICAL DEVELOPMENT 156-171* (2004).

⁸ DONALD J. PISANI, *TO RECLAIM A DIVIDED WEST: WATER, LAW & PUBLIC POLICY 1848-1902* (1992).

⁹ David B. Danbom, *Publicly Sponsored Agricultural Research in the United States from an Historical Perspective*, in *NEW DIRECTIONS FOR AGRICULTURE & AGRICULTURAL RESEARCH: NEGLECTED DIMENSIONS & EMERGING ALTERNATIVES 107-131* (Kenneth A. Dahlberg ed. 1986); NATIONAL RESEARCH COUNCIL, *COLLEGES OF AGRICULTURE AT THE LAND GRANT UNIVERSITIES: A PROFILE* (1995); PAUL K. CONKLIN, *A REVOLUTION DOWN ON THE FARM: THE TRANSFORMATION OF AMERICAN AGRICULTURE SINCE 1929*, ch. 1 (2008).

¹⁰ An early and clear articulation of how this dynamic played out in the largest of the states and the most favorably endowed by nature, across a range of natural resources, appears in GERALD D. NASH, *STATE GOVERNMENT AND ECONOMIC DEVELOPMENT: A HISTORY OF ADMINISTRATIVE POLICIES IN CALIFORNIA 1849-1933* (Institute of Governmental Studies, University of California, 1964). California history also illustrates the wanton destruction of nature that occurred in the era before American resource law began to be constrained by science. See Donald J. Pisani, *"I am resolved not to interfere, but permit all to work freely": The Gold Rush and American Resource Law*, in *A GOLDEN STATE: MINING & ECONOMIC DEVELOPMENT IN GOLD RUSH CALIFORNIA 123-148* (James Rawls & Richard Orsi eds. 1999).

chronic failure¹¹ to ask what new economic opportunities for the nation as a whole lie in the science of climate change might fairly be described as puzzling and perhaps even, although not in any unpatriotic sense, as un-American.

There are people and governments and private companies, of course, who see climate change as an opportunity to make money from transforming nature into wealth in new ways. They would like greater license to convert sunshine and wind into electrical energy, for example. Such a policy would be in line with having governments at all levels exert more authority to reduce greenhouse gas emissions, encourage energy conservation, and stimulate energy production from renewable resources.

The rub, of course, is that new orderings of authority to promote renewables, in the name of counteracting climate change, have to contend with older forms of authority that gave license for the enhancement of economic value and social good by exploiting non-renewable resources. The trick, then, in a liberal democracy is to reconcile the two - to invent instruments that enable adaptation to climate change without destroying or unreasonably restricting the ways of creating wealth from nature that the state has previously sanctioned.

Is this something we know how to do, or are at least learning how to do? Judging from a recent survey¹² of opportunities to make law and policy once again the handmaidens of enlightened change, this time by adapting ocean and coastal law and policy to climate science, the answers to these questions are less than reassuring. They are also, given the history of ocean and coastal law and policy, and of the way they have been shaped by science, more than a little surprising.

II

Recall that for most of human history the oceans were so little studied and, therefore, so poorly understood, yet also perceived to be so vast and so unaffected by whatever demands people made upon them, that the resources the oceans contained were thought for all practicable purposes to be inexhaustible. The chief thing governments needed to do to turn marine resources into wealth was ensure unlimited access to the bounty of the seas. This they did by guaranteeing the freedom of the seas, beyond the traditional three mile limit,¹³ and beyond that by placing only the most minimal of restrictions either on the behavior of resource exploiters or on the techniques and equipment they used.

¹¹ The Intergovernmental Panel on Climate Change was established in 1988 and issued its first assessment report in 1990, twenty-five years ago.

¹² CLIMATE CHANGE IMPACTS ON OCEAN & COASTAL LAW: U.S. & INTERNATIONAL PERSPECTIVES (Randall Abate ed. 2015), hereinafter cited as Abate (2015).

¹³ For a superb, short introduction to the law of the sea and of the major international controversies that have arisen thereunder, see DAVID HUNTER, JAMES SALZMAN & DURWOOD ZAEKE, INTERNATIONAL ENVIRONMENTAL LAW & POLICY, 3d ed. 737-791 (2007). They observe that "environmental matters were not a concern of oceans law until after World War II, primarily because the seas' bounty appeared to be inexhaustible and pollution remained small scale and local." *Id.* at 737. See also A SEA CHANGE: THE EXCLUSIVE ECONOMIC ZONE & GOVERNANCE INSTITUTIONS FOR LIVING MARINE RESOURCES (Syma Ebbin, Alf Häkon Hoel & Are Sydnes eds. 2005).

In the context of fisheries law and policy, DeSombre and Barkin add that:

Until the era of industrial fishing, the very idea that humans could threaten the bounty of the sea seemed absurd. As recently as the 1950s, despite clear evidence of decline in some major fisheries, the argument was still made that human efforts were not a threat to global fish stocks. A 1954 book written by two marine scientists was entitled *The Inexhaustible Sea*, indicating how even scholars conceptualized ocean resources not much more than half a century ago. Serious international efforts to meaningfully manage [sic] global fisheries did not develop real momentum until the 1970s, when evidence of depletion of major stocks could no longer be ignored.¹⁴

There were, however, serious and sustained efforts made earlier at both the state and federal levels to argue that inexhaustibility was a myth and that, unless fishing effort was brought into line with what was actually known about the oceans and marine resources, great damage could be done both to the ocean environment and to the fishers and fisheries intent on extracting wealth from it. The story is a long one, and the search for legal and policy instruments that might use the available science to best advantage is complex, conflict-ridden and far from being concluded on any basis that attracts a broad consensus.¹⁵

The all-time classic version of the story, told from the perspective of a single state and spanning a hundred and thirty years, is the one told by Arthur McEvoy about California.¹⁶ His mesmerizing story does not stand alone, however, and the strands that inter-weave it with the national and international history of marine science,¹⁷ with the often bitter and protracted struggle for acceptance of limited entry in fisheries,¹⁸ and with two major episodes of domestic political mobilization by the ocean community since the late 1960s¹⁹ form a rich tapestry of environmental scholarship.

¹⁴ ELIZABETH DESOMBRE & J. SAMUEL BARKIN, FISH 79 (2011). The book was HAWTHORNE DANIEL & FRANCIS MINOT, THE INEXHAUSTIBLE SEA (1954).

¹⁵ Witness the difficulties attending the latest attempt to reauthorize the Magnuson-Stevens Fishery Conservation and Management Act (FCMA) of 1976, the most important legal authority for the governance of marine fisheries in federal waters. The legislative history is being tracked at http://www.nmfs.noaa.gov/sfa/laws_policies/msa/reauthorization_activities.html (last accessed 29 September 2015). A good understanding of the purposes and structure of what is now usually referred to simply as the Magnuson-Stevens Act (MSA) can still be found in MICHAEL J. BEAN & MELANIE J. ROWLAND, THE EVOLUTION OF NATIONAL WILDLIFE LAW, 3d ed. 148-192 (1997) and is more recently reviewed by DALE D. GOBLE & ERIC T. FREYFOGLE, WILDLIFE LAW: CASES & MATERIALS 867-920 (2d. ed. 2010).

¹⁶ ARTHUR F. MCEVOY, THE FISHERMAN'S PROBLEM: ECOLOGY & LAW IN THE CALIFORNIA FISHERIES, 1850-1980 (1986).

¹⁷ Harry N. Scheiber, *Pacific Ocean Resources, Science and Law of the Sea: Wilbert M. Chapman and the Pacific Fisheries, 1945-70*, 13 ECOLOGY L.Q. 381-534 (1986); Harry N. Scheiber, *Modern U.S. Pacific Oceanography and the Legacy of British and Northern European Science*, in MAN & THE MARITIME ENVIRONMENT 36-75 (Stephen Fisher ed. 1994); Scheiber (1995), *supra* note 4; Harry N. Scheiber, *From Science to Law to Politics: An Historical View of the Ecosystem Idea and Its Effect on Resource Management*, 24 ECOLOGY L.Q. 631-651 (1997).

¹⁸ Harry N. Scheiber & Christopher J. Carr, *From Extended Jurisdiction to Privatization: International Law, Biology, and Economics in the Marine Fisheries Debates, 1937-1976*, 16 BERKELEY J. INT'L L. 10-54 (1998); CARMEL FINLEY, ALL THE FISH IN THE SEA: MAXIMUM SUSTAINABLE YIELD & THE FAILURE OF FISHERIES MANAGEMENT (2011).

¹⁹ Harry N. Scheiber, *The Stratton Commission: An Historical Perspective on Policy Studies in Ocean Governance, 1969 and 1998*, in THE STRATTON ROUNDTABLE: LOOKING BACK, LOOKING FORWARD, LESSONS FROM THE 1969 COMMISSION ON MARINE SCIENCE, ENGINEERING AND RESOURCES 31-38 (Robert Knecht, Biliana Cicin-Sain & Nancy Foster eds., NOAA

One of the things we learn from this substantial body of work is that scientific developments in oceanography have had an enduring influence, beginning as far back as the 1890s, and have persistently pulled law and policy towards ideals of comprehensiveness, ecosystem-based management and integrated ocean and coastal regulation.²⁰ But what we also learn is that the scientific impulse to understand oceans and coasts and their resources in terms of their constituent ecosystems has had only a slow and incremental leavening effect on the political development of instruments that either license the exploitation of marine resources or seek to control their external effects, or increasingly in recent decades try to do both simultaneously.²¹

Although much has been made of the way in which both the Stratton Commission in 1969 and the Pew and USCOP panels in 2003 and 2004 substantially advanced ecosystem-based management ideals for coasts and oceans,²² the law and policy legacies of all the commissions are marked by what Scheiber calls “the intractable realities of segmentation,”²³ a term he derives from the Stratton Commission’s own words:

It is impossible to deal with development and management issues in terms of marine resources *as a whole*, although [some] general policy considerations must be accommodated.... There is no single national policy uniformly applicable to all resources, just as there is no single defense, economic, or foreign policy. Rather, there is only a body of experience and general objectives which guide *decisions on specific issues at specific times*.²⁴ [Emphasis added].

Thanks to the energy and initiative of Richard Hildreth, and his collaborators at the University of Oregon Law School’s Ocean and Coastal Law Center, it became possible to track in great detail the multiple spillovers from and correlates of the Stratton Commission’s work, and the way they played out over time, both in relation to the domestic environmental movement in the 1970s and the contemporaneous international

National Ocean Service, 1998). The ocean community, Scheiber writes, grew out of a tradition of corporativism that brought together people from industry, resource managers, and scientists to lobby for public support of scientific research on fisheries. It also became typical of fisheries regulation after the Second World War, when core fisheries-oriented coalitions systematically sought interactions with other industrial-scientific-engineering clusters of interests and the political leaders who took an interest in their concerns. *Id.* at 32-33. See also Donna R. Christie, *Implementing an Ecosystem Approach to Ocean Management: An Assessment of Current Regional Governance Models*, 16 DUKE ENVTL. L. POL’Y FORUM 117-142 (2006); Donna R. Christie, *From Stratton to USCOP: Environmental Law Floundering at Sea*, 82 WASH. L. REV. 533-546 (2007); Donna R. Christie, *Lead, Follow or Be Left Behind: The Case for Comprehensive Ocean Policy and Planning for Florida*, 44 STETSON L. REV. 335 (2015).

²⁰ Scheiber (1997), *supra* note 17 at 636-639.

²¹ The bloom was off the rose of ecosystem-based management when Oliver Houck wrote in a widely cited article that ecosystem management initiatives have proven in the field to be “amorphous and unenforceable” and sometimes justified in terms that amount to little more than a design for avoiding definitive management decisions and [instead] keeping stakeholders happy. Oliver Houck, *On the Law of Biodiversity and Ecosystem Management*, 81 MINN. L. REV. 869 (1997), quoted in Scheiber (1998), *supra* note 19 at 36. This verdict was decisively affirmed in JUDITH LAYZER, *NATURAL EXPERIMENTS: ECOSYSTEM-BASED MANAGEMENT AND THE ENVIRONMENT* (2008).

²² Christie (2007), *supra* note 19.

²³ Scheiber (1998), *supra* note 19 at 35.

²⁴ *Id.*, quoting COMM’N ON MARINE SCI., ENG’G & RES., *OUR NATION & THE SEA: A PLAN FOR NATIONAL ACTION* (1969) at 83.

initiatives to recast the law of the sea.²⁵ The basis was thus laid for the publication in 1999 of the first authoritative text on ocean and coastal law, now in its fourth edition,²⁶ in much the same way that the mobilization of the ocean community behind the Pew and USCOP initiatives enabled, among other things, a second authoritative and comprehensive text on ocean and coastal law that appeared in 2009.²⁷

Both of these standard texts are testimony to the power of segmentation to counteract the imperatives of comprehensiveness.

Indeed, as Donna Christie observes, in the thirty years that separate Stratton from Pew and USCOP:

[T]he number of laws and agencies involved in the management of ocean resources dramatically expanded. The Pew Oceans Commission and USCOP estimated that at least twenty federal agencies are involved in implementing over 140 ocean-related statutes. It is not surprising that these commissions continued to view the jurisdictional scope and the fragmented and over-lapping system of ocean governance as primary impediments to implementing coherent and effective ocean policy. Neither the creation of NOAA nor the development of state coastal management regimes under the Coastal Zone Management Act [the two principal institutional legacies of Stratton] provided a framework sufficient to coordinate the regulation and management of ocean and coastal activities and the conflicts that have proliferated as coastal and ocean uses have continued to intensify [citations omitted].²⁸

The important lessons to be learned, then, from tracing the ways in which scientific development and political development have been intertwined in the ocean and coastal domains over the last several decades are profound. The real interests in the wealth of the oceans, both exploitive interests and, latterly, protective interests that the government has incrementally recognized and legitimated by creating separate or, to use Scheiber's term, segmented statutes and agencies are now increasingly forced to confront each other.

Moreover, while they remain segmented, they are now also so thoroughly entangled in each other's affairs - twenty agencies and more than a hundred and forty

²⁵ The Center published several newsletters over a twenty-six-year period, providing analyses of significant new developments in ocean and coastal law. Coastal Law Memo ran for five issues, from 1980 to 1986. Ocean Law Memo began in 1973 and later became Ocean and Coastal Law Memo. Publication ceased in 1998. All publications are available online in Scholars' Bank, an open access repository at the University of Oregon accessible from <https://scholarsbank.uoregon.edu/xmlui/handle/1794/6732> (last accessed 29 September 2015).

²⁶ ALISON RIESER, DONNA R. CHRISTIE, JOSEPH J. KALO & RICHARD G. HILDRETH, OCEAN & COASTAL LAW: CASES & MATERIALS (4th ed. 2013).

²⁷ OCEAN & COASTAL LAW & POLICY (Donald Baur, Georgia Victoria Hancock, Michael Sutton & Tim Eichenberg eds., 2d ed. 2015).

²⁸ Christie (2007), *supra* note 19 at 538. The agencies and statutes are listed in PEW OCEANS COMM'N, AMERICA'S LIVING OCEANS: CHARTING A COURSE FOR SEA CHANGE 26 (2003) AND U.S. COMM'N ON OCEAN POL'Y, AN OCEAN BLUEPRINT FOR THE 21ST CENTURY 77-78 (2004).

statutes at the federal level alone, as Christie reminds us²⁹ - that repeated and insistent demands at this point for policymakers to attend to the imperatives of comprehensiveness will probably do little more than set the various established stakeholders at loggerheads.³⁰ And it is little surprise that, in the face of such stalemate, schemes for government to cede authority to remedies relying on privatization begin to seem attractive, especially if they are coincident with the shifting ideological alignments of key institutions. This would go some way to explain, for example, the recent willingness of at least some conservative parts of Congress and the executive branch to institute catch shares as a universal, limited-entry, privatized solution for the over-exploitation of fisheries.³¹

III

One might have thought that a welcome attempt to re-examine textbook truths about ocean and coastal law in the light of climate change³² would take these lessons of history very much to heart. In fact, in a new, over-arching survey, canvassing mostly American but some international perspectives, not a great deal is said, except in passing, here and there, about how we got to where we are or about the intersection, now of many decades standing, between scientific and political development in ocean management. The emphasis is rather on our present state of unpreparedness to respond to climate change and on what we could and, more often, should do next. The forward-looking and prescriptive tone is set in a foreword:

²⁹ The proliferation of segmented authorities was not, of course, the only change in the context of ocean law and policy that occurred between Stratton and Pew/USCOP. Christie also observes that during this period “The United States ocean jurisdictional claims had expanded to a twelve-mile territorial sea, a twenty-four-mile contiguous zone, a 200-mile exclusive economic zone (EEZ), and a continental shelf that potentially could extend more than 300 miles offshore—quite different from the narrow three-mile belt of sovereignty and more limited continental shelf claim at the time of the Stratton Commission. Stresses on coastal waters increased because of population growth in coastal watershed counties, which exceeded thirty seven million people between 1970 and 2000 and is expected to increase another twenty-one million by 2015. Much of this coastal population is concentrated in coastal areas that are the most ecologically sensitive and in areas that are the most susceptible to hurricanes. The overall condition of coastal waters is now judged to be somewhere between poor and fair, and beach closures due to the presence of pathogens or algae outbreaks, like red tide, have become common. Numerous offshore hypoxic areas and ‘dead zones,’ including a major dead zone in the Gulf of Mexico, have been identified. Moreover, in this intervening period, concerns about the effect of global climate change on the oceans emerged, and the nation became aware that the oceans were not endlessly resilient but, in fact, both finite and fragile [citations omitted].” *Id.* at 537-538.

³⁰ These are the terms in which ORREN & SKOWRONEK (2004), *supra* note 7 at 166-171, describe the political development of federal land policy from the early years of the republic through the late 1990s. The difference in the case of oceans and coasts is that the development is much more telescoped in time. The early but quite feeble political development of fisheries regulation at the federal and state levels in California is analyzed in MCEVOY (1986), *supra* note 16 at 156-184, but most of it has occurred since the end of the Second World War.

³¹ NATIONAL RESEARCH COUNCIL, SHARING THE FISH: TOWARD A NATIONAL POLICY ON INDIVIDUAL FISHING QUOTAS (1999); J. SAMUEL BARKIN & ELIZABETH R. DESOMBRE, SAVING GLOBAL FISHERIES: REDUCING FISHING CAPACITY TO PROMOTE SUSTAINABILITY (2013). But see also Liam Campling, Elizabeth Havice & Penny McCall Howard, *The Political Economy and Ecology of Capture Fisheries: Market Dynamics, Resource Access and Relations of Exploitation and Resistance*, 12 J. AGRARIAN CHANGE 177-203 (2012).

³² Abate (2015), *supra* note 12.

Paying attention to climate change impacts on the Earth's oceans and coasts....suggests many foci for increased attention in ocean and coastal law. The increased threats that climate change poses to marine biodiversity - and the consequent threats that arise to food security, community stability, public health, and national security - counsels that the nations of the world redouble their efforts to protect that resource. Specifically, nations should more effectively manage fisheries for long-term productivity; protect more of the ocean's critical habitat areas in marine protected areas and through marine spatial planning; develop cooperative management arrangements for shifting fisheries, akin to the structures already in place for highly migratory species; and develop policies for the use of oceans for mariculture (marine aquaculture).³³

This is, of course, an ambitious agenda, to say the least, and even in seven hundred pages we get only glimpses of what is actually getting increased attention. After a big picture overview,³⁴ contributions are divided into two unequal parts, the larger dealing with ocean issues and the smaller with coastal problems and experiences. Readers of the *Journal* will be most interested in the sections dealing with fisheries and marine habitat,³⁵ marine mammals,³⁶ marine invasive species,³⁷ and case studies of attempts by some American states³⁸ to prepare for climate change adaptation.

Overall, what emerges from these several contributions is, first, a clear sense that existing authorities are not up to the job and need to be reformed.

Thus Farady writes, for example, that the “current fishery management regime [for New England] is inadequate to respond to changes in fish stocks and the ecosystem caused by climate change...[and] needs to be revised to take into account...changes in where fish are found, how many of them there are, and who is catching them.”³⁹ McLaughlin considers it “unlikely that policy responses to climate change [of benefit to the Gulf of Mexico] will be incorporated into federal legislation such as the MSA in the near term.”⁴⁰ And in the Pacific and the Arctic “the legal and regulatory system [is] not designed with ecosystem resilience and integrity as a primary purpose. It is still largely

³³ Robin Kundis Craig, *Foreword*, in *id.* xxxi-xxxvi, at xxxv.

³⁴ Randall S. Abate & Sarah Ellen Krejci, *Climate Change Impacts on Ocean and Coastal Law: Scientific Realities and Legal Responses*, in *id.* at 1-24.

³⁵ Susan E. Farady, *Moving Targets: Fisheries Management in New England in the Midst of Climate Change*, in *id.* at 73-90; Richard J. McLaughlin, *Responding to Climate Change Impacts to Fisheries and Marine Habitat in the Gulf of Mexico*, in *id.* at 91-108; Janis Searles Jones, Ivy Frederickson & Adena Leibman, *Climate Change Impacts to Fisheries and Habitat in the Pacific and the Arctic*, in *id.* at 109-132; Alexis K. Segal, *The Endangered Species Act and Marine Species Protection in the Climate Change Era*, in *id.* at 133-152.

³⁶ Keith W. Rizzardi, *Marine Mammal Protection Act Implementation in an Era of Climate Change*, in *id.* at 193-214.

³⁷ Stephanie Showalter Otts, *Confronting the Marine Invasive Species Threat: Practical and Legal Challenges*, in *id.* at 215-233; Eric V. Hull, *The Impact of Marine Invasive Species on Endangered Species Protection Efforts in a Changing Ocean Environment*, in *id.* at 235-251.

³⁸ David Roche *et al.*, *The Role of Alaska Natives in Climate Change Decision-Making in the Alaskan Arctic*, in *id.* at 503-531; Sara C. Aminzadeh, *Rising to the Challenge: California Coastal Climate Change Adaptation*, in *id.* at 533-555; Jaclyn Lopez, *Sea Level Rise and Species Survival along the Florida Coast*, in *id.* at 557-574; Melissa Trosclair Daigle, *Sea Level Rise and a Sinking Coast: How Louisiana Coastal Communities Are Addressing Climate Change*, in *id.* at 575-591.

³⁹ Farady (2015), *supra* note 35 at 90.

⁴⁰ McLaughlin (2015), *supra* note 35 at 108.

concerned with the effects of fishing on fish, and the effects of fishing on other aspects of the marine environment... It was not built to consider the effects of changes to the marine environment on fish, on habitat, and ultimately on fishing.”⁴¹

With respect to endangered species and marine mammals, the Endangered Species Act (ESA) has been more effective than the Marine Mammal Protection Act (MMPA) in dealing with the impacts of climate change on marine species, chiefly because the MMPA includes no authority to avoid harm by protecting habitat.⁴² Segal finds no evidence, however, that climate change impacts on listed species are being “incorporated systematically and rigorously into ESA decision making.”⁴³ And while Rizzardi concludes that the MMPA has had some success managing direct take or harassment of marine mammals, it has been far less successful in dealing with indirect effects like those attributable to climate change, not least because the process is so data-intensive, ridden with uncertainty, and therefore expensive.⁴⁴

In the past, the structure of political opportunity has led environmental advocacy groups to rely on litigation and the courts to make both the ESA and the MMPA useful tools for shaping ocean policy. But Rizzardi takes the view that, unless there are statutory reforms of the MMPA and changes in the way the law is funded, the ability of litigation to drive substantive changes in policy seems likely to be materially diminished.⁴⁵

The other major point that emerges clearly, both from the chapters in the book examining U.S. experience and from those painting on a broader international canvas, is that the fundamental tension in ocean law and policy between the intractable realities of segmentation and the impulse to premise legal reforms on ideals of comprehensiveness is still very much alive and well. And where one stands on this issue depends very much on where one sits.

Thus, although Hossain takes a broadly comprehensive view of the complexities involved in governing marine resources in the Arctic, his sensitivity to “the historic and traditional usage rights [in those] resources, in particular the living resources, by the significant number of indigenous peoples inhabiting the region”⁴⁶ leads him to endorse specific sector based reforms. “A piecemeal approach,” he writes, offers “a viable tool to adapt the existing regime,” with perhaps some coordination of the pieces by the Arctic Council.⁴⁷ In the Antarctic, on the other hand, while the urgency of climate change and the fragility of the continent both demand “greater integration of...otherwise piecemeal

⁴¹ Jones, Frederickson & Leibman (2015), *supra* note 35 at 130.

⁴² Abate & Krejci (2015), *supra* note 34 at 22-23.

⁴³ Segal (2015), *supra* note 35 at 152.

⁴⁴ Rizzardi (2015), *supra* note 36 at 197-206.

⁴⁵ *Id.* at 209-214.

⁴⁶ Kamrul Hossain, *Governance of Arctic Ocean Marine Resources*, in Abate (2015), *supra* note 12 at 297.

⁴⁷ *Id.* See also David Roche et al., *The Role of Alaska Natives in Climate Change Decision-Making in the Alaskan Arctic*, in Abate (2015), *supra* note 12 at 503-531.

regimes,”⁴⁸ a number of issues “such as the determination of EEZs, the designation of polar marine reserves, [and] shipping compliance regimes...are likely to be more effectively implemented through specialized instruments.”⁴⁹ And in the Indian Ocean, where Techera sees a pressing need to “ensure a foundation of strong regionalism...to develop fresh and unified approaches to combating climate change,”⁵⁰ she nonetheless argues that “as in the legally pluralist Pacific..., differences in each nation’s state-based and customary law must be acknowledged.”⁵¹

Those who want to reform law and policy to make them more responsive to climate science appear, then, to be pretty much where Scheiber was in 1998.⁵² They want their comprehensive and integrated and unified visions informed by the ideal of ecosystem-based management to be driving change, but they want to eat their segmented cake too, depending on which interests they think need to be most favored or have the strongest voice.⁵³ The prospect is one of being trapped on a law and policy merry-go-round that becomes ever more elaborate as reform ideas spin from comprehensiveness to segmentation, and back again. As authorizations for new ways of extracting wealth from the oceans jostle each other for priority, demands to constrain the negative externalities they impose on each other intensify and the data demands of decision making escalate. Perhaps there is no way forward for the political development of ocean and coastal law and policy.

The critical assumption in all of the contributions to *Climate Change Impacts on Ocean and Coastal Law*⁵⁴ seems to be that, if there is a way forward, it lies in finding better ways through law reform of taking science into account so that the marine environment, and all the living and non-living resources it sustains, can be protected, or better protected, from human-induced change, from the consequences of what is increasingly referred to as the Anthropocene.⁵⁵

But it is one thing to try to save oceans and coasts from changes that would never occur or would not be as bad for the environment as they might otherwise be, *if* we adapted ourselves to climate change realities and if we avoided or mitigated the worst environmental impacts of our marine resource behavior and consumption. It is, however, an altogether different thing to account for the very real possibility that, no matter how good we get at using science to protect nature, the environment will change anyway, and is already changing in ways that are essentially irreversible?⁵⁶ In the latter

⁴⁸ Elizabeth Burluson & Jennifer Huang, *Governance of Climate Change Impacts on the Antarctic Marine Environment*, in Abate (2015), *supra* note 12 at 344.

⁴⁹ *Id.*

⁵⁰ Erika J. Techera, *Law, Climate Change, and the Marine Environment in the Indian Ocean Region*, in Abate (2015), *supra* note 12 at 413-414.

⁵¹ *Id.* at 414.

⁵² Scheiber (1998), *supra* note 19.

⁵³ Sax (1989), *supra* note 7 at 135-137.

⁵⁴ Abate (2015), *supra* note 12.

⁵⁵ IRUS BRAVERMAN, *WILD LIFE: THE INSTITUTION OF NATURE* (2015); JAMIE LORIMER, *WILDLIFE IN THE ANTHROPOCENE: CONSERVATION AFTER NATURE* (2015); JEDEDIAH PURDY, *AFTER NATURE: A POLITICS FOR THE ANTHROPOCENE* (2015).

⁵⁶ BILL MCKIBBEN, *THE END OF NATURE* (1989)

case, we ought to be at least as much or more concerned with what environmental change will do to us, and to our schemes for productivity and progress, as we are about the impacts we might have on an environment that is on a trajectory for substantial and unsettling change no matter what we do. Can law and policy countenance such analyses?

Consider the intriguing and provocative proposition now facing the California Supreme Court.⁵⁷ In 2011, the Ballona Wetlands Lands Trust and the Ballona Ecosystem Education Project challenged a mixed-use real estate development in southern California located about two miles from the coast. The complaint was that the environmental impact assessment performed on the project, a document known in California law under the California Environmental Quality Act (CEQA) as an environmental impact report (EIR), had failed to account for the possibility that after the development was approved and constructed, if it was approved and constructed, a projected rise in sea level driven by climate change would inundate the project, making it substantially unlivable and destroying settled expectations about rising real estate values.

An appellate court held that the California Environmental Quality Act (CEQA) required consideration of the impacts developments might have on the coastal environment but did not require consideration of impacts on developments caused by climate-induced environmental change.⁵⁸ The purpose of an environmental impact assessment law, such as CEQA, the court said, was to identify the significant effects *of a project on the environment*, not the significant effects *of the environment on a project*.⁵⁹ On appeal, the California Supreme Court denied review. But after the Attorney General took an interest in the case and the state Legislature drafted a bill to reverse the appellate court decision, the California Supreme Court agreed to reconsider the issue on the basis of a different case and controversy,⁶⁰ and a final decision is still pending.

The work collected in *Climate Change Impacts on Ocean and Coastal Law* argues that we need a change of course, that by seizing opportunities to make new law we can begin to address issues climate science tells us are compelling, such as fish stock migration,⁶¹ the differential degradation of coasts and beaches,⁶² and the difficulties of exercising social control at sea.⁶³ We come away equally impressed, however, by the need for some stronger collective thinking about new ways to see and exploit the structure of opportunities for change that are embedded in laws we already have. The Ballona wetlands litigation in California is one case in point and a case in

⁵⁷ Aminzadeh (2015), *supra* note 38 at 545-548.

⁵⁸ Ballona Wetlands Land Trust v. City of Los Angeles, 201 Cal. App. 4th 455 (2011).

⁵⁹ *Id.* at 473.

⁶⁰ California Building Industry Association v. Bay Area Air Quality Management District, 312 P.3rd 1070 (Cal. 2013).

⁶¹ Farady (2015), *supra* note 35.

⁶² Patrick W. Krechowski, *Coastal Construction and Beach Nourishment in the New Climate*, in Abate (2015), *supra* note 12 at 439-460.

⁶³ Marcos A. Orellana, *Climate Change and the International Law of the Sea: Mapping the Legal Issues*, in Abate (2015), *supra* note 12 at 253-271.

which the technical and organizational ability of the plaintiffs to demonstrate how a development project would affect coastal ecosystems and put people in harm's way was crucial to making themselves heard and their influence felt.⁶⁴

In the very different context of many other parts of the world, such as the Indian Ocean, as Techera underlines, the same ability would be hard to find. Although the region has in place a rich tapestry of laws in the form of international treaty commitments,⁶⁵ regional and sub-regional agreements,⁶⁶ and in many cases national climate legislation and action plans,⁶⁷ the technical and financial capacities to exploit the opportunities they provide to shape and influence policy, especially at the local level,⁶⁸ are not well developed. Nor is there the same level of legal and institutional commitment to the representation of and consultation with community interests that Roche and his colleagues find in the Alaskan Arctic.⁶⁹

It would have been useful to ask more specifically, then, how the countries in the Indian Ocean region, some of which are developing countries and in some cases also small island developing states, or least developed countries, or both, can address capacity issues. Techera holds out for an intensification of governmental efforts at regional cooperation that have been ongoing since at least the early 1980s but have so far “not come to fruition.”⁷⁰ It strikes us, however, that that is a slender reed on which to hang the future of the fish and wildlife resources not just of the Indian Ocean region but also of other large parts of the world where there are significant numbers of lesser developed countries with vital coast and ocean interests.

There is some evidence that others have reached the same conclusion and that, in the particular case of fisheries, local communities faced with frustration at underperforming central governments and uncertain property rights in the limited entry schemes advanced by major international aid agencies⁷¹ are asking what they can do to help themselves, turning as best they can to science and scientists to help their cause in ways that resonate deeply with the long history of the interweaving of science and policy we have sketched, here.⁷² Techera's foray into the Indian Ocean is insufficient by itself

⁶⁴ Megan M. Herzog & Sean Hecht, *Combatting Sea-Level Rise in Southern California: How Local Governments Can Seize Adaptation Opportunities while Minimizing Legal Risk*, 19 HASTINGS W.-NW. J. ENVTL. L. & POL'Y 485-490 (2013).

⁶⁵ Techera (2015), *supra* note 50 at 397-401.

⁶⁶ *Id.* at 401-404.

⁶⁷ *Id.* at 405-413, examining South Africa, Mozambique, the Seychelles, and the Maldives.

⁶⁸ J. Zachary Koehn, Daniel Reineman & John Kittinger, *Progress and Promise in Spatial Human Dimensions Research for Ecosystem-Based Ocean Planning*, 42 MARINE POL'Y 31-38 (2013); GOVERNABILITY OF FISHERIES & AQUACULTURE: THEORY & APPLICATIONS (Maarten Bavinck et al. eds. 2013).

⁶⁹ Roche *et al.* (2015), *supra* note 50.

⁷⁰ Techera (2015), *supra* note 50 at 415.

⁷¹ Becky Mansfield, *Neoliberalism in the Oceans: "Rationalization," Property Rights, and the Commons Question*, 35 GEOFORUM 313-326 (2004).

⁷² Mary Ann Brocklesby & Eleanor Fisher, *Community Development in Sustainable Livelihoods Approaches: An Introduction*, 38 COMMUNITY DEV. J. 185-198 (2003); Joshua Cinner & Gilbert David, *The Human Dimensions of Coastal and Marine Ecosystems in the Western Indian Ocean*, 39 COASTAL MGMT. 351-357 (2011); Joshua Cinner et al., *Transitions towards Co-Management: The Process of Marine Resource Management Devolution in Three East African Countries*, 22 GLOBAL ENVTL. CHANGE 651-658 (2012); Steve Rocliffe et al., TOWARDS A NETWORK OF LOCALLY

to analyse these developments and should have been supplemented with more international rather than U.S.-centric chapters. But a start has been made, and we look forward to other books and *Journal* contributions that build on what is an initial assessment.