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ARTICLE

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I. INTRODUCION: COMING TO TERMS

As the field of climate change law and policy has evolved over the past decade, new terminology has also emerged. Two concepts that have garnered considerable attention are "climate proofing" and "climate policy coherence."

The concept of climate proofing is based on the recognition that, regardless of whether we will be able to reduce greenhouse gas (GHG) emissions in the future, climate change is occurring now and due to past GHG emissions, levels will continue to occur in the coming decades.[1] This reality calls for adapting our built environment, protected natural resources, as well as laws and

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1. GROUP ON WATER AND CLIMATE, GUIDANCE TOWARDS CLIMATE PROOFING OF WATER MANAGEMENT 1 (2007).

> The Guidance builds on the notion that climate change is a reality; the Intergovernmental Panel on Climate Change (IPCC) in its latest assessment report concluded that the global climate is in fact changing, and this change will affect the hydrological cycle and thus water availability as well as water services. Adaptation to a certain degree of climate change is therefore inevitable.

Id.

policies to account for climate change consequences. Europe's Task Force on Water and Climate described climate proofing as the "methodology to asses the resilience of water management and water services to cope with climate change."[2] A more extensive definition of climate proofing was set forth in the Asian Development Bank's 2005 report, *Climate Proofing: A Risk-Based Approach to Adaptation*:

> [A] shorthand term for identifying risks to a development project, or any other specified natural or human asset, as a consequences of climate variability and change, and ensuring that those risks are reduced to acceptable levels through long-lasting and environmentally sound, economically viable, and socially acceptable changes. . .[3]

Climate proofing posits that we can avoid some of the more dire adverse effects of sea level rise, increased evaporation of surface freshwater and elevated temperatures through appropriate modification of how we manage land and water resources.

The concept of climate policy coherence proposes that more integrated strategic cooperation between different governmental entities—including different countries—is a critical component to making progress on both GHG emissions reduction and improved climate proofing. For instance, in June 2009, the North American Commission for Environmental Cooperation (NACEC) hosted a regional workshop in Denver, Colorado titled *Climate Policy Coherence in North America*. The June 2009 NACEC workshop evaluated, among other things, whether there were adequate bilateral and trilateral governance structures in place for Canada, Mexico and the United States to effectively coordinate climate adaptation strategies for cross-border resources such as international rivers.[4] Similarly, in January 2009, the Partnership for European Environmental Research (PEER) released its report, *Climate Policy Integration, Coherence and Governance*, which noted the ways in which continent-wide European Union (EU) programs impact climate proofing efforts:

2. *Id.* at 2 (on file with author).

3. ASIAN DEV. BANK, CLIMATE PROOFING: A RISK-BASED APPROACH TO ADAPTATION xii (2005) (on file with author).

4. The author attended and participated in the June 2009 NACEC workshop. Workshop materials indicating title on filed with author.

> If adaptation to climate change is to be integrated into policies that affect agriculture or water, the EU level has to be included because the Common Agricultural Policy and the Water Framework Directive set vital frameworks in these fields.[5]

This article assesses the extent to which the concepts of climate proofing and climate policy coherence have found expression in continental natural resource regimes established in North America and Europe. The article first examines the recognition of these concepts within three North American cross-border regimes directly impacted by climate change: the Waters Treaty between Mexico and the United States; the Pacific Salmon Treaty between Canada and the United States; and the North American Waterfowl Management Plan between Canada, Mexico and the United States. Next it considers the extent to which these concepts are reflected in recent European initiatives related to water resources, transboundary watercourses and the Danube River Basin. The article concludes with a comparative assessment as to why the pace and scope of continental climate adaptation policy in North America and Europe has differed.

II. NORTH AMERICA'S CROSS-BORDER NATURAL RESOURCE REGIMES: SLOW TO ADAPT

A. Mexico-United States Waters Treaty and Colorado River Flow

The 1944 Waters Treaty between Mexico and the United States allocates the waters of the Colorado River, as well as the Rio Grande and Tijuana River.[6] The Mexico-United States allocation of the Colorado River—which allocates 1.5 million-acre feet (MAF) annually to Mexico—was premised on the hydrological assumption of just over 16 MAF annual flows.[7] Domestically, pursuant to the 1922 Colorado River Compact, the United States has allocated 14 MAF between "Upper Basin" states (Colorado,

5. P'SHIP FOR EUROPEAN ENVTL. RESEARCH, CLIMATE POLICY INTEGRATION, COHERENCE AND GOVERNANCE 67-68 (2009) (on file with author).

6. Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, U.S.-Mex., Feb. 3, 1944, T.S. No. 994 [hereinafter 1944 Waters Treaty].

7. *Id.* at 55.

New Mexico, Utah and Wyoming) and "Lower Basin" states (Arizona, California and Nevada).[8] The 1944 Waters Treaty provides that, in the event the United States is unable to meet its 1.5 MAF Colorado River delivery obligation to Mexico due to "extraordinary drought" conditions (a term not defined in the treaty), the matter can be referred to the International Boundary and Water Commission (IBWC) to try to forge a resolution.[9]

It is now recognized that the 16 MAF total annual flow, that provided the basis for the Colorado River provisions in the 1944 Waters Treaty, was flawed due to the sample years relied upon for the Mexico-United States allocation. More specifically, the early 20thCentury data relied upon to support the 16 MAF flow turned out to be the result of particularly wet years.[10] In 1965, it was reported that the Colorado River's reliable natural flow was 14% less than assumed, and more recent reports estimate that average flows were 22% less and the 16 MAF premise may have overestimated the long-term flow by 2 MAF.[11]

To date, the on-river storage provided by Lake Mead (behind Hoover Dam) and Lake Powell (behind Glen Canyon Dam) has provided sufficient additional water supplies such that the United States has so far been able to meet its Colorado River water delivery obligations to Mexico. Yet, as a Fall 2008 report by the Water Education Foundation's Colorado River Project explained, the drought conditions over the past decade have now begun to severely test the Colorado River allocation regime: "A year ago, the Colorado River Basin was enduring the seventh dry year of the past eight. Inflow into Lake Powell was 68 percent of average and combined storage of Powell and Lake Mead was roughly 50 percent of capacity."[12] Similarly, in a March 2009 article in *High Country News* magazine, special counsel John Carlson to the Colorado River Water Conservation District observed: "Lake Meade and Lake Powell provide the backup capacity that ensures

8. Colorado River Compact, 1922, *available at* http://www.usbr.gov/lc/region/pao/pdfiles/crcompct.pdf.

9. 1944 Waters Treaty, *supra* note 6, at 6.

10. Matt Jenkins, *How Low Will It Go?*, HIGH COUNTRY NEWS, Mar. 2, 2009, at 12; JAMES LAWRENCE POWELL, DEAD POOL: LAKE POWELL, GLOBAL WARMING AND THE FUTURE OF WATER IN THE WEST 7 (2008).

11. *Id.*

12. Sue McClurg, Colo. River Project, *How is the Colorado River Shortage Agreement Working?*, RIVER REPORT 11 (2008).

enough water . . . After nearly a decade of drought, the reservoirs are half-empty. If they continue to drop that will touch off a fight over what little water is in the river, like creditors battling over the carcass of a bankrupt company . . . ."[13]

The drought conditions over the past decade prompted the United States Department of the Interior to adopt the *Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations of Lake Powell and Lake Mead* (*Colorado River Interim Guidelines*) in December 2007, to address the allocation of diminished Colorado River water supplies between Arizona, California and Nevada.[14] However, the *Colorado River Interim Guidelines* did not address the question of whether deliveries to Mexico pursuant to the 1944 Waters Treaty might be affected as a result of such drought-related shortages.

Against this backdrop, there are now indications that what has been referred to as "drought" conditions over the past decade can be explained in part as a manifestation of the effects of climate change on the Colorado River basin hydrology. A review of the science to date on this question was provided by James Lawrence Powell, Executive Director of the National Physical Science Consortium at the University of Southern California. In his 2008 book *Dead Pool: Lake Powell, Global Warming and the Future of Water in the West* (published by University of California Press), Powell reports:

> Higher temperatures obviously cause more and faster melting, but does not the same amount of meltwater flow downstream, only sooner? Evidently not. Warmer temperatures not only melt snow, they cause it to sublimate—to pass directly from solid into vapor without going through the liquid phase. Think of clouds of carbon dioxide vapor streaming from a block of dry ice. Water vapor from subliminated snow wafts away on the wind, to condense and rain somewhere, just not necessarily in the river basin where it originated.[15]
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> . . . .

13. Jenkins, *supra* note 10, at 14.

14. *Id.* at 11.

15. POWELL, *supra* note 10, at 21-22.

> The climate models portray a twenty-first century Colorado River basin that is hotter but no wetter. Warmer temperatures not only reduce the size of the snowpack and cause it to melt sooner, they increase evaporation from snow and soils, as well as transpiration from plant leaves (together called evapotranspiration). Setting aside the relatively small percentage of rainfall that sinks into the soil, runoff is essentially the difference between precipitation and evapotranspiration. . .[16]
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> . . . .
>
> If precipitation remains constant while evapotranspiration increases by just 2 percent, runoff decline by nearly 14 percent. If precipitation falls by 1 percent and evapotranspiration increases by the same 2 percent, runoff dips by 22 percent. Thus not only is the water balance in the Colorado River basin poised on a razor's edge between supply and demand, even a tiny increase in evapotranspiration causes a multiplied and dangerous decrease in runoff.[17]
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> . . . .
>
> Assimilating these different studies, one would certainly be justified in assuming that global warming will reduce runoff in the Colorado River by 20 percent by mid-century. To assume no reduction would be imprudent or worse.[18]

James Lawrence Powell's observations coincide with the conclusion reached in a 2007 report by the National Academy of Sciences-National Research Council (NRC), titled *Colorado River Basin Water Management: Evaluating and Adjusting to Hydroclimatic Variability*. The NRC report determined that "warmer regional temperatures and the specter of recurrent drought points to a future in which the potential for conflict among existing and prospective new users will prove endemic."[19]

Within the context of the IBWC and Mexico-United States diplomatic relations, the question of adapting the Colorado River

16. *Id.* at 179.
17. *Id.* at 180.
18. *Id.* at 181.
19. NAT'L ACAD. OF SCI., COLORADO RIVER BASIN WATER MANAGEMENT: EVALUATING AND ADJUSTING TO HYDROCLIMATIC VARIABILITY (2007).

binational regime to reflect climate change impacts has been raised obliquely in recent years. In August 2007, a *Joint Mexico-United States Statement on Lower Colorado River Issues* was released. This Joint Statement provided: "authorities from both nations agree that the IBWC, a treaty-based bilateral organization with over a century of successful collaboration, should be utilized to expedite discussions in coming weeks to further Colorado River cooperation. Among the issues expected to be addressed are . . . continued needs of both nations for water for urban, agricultural and environmental purposes, the study of the hydrological system and *potential impacts of climate change*, including the effects of the ongoing historic Colorado River drought. . . ."[20]

In March 2008, the IBWC announced new *Terms of Reference for Mexico-United States Joint Cooperative Actions—Colorado River Users*. In these Terms of Reference, one of Mexico's listed "objectives" is "Evaluation of current *climatological* conditions and future shortage conditions" and one of the United States listed "objectives" is to "*Evaluate potential climate change impacts* on Colorado River hydrology."[21] According to persons directly involved in the IBWC Terms of Reference process, to date climate change effects and adaptation have not been considered as autonomous issues but rather have been addressed under the broader umbrella of discussions relating to chronic long-term drought and water supply shortages.[22]

Finally, in January 2009, former United States Secretary of the Department of the Interior Dirk Kempthorne and Mexico's Ambassador to the United States Arturo Saruukhan issued a *Joint Declaration on Colorado River Issues*. This *Joint Declaration* stated:

20. Press Release, U.S. Dep't of the Interior, Secretary Kempthorne Announces Joint U.S.-Mexico Statement on Lower Colorado River Issues (Aug. 13, 2007) (emphasis added).

21. International Boundary and Water Commission, U.S. & Mex., Terms of Reference: United States-Mexico Joint Cooperative Actions-Colorado River Users (Mar. 11, 2008) (unpublished document, on file with author) (emphasis added).

22. Telephone Conversation with Jennifer Pitt, Senior Resource Analyst, Environmental Defense Fund (Sept. 2009).

> Whereas recent periods of historic drought in the Colorado River Basin and *growing recognition of the potential adverse impacts of climate change* have stimulated efforts to identify cooperative and innovative approaches to ensure that the Colorado River allotment of each nations will continue to meet the needs of both nations . . . Secretary Dirk Kempthorne and Ambassador Arturo Sarukhan hereby applaud the efforts of the IBWC and its work to help identify cooperative and innovative measures that both countries could implement consistent with the provisions of the 1944 Treaty to help ensure that the Colorado River is able to continue to meet the needs of both nations and . . . Further, both government support these efforts to identify innovative opportunities for water conservation, storage, supply augmentation, and environmental protection, which are viewed as complementary to the mission of the Department of the Interior and the respective Mexican ministries, consistent with the provisions of the 1944 Treaty.[23]

The December 2007 *Joint Statement*, the March 2008 *Terms of Reference* and the January 2009 *Joint Declaration* all mention the potential impacts of climate change on Colorado River hydrology, but it remains to be seen whether these brief references will translate into a substantive dialogue regarding the terms and operation of the 1944 Waters Treaty allocation regime.

Based on positions set forth by the United States in the context of previous efforts to address Colorado River supply shortages, there remain some grounds for skepticism as to whether such a substantive bilateral dialogue on climate change effects will be forthcoming, at least on the United States' side. More specifically, in 2004 the United States Department of the Interior prepared a Final Environmental Impact Statement (EIS) for a proposed *Lower Colorado River Multi-Species Conservation Program*. Although comments on the Draft EIS for this program faulted the analysis for failing to take into account anticipated climate change-related impacts on Colorado River basin

23. Press Release, U.S. Dep't of the Interior, Secretary Kempthorne, Mexican Ambassador Sarukhan Sign Declaration Commending On-Going Partnership in the Management of the Colorado River (Jan. 15, 2009) (emphasis added).

hydrology, the United States Department of the Interior responded as follows:

> Reclamation [the Bureau of Reclamation, a subagency of the United States Department of the Interior] believes that the use of actual data recorded over the past century provides the best basis for ongoing Colorado River management activities . . . If Reclamation were to use a different modeling approach . . . it would conflict with all of the other Colorado River management actions and analyses that Reclamation has taken and is currently taken. Attempting to predict global changes in climate, shifts in demographic patterns, and other factors affecting Colorado River hydrology are far more speculative than Reclamation's reliance on actual annual hydrological data.[24]

The dismissive approach towards climate change impacts reflected in the 2004 EIS for the *Lower Colorado River Multi-Species Conservation Program* has changed somewhat in more recent years. In 2007, the United States Department of the Interior approved the *Colorado River Interim Guidelines for Lower Basin Shortage and the Coordinated Operations for Lake Powell and Lake Mead* (*Lower Basin Shortage Interim Guidelines*).[25] In the 2007 EIS that accompanied the final *Lower Basin Shortage Interim Guidelines*, the question of climate change effects on Colorado River flow was given more substantive consideration.[26] As reported in a January 2009 article by Carly Jerla and Jim Prairie of the United States Bureau of Reclamation:

> Acknowledging and responding to the potential impacts of climate change and increased hydrologic variability, [the Bureau of] Reclamation empanelled a group of leading climate expects during the Interim Guidelines development process. The Climate Technical Work Group assessed the state of knowledge regarding climate change in the Basin

24. Carly Jerla & Jim Prairie, *Lower Colorado River Multi-Species Conservation Program: Final Programmatic Environmental Impact Statement/Environmental Impact Report*, *in* DEAD POOL: LAKE POWELL, GLOBAL WARMING AND THE FUTURE OF WATER IN THE WEST 182 (2008).

25. *Id.*

26. *Id.*

> and prioritized future research and development objectives. Their findings and recommendations were published as an appendix to the Final EIR (Appendix U) and are soon to be re-published, with no change in content, as a stand-alone report. The recommendation of the Work Group was to include a qualitative discussion of climate change and variability accompanied by a quantitative sensitivity analysis using paleoclimate evidence. This became Appendix N of the Final EIS.[27]

In the context of the EIS prepared for the *Lower Basin Shortage Interim Guidelines*, the formation of a Climate Technical Working Group and the inclusion of Appendix N and Appendix U suggest a greater willingness to recognize the potential effects of climate change on Colorado River hydrology. However, even in this instance, this recognition did not translate into proposals for actual climate adaptation measures. The Final EIS for the *Lower Basin Shortage Interim Guidelines* did not factor Appendix N's climate change modeling and projections into its alternatives analysis or recommendations, explaining: "Based on the current inability to precisely project future impacts of climate change . . . this final EIS is based on the re-sampled historical record."[28]

The United States' increasing willingness to acknowledge potential climate impacts in the water sector was also evidenced by the federal Environmental Protection Agency's 2008 report titled *National Water Program Strategy: Response to Climate Change*.[29] This publication recognized that "in some parts of the country, drought, changing patterns of precipitation and snowmelt, and increased water loss due to evaporation as a result of warmer air temperatures will result in changes to the

27. Carly Jerla & Jim Prairie, *Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead & Efforts Addressing Climate Change and Variability*, INTERMOUNTAIN WEST CLIMATE SUMMARY, Jan. 2009, at 5-7.

28. U.S. DEP'T OF THE INTERIOR, BUREAU OF RECLAMATION UPPER AND LOWER COLO. REGIONS, RECLAMATION: MANAGING WATER IN THE WEST, FINAL ENVIRONMENTAL IMPACT STATEMENT, COLORADO RIVER INTERIM GUIDELINES FOR LOWER BASIN SHORTAGES AND COORDINATED OPERATIONS FOR LAKE POWELL AND LAKE MEAD 9, 14 (2007), *available at* http://www.usbr.gov/lc/region/programs/strategies/FEIS/index.html.

29. EPA, NATIONAL WATER PROGRAM STRATEGY: RESPONSE TO CLIMATE CHANGE (2008).

availability of water for drinking and for use for agriculture and industry"[30] and that "limited water availability and drought in some regions will require drinking water providers to reassess supply facility plans and consider alternative pricing, allocation and water conservation options."[31] The 2008 *National Water Program Strategy* report, however, was fairly tentative and vague in regard to proposed responses to these water sector impacts. Its "action" items provided:

> The National Water Program will explore opportunities with States and drinking water systems to better address expected impacts of climate change on water supply and water usage rates through water conservation and water resources management.[32]
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> . . . .
>
> The National Water Program will promote technologies to identify and address leakage from water pipes and other conveyances.[33]
>
> . . . .
>
> The National Water Program will work to publish a document describing a process through which utilities can conduct a self-analysis of sustainability, including a climate-change specific vulnerability analysis.[34]

These action items are thin on specifics, in terms of what the federal government will do and when. Moreover, and significantly, the 2008 *National Water Program* report makes no mention of the Colorado River specifically, or of the need for potential changes in the way interstate and international rivers (such as the Colorado) are allocated. This does not suggest that examination of climate adaptation in the Mexico-United States Colorado River regime is presently a priority for the United States.

Professor and water law scholar Dan Tarlock has discussed some of the reasons that international water allocations regimes

30. *Id.* at ii.
31. *Id.* at 12.
32. *Id.* at 28.
33. *Id.*
34. *Id.* at 49.

(such as the Mexico-United States Colorado River regime) may face difficulty adapting to climate change impacts.[35] In his law review article, entitled *How Well Can International Water Allocation Regimes Adapt to Global Climate Change?*, Tarlock posits that such adaptation may be hindered by the international regime's lack of flexibility in terms of adjusting water allocations fixed pursuant to treaty provisions, and by the fact that treaty provisions usually subordinate ecosystem/instream protection to water development and usage concerns.[36] Tarlock's analysis helps to explain why there has to date been reluctance to directly address the impacts of climate change on the existing United States-Mexico Colorado River regime, but also underscores that there are compelling reasons why this reluctance should nonetheless be overcome.

Should Mexico and the United States prove willing to look more closely at how climate change will affect the bilateral allocation regime established for the Colorado River, a fruitful starting point for this examination might be the "extraordinary drought" provisions under the 1944 Waters Treaty.[37] These treaty provisions establish the process and criteria to address situations where climatic conditions prevent the United States from delivering the specified 1.5 MAF of Colorado Water to Mexico.[38] In the context of rising temperatures and greater evaporation resulting from climate change, the "extraordinary drought" conditions that have occurred over the past decade may simply be symptomatic of the new "ordinary" conditions. A 2009 study by the North American Center for Transboundary Studies reported:

> Both droughts and floods may become more extreme as a result of global climate change. In 2009, the Border Governors Conference committed to a binational drought science workshop. In this workshop, experts modeled the effects of climate change on local hydrological cycles. These models suggest longer, deeper droughts in the southwest of the United States and in the west of Mexico in the future.

35. Dan Tarlock, *How Well Can International Water Allocation Regimes Adapt to Global Climate Change?*, 15 J. LAND USE & ENVTL. L. 423 (2000).

36. *Id.* at 423-24.

37. 1944 Waters Treaty, *supra* note 6, art. 2.

38. *Id.*

> Some models show the U.S. missing its treaty water delivery obligation to Mexico on the Colorado River for two thirds of the remaining years in the century.[39]

This suggests that modifications to the existing bilateral Colorado River allocation regime may be needed to better reflect the current climate-induced hydrological realities.

B. Canada-United States Pacific Salmon Treaty and Coldwater Fisheries

The 1985 Pacific Salmon Treaty, between Canada and the United States, seeks to deter overfishing of regional salmon stocks through a system of allocated fishing rights.[40] This bi-national fishing rights allocation scheme was deemed necessary because salmon originating in the rivers/streams of Canada often spend a significant part of their lifecycle feeding and growing in the off-shore ocean waters of the United States and vice-versa.[41] Recognizing that salmon fishing can take place in both waters and inland rivers/streams, the 1985 Pacific Salmon Treaty focused less on defining whether particular salmon stocks are "Canadian" or "American" and more on working to ensure that overall fishing levels were sustainable and that fishing rights were equitably allocated (based in large part on the location of the inland rivers/stream where salmon originated) between the two nations.[42] This origination focus was reflected in Article III(1)(b) of the 1985 Pacific Salmon Treaty, which provides for "each party to receive benefits equivalent to the production of salmon originating in its waters."[43] The governing body

39. N. Am. Ctr. for Transboundary Studies, *Memo on Water*, *in* RETHINKING THE MEXICO-U.S. BORDER: SEEKING COOPERATIVE SOLUTIONS TO COMMON PROBLEMS 25 (2009).

40. *See generally* Treaty between the Government of Canada and the Government of the United States Concerning Pacific Salmon, U.S.-Can., Jan. 28, 1985, State Dep't No. 98-149, 1998 WL 646161 [hereinafter 1985 Pacific Salmon Treaty], *available at* http://www.psc.org/pubs/treaty.pdf.

41. M.P. SHEPARD & A.W. ARGUE, THE 1985 PACIFIC SALMON TREATY: SHARING CONSERVATION BURDENS AND BENEFITS 96-119 (2005).

42. *Id.*

43. 1985 Pacific Salmon Treaty, *supra* note 40, art. III.

established to implement the agreement is the Pacific Salmon Commission.[44]

Although the negotiations of the 1985 Pacific Salmon Treaty understood the essential role that river/stream habitat plays in the lifecycle of salmon (and therefore the abundance and productivity of salmon stocks), the issue of habitat conservation was not directly addressed in the initial agreement.[45] The 1999 Agreement on the Pacific Salmon Treaty was adopted, in part, to foster improved habitat conservation measures in Canada and the United States.[46]

Over the past decade, an increased body of scientific literature has addressed the question of climate change impacts on North American salmon fisheries.[47] Much of this literature has focused on how increasing air temperatures affect the temperature in river/stream habitat where salmon spawn and migrate, and the corresponding impact of such higher river/stream temperatures on salmon stock reproduction and survival rates.[48]

For instance, in May 2002 the Natural Resources Defense Council (NRDC) and Defenders of Wildlife co-authored report titled *Effects of Global Warming on Trout and Salmon in U.S. Streams*.[49] This report found:

> Because trout and salmon are known to be intolerant of warm water, their distribution and/or abundance could be

44. *Id.* at 5.

45. EUGENE H. BUCK, THE PACIFIC SALMON TREATY: THE 1999 AGREEMENT AND RENEGOTIATION OF ANNEX IV 20 (2007).

46. 1985 Pacific Salmon Treaty, *supra* note 40, at 121.

47. *See generally* PATTY GLICK, NAT'L WILDLIFE FED'N, FISH OUT OF WATER: A GUIDE TO GLOBAL WARMING AND PACIFIC NORTHWEST RIVERS (2005), *available at* http://www.nwf.org/News-and-Magazines/Media-Center/News-by-Topic/Global-Warming/2005/~/media/PDFs/Global%20Warming/Fish_Out_of_Water_2005_FINAL.ashx; KIRKMAN O'NEAL, DEFENDERS OF WILDLIFE & NRDC, EFFECTS OF GLOBAL WARMING ON TROUT AND SALMON IN U.S. STREAMS (2002) [hereinafter EFFECTS OF GLOBAL WARMING ON TROUT AND SALMON], *available at* http://www.defenders.org/resources/publications/programs_and_policy/science_and_economics/global_warming/effects_of_global_warming_on_trout_and_salmon.pdf; JAMES BATTIN ET AL., PROJECTED IMPACTS OF CLIMATE CHANGE ON SALMON HABITAT RESTORATION (2007).

48. The author generally refers to all of the sources in the previous citation.

49. *See generally* EFFECTS OF GLOBAL WARMING ON TROUT AND SALMON, *supra* note 47.

> threatened if future climate change warms the streams they inhabit . . . We find that trout and salmon habitat is indeed vulnerable to the effects of global warming. Based on emissions scenarios A1 and A2 from the Intergovernmental Panel on Climate Change (IPCC) we estimate that individual species of trout and salmon could lose 5-17% of their existing habitat by the year 2030, 14-34% by 2060 and 21-42% by 2090, depending on the species considered and model used . . . Projected effects on trout and salmon are lower for IPCC emissions B1 and B2 . . . For these scenarios, we estimate habitat losses of 4-20% by 2030, 7-31% by 2060, and 14-36% by 2090, depending on fish species and model.[50]

The May 2002 NRDC-Defenders of Wildlife report went on to conclude:

> This study supports an abundant scientific literature in concluding that highly-valued cold water fisheries are vulnerable to severe losses of habitat from the warming of streams. We estimate that 18-38% of presently suitable stream locations would become unsuitable for all trout and salmon by the year 2090. Projected losses occur for all of the eight species modeled, and across all regions of the U.S. with existing cold water habitat. Estimated losses are substantial, regardless of the general circulation model or emissions scenarios used for the calculations.[51]

As another example, in April 2007, scientists with the United States National Oceanic Atmospheric Administration (NOAA) Fisheries Service Center and the University of Washington published a study with the National Academy of Sciences, titled *Projected Impacts on Climate Change in Salmon Habitat Restoration*, showing how global warming could result in a 20-40% decline in Chinook salmon populations by 2050 for the State of Washington's Snohomish River Basin.[52] This NOAA-University of Washington study also found that habitat deterioration resulting from climate change is likely to make

50. *Id.* at 3.
51. *Id.* at 35 (emphasis added).
52. BATTIN ET AL., *supra* note 47.

salmon recovery more difficult throughout the Pacific Northwest, particularly in higher elevation basins.[53]

The 1999 Agreement on the Pacific Salmon Treaty establishes a framework that could enable Canada and the United States to better collaborate on adaptation policies relating to the adverse impact of climate change on salmon habitat. Attachment D under the 1999 Agreement on the Pacific Salmon Treaty is titled *Renewed Cooperation on Scientific and Institutional Matters*, and provides:

> [R]ecognizing the advantages of consultation and cooperation on science and information exchanged . . . Recognizing the benefits of processes for getting information for management, including the development of common assessment model . . . The Government of Canada and the Government of United States agree to . . . (d) request the Commission [Pacific Salmon Commission] to eliminate the Committee on Research and Statistics and to reconstitute itself as the Committee on Scientific Cooperation . . . (i) assist in the consultation with the scientific and technical committees of the Commission in setting the scientific agenda for the Commission, including *identifying emerging issues* and subject for research and monitoring progress . . . (iv) undertake the tasks assigned to it in the agreement on Habitat and Restoration . . . .[54]

Attachment E under the 1999 Agreement on Pacific Salmon Treaty is titled *Habitat and Restoration*, and provides:

> Recognizing that protection and restoration of salmon habitat and maintenance of adequate water quality and quantity are vital to achieving improved spawning success, safe passage of adult and juvenile salmon, and therefore, optimum production of naturally spawning stocks . . . the Parties agree . . . (1) To use their best efforts, consistent with applicable law, to (1) protect and restore habitat so as to promote safe passage and adult and juvenile salmon and achieve high levels of natural productions . . . (b) maintain and, as needed, improve safe passage of salmon to and from

53. *Id.*

54. 1985 Pacific Salmon Treaty, *supra* note 40, art. XV, IV, ch. 7, Attachment E (emphasis added).

> their natal streams, and (c) maintain adequate water quality and quantity . . . (2) to promote these objectives by requesting the Commission [Pacific Salmon Commission] to report annually to the Parties on . . . (b) *non-fishing factors* affecting the safe passage of salmon as well as the survival of juvenile salmon . . . (c) options for addressing *non-fishing constraints* and restoring optimum production . . . (3) The Committee on Scientific Cooperation, when constituted, shall in consultation with the scientific and technical committees of the Pacific Salmon Commission (the "Commission") provide advice to the Commission for referral to the Parties regarding *non-fishing factors* affecting the safe passage and optimum production of salmon.[55]

Because adaptation of salmon habitat policies to rising climate-induced water temperatures qualifies as an "emerging issue" meriting closer scientific assessment, and because climate-induced rising water temperatures qualifies as a "non-fishing factor/constraint" affecting the production and survival of salmon stocks, such matters fall within the scope of Attachment D and E to the 1999 Agreement on the Pacific Salmon Treaty. Such matters could be made a priority by the Committee on Scientific Cooperation which in turn could advise the Pacific Salmon Commission on what steps Canada and the United States should take to address these concerns.

There have been calls for the bilateral institutions of the Pacific Salmon Treaty to more directly confront climate change effects. For instance, in February 2007, the Pacific Salmon Commission met in Portland, Oregon.[56] At this meeting, Ron Sims, Executive of Kings County, Washington (where Seattle is located) urged the Pacific Salmon Commission to establish a working group to develop a Climate Change Preparedness Plan for Salmon Management, explaining:

> Our discussions about managing precious natural resources like salmon should start with a discussion about how we are going to prepare for and adapt to climate

55. 1985 Pacific Salmon Treaty, *supra* note 40, art. XV, IV, ch. 7, Attachment D (emphasis added).

56. Ron Sims, Submission to Pacific Salmon Commission (2007) (on file with author).

> change . . . Less snowpack means less water in our rivers during the summer and possibly lethal river water temperatures. . . . For this region to be successful in sustaining our native salmon through foreseeable and unforeseeable climate impacts, it is essential for harvest managers to work in unison with habitat and hatchery managers to understand the issue and prepare ourselves to act and adapt.[57]

Kathleen Miller of the National Center for Atmospheric Research (in Boulder, Colorado) has written, in her report *Pacific Salmon Fisheries: Climate, Information and Adaptation in a Conflict-Ridden Context*, that Canada and the United States need "to come to grips with the fact that there may be long term natural trends in abundance that have nothing to do with their previous management activities."[58] Miller suggests, however, that serious questions remain as to whether the Pacific Salmon Commission will be up to the task: "institutions typically develop over time to manage competition, but they may be either well or poorly suited to adapting to the effects of climate variability and climate change. Climatic variation can disrupt cooperative resource management arrangements by upsetting expectations, altering incentives to cooperate or by contributing to misjudgments regarding the state of the resource or the actions of the other parties."[59]

Notwithstanding the recommendations of those such as Sims and Miller, to date there is little evidence that climate change adaptation has emerged as a scientific or policy priority within the Pacific Salmon Treaty regime.

Should Canada and the United States show a greater inclination to use the framework and institutions of the Pacific Salmon Treaty to improve climate adaptation efforts in regards to coldwater fisheries habitat, the "origination" assumptions and provisions of the treaty may provide an appropriate initial focus. To recall, under the Pacific Salmon Treaty, the allocations (in terms of fishing and catch) between Canada and the United

57. *Id.* at 26.

58. Kathleen A. Miller, *Pacific Salmon Fisheries: Climate, Information and Adaptation in a Conflict-Ridden Context*, 45 CLIMATE CHANGE 21 (2000) (on file with author).

59. *Id.* at 21-22.

States are based on assumptions regarding the volume of Pacific salmon that "originate" respectively in each nation's freshwater rivers and streams. However, as a result of adverse climate change impacts on spawning habitat due to rising in-stream temperatures, the respective volume of "originating" salmon in both the United States and Canada could change with implications for the biological rationale for the underlying Pacific Salmon Treaty allocation regime. Therefore, retention of the current allocation between Canada and the United States could be made contingent on the extent to which each nation is taking affirmative steps to "climate proof" salmon habitat from rising temperatures.

Because higher-elevation freshwater streams may be less susceptible to lethal in-stream temperature increases than corresponding lower-elevation streams, one apparent climate adaptation strategy for salmon is to improve and expand access to higher-elevation upstream spawning grounds in both Canada and the United States, possibly through the removal or modification of on-stream dams that currently block passage to these higher-elevation reaches. As the organization Trout Unlimited suggested in its 2007 report, *Healing Troubled Waters: Preparing Trout and Salmon Habitat for a Changing Climate*: "Dams, culverts and other blockages to fish movement that are obsolete or unneeded should be removed to . . . increase the likelihood of fish finding suitable habitat conditions."[60]

The type of "upstream adaptation" approach proposed by Trout Unlimited falls within the broader category of climate adaptation strategies that are increasingly referred to as "assisted migration."[61] As explained in a recent law review article:

> Over the next several decades, as the effects of global climate change are realized, the suitable habitats for many plant and animal species will shift to higher latitudes or altitudes, and many species may not be able to follow on

60. TROUT UNLIMITED, HEALING TROUBLED WATERS: PREPARING TROUT AND SALMON HABITAT FOR A CHANGING CLIMATE 9 (2007).

61. *See* Bob Holmes, *Assisted Migration: Helping Nature to Relocate*, NEW SCIENTIST, Oct. 6, 2007, at 46; *see also* Jason S. McLachlan et al., *A Framework for Debate of Assisted Migration in an Era of Climate Change*, 21 CONSERV. BIOL. 297 (2007).

> their own . . . Assisted migration is simply the action of picking up and moving certain individuals or populations of species that either cannot or will not be able to migrate on their own in response to the rapidly changing climatic conditions expected over the next several decades. This failure to migrate may be due to the nature of the species itself . . . or because the habitat has become so fragmented due to human development that migration to the new suitable areas is impossible. Assisted migration efforts may include the less invasive method of creating new migratory corridors through which species could migrate independently.[62]

An example of how such "upstream adaptation" strategies might be pursued is the current prospect of removal for four aging dams on the Snake River (a major tributary to the mainstem of the Columbia River) in the United States.[63] In 2009, the Salmon Solutions and Planning Act was introduced in the United States House of Representatives, and called for evaluating whether Ice Harbor Dam, Lower Monumental Dam, Little Goose Dam and Lower Granite Dam on the Snake River should be decomissioned.[64] The removal of these dams would provide salmon with improved access to upstream higher elevation spawning habitat, which in turn could help preserve or increase the number of salmon "originating" in United States waters per the allocation regime in the Pacific Salmon Treaty.

C. North American Waterfowl Management Plan and Coastal Wetlands

Canada, Mexico and the United States have worked to better protect threatened migratory bird species through the Migratory Bird Treaty and the North American Waterfowl Management

62. Julie Lurman Joly & Nell Fuller, *Advising Noah: A Legal Analysis of Assisted Migration*, 39 ENVTL. L. REP. 10413, 10413-14 (2009).

63. Kim Murphy, *If Salmon Can't Be Saved, Snake River Dams May Have to Go*, L.A. TIMES, May 18, 2009.

64. Scott Learn, *Salmon Bill Would Put Removal of Snake River Dams Back on Table*, OR. ENVTL. NEWS, Aug. 3, 2009.

Plan (NAWMP).[65] The Migratory Bird Treaty was signed by Canada and the United States in 1918 and was signed by Mexico in 1936. The Migratory Bird Treaty was prompted by overhunting due to the market for bird feathers, and focused on restricting hunting and the sale and marketplace for such bird products.[66] The NAWMP, signed by the United States and Canada in 1986 and joined by Mexico in 1994, is targeted not at hunting and the trade in bird products but rather at preserving and enhancing habitat for migratory waterfowl such as coastal wetlands.[67] Since 1986, it is estimated that the NAWMP has helped secure over 3,000,000 acres of bird habitat, with 500,000 of these acres receiving permanent protection and the remaining 2.5 million acres in conservation programs that are not permanent in nature (e.g. conservation easements for a specified duration).[68]

Extensive loss of coastal wetlands currently protected under the NAWMP (and related national programs in Canada, Mexico and the United States) is expected due to inundation resulting from climate-induced glacier melting and sea rise. James Titus, Sea Level Rise Program Coordinator for the United States Environmental Protection Agency has written: "If sea level rises a few meters over the next few centuries, everything that the federal wetlands protection programs has accomplished in the coastal zone will be for naught because the wetlands protected will be underwater."[69] Titus has further noted that, at least in the United States, the "federal regulatory program is making no effort to enable wetlands to migrate inland as sea level rises."[70]

65. Migratory Bird Treaty Act of 1918, 16 U.S.C. §§ 703-12 (2006); U.S. FISH & WILDLIFE SERV. & CANADIAN WILDLIFE SERV., NORTH AMERICAN WATERFOWL MANAGEMENT PLAN: A STRATEGY FOR COOPERATION (1996).

66. KURKPATRICK DORSEY, DAWN OF CONSERVATION DIPLOMACY: U.S.-CANADIAN WILDLIFE PROTECTION TREATIES IN THE PROGRESSIVE ERA 165-77 (1998).

67. ASSESSMENT STEERING COMMITTEE, PLAN COMM. OF N. AM. WATERFOWL MGMT. PLAN, NORTH AMERICAN WATERFOWL MANAGEMENT PLAN, CONTINENTAL PROGRESS ASSESSMENT, FINAL REPORT 9 (2007) [hereinafter CONTINENTAL PROGRESS ASSESSMENT].

68. *Id.* at 22.

69. James C. Titus, *Does the U.S. Government Realize that the Sea is Rising? How to Restructure Federal Program So That Wetlands and Beaches Survive*, 30 GOLDEN GATE U. L. REV. 717, 765 (2000).

70. *Id.* at 762.

The loss of coastal wetlands to climate-induced sea rise has been noted by others as well. In June 2005, the National Wildlife Federation published *The Waterfowler's Guide to Global Warming*. This publication noted:

> As the climate warms, a possible 3-34-inch rise in average seas by 2100 could eliminate up to 45% of coastal wetlands in the contiguous United States. Especially vulnerable are the shallow wetlands of the Gulf and Atlantic coasts. These regions provide important wintering habitat for diving ducks such as canvasbacks, redheads, ruddy ducks, scaup, northern pintails, and lessen snow geese.[71]
> . . . .
>
> Sea level rise, in particular, is likely to significantly reduce viable winter habitat for numerous waterfowl, especially where coastal wetlands and other natural ecosystems are restricted by developments such as sea walls and dikes, which limit the ability to spread inland when coastal conditions change. Left unchecked, global warming is expected to cause global sea levels to rise by 3-34 inches by 2100—a rate up to five times faster than that of the past century. The loss of coastal wetlands in the contiguous United States alone due to this amount of sea-level rise is estimated at 17 to 43 percent in areas without structural protection of dry land, and at 20 percent to 45 percent where structures such as sea walls are present.[72]
> . . . .
>
> While the most important strategy we can undertake to prevent broad-scale loss of wildlife and habitat due to global warming is to reduce greenhouse gas emissions, the nation must also begin to develop strategies to help species and ecosystems cope with some changes that are inevitable, as well as build in the flexibility to deal with those impacts that may be unforeseen. For waterfowl, taking the potential impacts and uncertainties associated with global warming into consideration in efforts such as

71. NAT'L WILDLIFE FED'N, THE WATERFOWLER'S GUIDE TO GLOBAL WARMING 4 (2005), *available at* http://online.nwf.org/site/DocServer/Waterfowlers_Guide_June_2005.pdf? docID=363.

72. *Id.* at 20.

> the *North American Waterfowl Management Plan* and other relevant resource management activities will help ensure that our conservation successes will endure for generations to come.[73]

In his July 2008 testimony before the United States House of Representatives on Natural Resource, Subcommittee on Fisheries, Wildlife and Oceans, the chief biologist for the waterfowl conservation organization Ducks Unlimited, Dale Humburg, explained:

> Climate change, accepted by the scientific community as a global reality, will impact every aspect of our environment, including North America's wetlands and waterfowl. Although specific impacts are difficult to predict, changing precipitation patterns, greater variability in weather, rising sea levels, species extinctions and extreme weather events are among expected outcomes. From a waterfowl perspective, climate change is expected to alter wetlands habitats in all priority waterfowl landscapes. Integrating predictions of climate change into wetlands and waterfowl planning will involve considerations of impacts of sea level rise on coastal wetlands, accounting for known climatic variations in conservation planning, and taking climate change into consideration when selecting the location and other characteristics of conservation areas.[74]

In terms of coastal wetlands, a key climate adaptation strategy is to permit such wetlands to migrate landward as sea levels rise. This approach was highlighted in the January 2009 report by the United States-based Association of State Wetlands (ASWM) Managers, titled *Recommendations for a National Wetlands and Climate Change Initiative*.[75] The ASWM report

73. *Id.* at 25-26 (emphasis added).

74. Dale D. Humburg, Chief Biologist, Ducks Unlimited, Testimony before the U.S. H.R. Comm. on Natural Res., Subcomm. on Fisheries, Wildlife, & Oceans: Going Going Gone? An Assessment of the Global Decline in Bird Populations (July 10, 2008), *available at* http://www.ducks.org/Conservation/GovernmentAffairs/3890/TestimonyofDaleDHumburgChiefBiologist.html.

75. *See generally* ASS'N OF STATE WETLAND MANAGERS, RECOMMENDATIONS FOR A NATIONAL WETLANDS AND CLIMATE CHANGE INITIATIVE (2009), *available at* http://www.aswm.org/calendar/wetlands2008/recommendations_2008_112008.pdf.

found: "Strategies for adapting coastal/estuarine wetlands to climate change (and thereby reducing impacts to wetlands and wetlands functions)" include . . . *Acquire upland buffers to permit coastal/estuarine wetlands to migrate when sea level rise occurs* . . . ."[76]

Within the NAWMP regime, climate change impacts on coastal wetlands have recently begun to receive some limited recognition. The implementation and performance of the NAWMP are overseen by a trilateral Plan Committee, whose work centers on Joint Ventures (JVs) to further waterfowl habitat protection.[77] In February 2007, the NAWMP Plan Committee released its *Continental Progress Assessment Final Report*.[78] In a section titled "New Challenges" this report stated:

> The Plan Committee must plan for emerging challenges that will face waterfowl and habitat conservation in North America in the next decade, including the impact of global climate change on prairie wetlands and coastal ecosystems, and increasing development in the boreal forest. Few JVs have actively addresses these challenges in their planning processes. As our climate changes, will Plan continental goals change? Impacts of sea-level rise are already evident in coastal regions . . . We recognize that uncertainty about future climate predictions increases at smaller geographic scales, imposing limits on the spatial resolution of useful climate predictions. Nonetheless, JV planners should identify places and programs that are more or less vulnerable to future climate change and invest accordingly to reduce risk . . . The Plan Committee should solicit and support studies of these broad scale challenges, and JVs need to more actively consider these issues in conservation plans.[79]

The February 2007 NAWMP Plan Committee report then determined:

> [E]xperience over the last 20 years, however, suggests that certain approaches enhance effectiveness of the Plan's

76. *Id.* at 9 (emphasis added).
77. CONTINENTAL PROGRESS ASSESSMENT, *supra* note 67, at 2.
78. *Id.* at 44.
79. *Id.*

> conservation investments. Therefore, we recommend that . . . . *(10) Global climate change must be given more consideration in JV regional targeting, program emphasis, and project design* . . . Impact on climate change on coastal, Arctic, boreal forest and prairie regions will be profound. JV planners need to identify places and programs that are vulnerable to future climatic changes and invest accordingly to reduce risk.[80]

As set forth below, the February 2007 NAWMP Plan Committee report also included a three-tiered ranking system for the importance of recommendations, with "HHH" designations for high-priority recommendations, "HH" designations for medium priority recommendations, and "H" designations for low-priority recommendations:

> [R]anking Recommendations . . . members of the ASC [Assessment Steering Committee] were asked to rank all 27 recommendations on a scale of 3 (most important) to 1 (less important) . . . (10) Global climate change should be given more considerations in JV regional targeting, program emphasis and project design . . . *H*.[81]

The low-priority "H" designation given to climate change adaptation by the NAWMP's Assessment Steering Committee does not bode well (at least in the short-term) for the prospects for the NAWMP regime to devote energy or resources towards strategies to ensure that coastal wetlands for waterfowl are not lost to sea-rise induced inundation.

Climate change has also yet to receive substantive treatment within North America's other continental wetlands regime, the *Memorandum of Understanding for the Conservation of Migratory Birds and Wetlands* (signed by Canada, Mexico and the United States in 1988).[82] Although the 1988 Memorandum of Understanding has helped direct additional resources towards wetlands protection in all three North American countries, there is no indication that climate change impact or adaptation

80. *Id.* at 68-69 (emphasis added).

81. *Id.* at 73-74 (emphasis added).

82. Press Release, U.S. Dep't of Fish and Wildlife Serv., Canada, Mexico and the U.S. Sign Memorandum of Understanding for Conservation of Migratory Birds and Wetlands (Apr. 5, 1988) (on file with author).

considerations have been incorporated into project selection or funding decisions undertaken pursuant to the agreement.[83]

Domestically, the issue of climate change effects received some attention in the United States federal Environmental Protection Agency's (EPA) 2008 *National Water Program Strategy* report (discussed above).[84] In the United States, the primary regulatory program for conservation of wetlands is section 404 of the federal Clean Water Act, which is administered jointly by EPA and the United States Army Corps of Engineers.[85] This publication acknowledged that the "primary impact of sea level rise on water resources is the gradual inundation of natural systems"[86] in coastal and estuarine areas, and then offered the following proposed responses to this impact:

> EPA will explore how consideration of climate change should inform significant deterioration determinations andpublish additional guidance where appropriate.[87]
>
> . . . .
>
> The National Water Program will work with the Army Corps of Engineers to ensure effective implementation of the regulatory framework under section 404 of the Clean Water Act in a way that considers the effects of climate change and will explore the need for additional guidance on avoiding or minimizing impact, defining "significant deterioration" and "unacceptable adverse impact."[88]

This proposed domestic response is again vague in terms of details, and makes no specific mention of responding to the particular climate adaptation problem facing coastal wetlands—inundation due to sea level rise and the corresponding need for wetlands to migrate landward. Stronger guidance from North America's continental multilateral wetlands conservation regimes might result in more effective and responsive policy at the domestic level.

83. *Id.*
84. EPA, *supra* note 29.
85. *Id.* at 51-53.
86. *Id.* at 16.
87. *Id.* at 52.
88. *Id.*

III. ADAPTATION ACROSS THE POND: EUROPE'S CONTINENTAL RESPONSE

North America is not the only region where continental cross-border natural resource regimes are fashioning responses to the effects of climate change. As discussed below, Europe is also considering this question in several multilateral forums including the 1992 United Nations Economic Commission for Europe's Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UNECE Transboundary Watercourse Convention),[89] the 1994 Convention on Cooperation for the Protection and Sustainable Use of the Danube River (Danube River Convention),[90] and the 2000 EU Water Framework Directive. [91]

A. Task Force on Water and Climate under the UNECE Transboundary Watercourse Convention

In terms of the UNECE Transboundary Watercourse Convention; November 2007 witnessed the first meeting of the Convention's Task Force on Water and Climate in Bonn, Germany, followed by a second meeting in July 2008 in Amsterdam, Netherlands, and a third meeting in November 2009 in Geneva, Switzerland.[92] In connection with these meetings, Europe's Task Force on Water and Climate prepared a series of advisory reports, including; *Guidance Towards Climate Proofing of Water Management* (September 2007),[93] *Guidance on Water and Climate Adaptation* (July 2008),[94] *Adaptation to Climate*

89. Convention on the Protection and Use of Transboundary Watercourses and International Lakes, Mar. 17, 1992, 1936 U.N.T.S. 269.

90. Convention on Cooperation for the Protection and Sustainable Use of the Danube River, June 29, 1994.

91. Comm'n of the European Communities, *White Paper, Adaptation to Climate Change, Adapting to Climate Change: Towards a European Framework for Action,* at 10, COM (2009) 147 final (Jan. 4, 2009).

92. Convention on the Protection and Use of Transboundary Watercourses and International Lakes, Draft Guidance on Water and Climate Adaptation (July 2, 2008) [hereinafter Draft Guidance].

93. Convention on the Protection and Use of Transboundary Watercourses and International Lakes, Guidance Towards Climate Proofing of Water Management (Sept. 28, 2007).

94. Draft Guidance, *supra* note 92.

Change in Eastern Europe, Caucasus, Central Asia and South Eastern Europe (July 2008),[95] and *Guidance on Water and Adaptation to Climate Change* (November 2009).[96] Given that Europe's Task Force on Water and Climate was established pursuant to a treaty on transboundary watercourses, these reports focused mostly on cross-border river basins.

The November 2009 *Guidance on Water and Adaptation to Climate Change* report noted the particular role that multilateral transboundary regimes can play in terms of climate adaptation policy:

> Transboundary rivers, lakes and groundwaters pose particular management challenges because of potentially competing national interests. Adaptation therefore requires transboundary cooperation, based on river basins and bio-geographics. While most measures will have to be implemented at the national or local level, where operational capacities exist, it is essential that efforts be coordinated in an equitable, acceptable and cost-effective manner at the level of the transboundary basin.[97]

One of the recommendations to emerge from Europe's Task Force on Water and Climate is the prospect for increased use of cross-border environmental impact assessments to identify more basin-specific climate adaptation measures. In particular, the July 2008 *Guidance on Water and Climate Adaptation* and the November 2009 *Guidance on Water and Adaptation to Climate Change* report both discussed the provisions of the 1991 Espoo Convention on Transboundary Environmental Impact Assessment[98] and suggested that such multilateral assessments could provide a process for more rigorous analysis of how to best anticipate and respond to the effects of climate change on

95. Convention on the Protection and Use of Transboundary Watercourses and International Lakes, Adaptation to Climate Change in Eastern Europe, Caucasus, Central Asia and South Eastern Europe (July 2, 2008).

96. U.N. Econ. Comm'n for Eur., *Guidance on Water and Adaptation to Climate Change*, U.N. Doc. EC/MP.WAT/30 (2009).

97. *Id.* at 38.

98. Convention on Environmental Impact Assessment in a Transboundary Context, Sept. 10, 1997, 1989 U.N.T.S. 309.

international river basins.[99] The November 2009 *Guidance on Water and Adaptation to Climate Change* report explained:

> The Espoo Convention supports environmentally sound and sustainable development by providing information on the relationship on the inter-relationship between certain economic activities and their environmental consequences, in particular in the transboundary context.[100]
> . . . .
>
> The Espoo Convention has been supplemented by a Protocol on Strategic Environmental Assessment (SEA), not yet in force. The Protocol will require its Parties evaluate the environmental consequences of their official draft plans and programmes, and provides for extensive public participation in government decision-making in numerous development sectors. [101]
> . . . .
>
> SEA is undertaken much earlier in the decision-making process than a project-level EIA [Environmental Impact Assessment], and it is therefore seen a key tool supporting sustainable development. SEA can also be an effective tool for climate change adaptation and mitigation, by introducing climate change considerations into development planning.[102]

Another proposal presented by Europe's Task Force on Water and Climate in its November 2009 *Guidance on Water and Adaptation to Climate Change* report was the use of "Vulnerability Assessments" and the "Climate Vulnerability Index" (CVI) in climate adaptation policy. As discussed in the report:

> A VA [Vulnerability Assessment] delineates the specific places, human groups, sectors and ecosystems that are at the highest risk, the sources of their vulnerability and how the risk can be diminished or eliminated. So identifying the regions and people at greatest risk and assessing the

99. U.N. Econ. Comm'n for Eur., *supra* note 96, at 30-31.
100. *Id.* at 30.
101. *Id.*
102. *Id.* at 31.

> sources and causes of their vulnerability is critical for designing and targeting adaptation. This shows the priorities for adaptation and helps policy-makers at various levels decide where and when to intervene.
>
> . . . .
>
> VAs should visualize what might happen to an identifiable population, sector or ecosystem in the current situation (current vulnerability) and under the changing conditions projected by scenarios and models (future vulnerability). VA should also cover the probability of these harmful effects.[103]
>
> . . . .
>
> To capture the essence of this definition of vulnerability, a composite index approach is proposed . . . This could explicitly incorporate indicators which represent the diverse dimensions of risks which give rise to vulnerability within a population, and this has been incorporated into a method of assessment know as the Climate Vulnerability Index (CVI). The objective of this method is to help identify those areas which are most vulnerable . . . .[104]

As set forth by Europe's Task Force on Water and Climate, the use of transboundary environmental assessment, strategic environmental assessment, vulnerability assessment and the CVI are not stand-alone or mutually exclusive techniques. Rather, they are presented as a suite of policy tools that can be combined and integrated to forge a coherent set of continental and basin-wide climate proofing strategies.

B. Danube River Commission and Danube River Basin Management Plan

In regards to the Danube, in December 2007 the International Commission for Protection of the Danube River (Danube River Commission) sponsored an international conference titled *Adaptation of Water Management to Effects of*

103. *Id.* at 70.
104. *Id.* at 72.

Climate Change in the Danube River Basin.[105] One of the outcomes of this 2007 conference, held in Vienna, Austria, was to agree to include a separate chapter on climate change in the revised Danube River Basin Management Plan (to be completed by the end of 2009).[106] In May 2009, the Danube River Commission released its draft of the revised Danube River Basin Management Plan, which included Section 8 titled *Water Quantity Issues and Climate Change*,[107] and Annex 19, titled *Summary of Eventual Main Impacts on Water Resources Due to Climate Change and List of Selected Climate Change Projects Relevant to the DRBD*.[108]

Section 8 of the May 2009 draft of the revised Danube River Basin Management Plan found that "climate change signals for the DRB [Danube River Basin] are sufficient to act beyond existing scientific uncertainties"[109] and that "climate change in the DRB is a significant threat to the DRB environment and further actions need to be taken as consequence . . . it is clear that there is still much work needed to clearly understand the scale and magnitude of pressures and impacts, but it is obvious that there are actions that can and must be taken now and this should be a priority for the overall management of the DRB."[110]

Annex 19 of the May 2009 draft of the revised Danube River Basin Management Plan described nine separate research and policy initiatives underway in Europe that relate to climate impacts and climate adaptation in the Danube Basin, and concluded:

> In summary, respective actions need to be taken to ensure that additional water use and flood defense measures will

105. AUSTRIAN MINISTRY FOR EUROPEAN & INT'L AFFAIRS, CONFERENCE PROCEEDINGS OF WATER MANAGEMENT TO EFFECTS OF CLIMATE CHANGE IN DANUBE RIVER BASIN (2007), http://www.icpdr.org/icpdr-files/14077.

106. *Id.* at 6.

107. INT'L COMM'N FOR THE PROT. OF THE DANUBE RIVER, DRAFT DANUBE RIVER BASIN DISTRICT MANAGEMENT PLAN § 8.2.2 (2009), http://www.icpdr.org/icpdr-files/15025.

108. INT'L COMM'N FOR THE PROT. OF THE DANUBE RIVER, ANNEX 19—SUMMARY OF EVENTUAL MAIN IMPACTS ON WATER RESOURCES DUE TO CLIMATE CHANGE AND LIST OF SELECTED CLIMATE CHANGE PROJECTS RELEVANT TO THE DRBD (2009), http://www.icpdr.org/icpdr-files/15022 [hereinafter ANNEX 19].

109. INT'L COMM'N FOR THE PROT. OF THE DANUBE RIVER, *supra* note 107, at 101.

110. *Id.*

> be *climate proof* in the future. *Climate proof* measures will ensure that additional impacts on the aquatic environment are prevented and the achievement of environmental objectives ensured.[111]

C. EU Water Framework Directive and Climate Adaptation White Paper by the Commission of the European Communities

The EU Water Framework Directive, adopted in 2000, establishes a framework for European Community wide actions in the field of water policy to protect inland surface waters, coastal waters and other water resources.[112] Pursuant to this directive, work on a Common Implementation Strategy (CIS) is underway.[113]

As part of the process of formulating the CIS for the EU Water Framework Directive, a European Policy Summit on Water was held in Brussels, Belgium in November 2008. At this summit, there were calls for a more vigorous and focused continental effort to address climate change adaptation in the water sector.[114] This led to the January 2009 white paper by the Commission of the European Communities titled *Adapting to Climate Change: Towards a European Framework for Action*, in which the Commission specifically addressed the question of—"Why is action needed at the EU level?"

> Due to the regional variability and severity of climate impact most adaptation measures will be taken at the national, regional or local level. However these measures can be supported and strengthened by an integrated and coordinated approach at the EU level.
>
> The EU has a particularly strong role when the impact of climate change transcends the boundaries of individual countries (e.g. river and sea basins and bio-geographic regions). Adaptation will require solidarity among EU

111. ANNEX 19, *supra* note 108, at 2 (emphasis in original).

112. U.N. Econ. Comm'n for Eur., *supra* note 96, at 46.

113. *Id.*

114. EUROPEAN WATER P'SHIP, CLIMATE CHANGE ADAPTATION AND WATER—THE NEED FOR STRONGER COOPERATION IN EUROPE (2009), http://www.ewp.eu/wp-content/uploads/2009/03/20090415-report-ccaw.pdf.

> member states to ensure that disadvantaged regions and regions most affected by climate change will be capable of taking the measures needed to adapt.[115]

In its January 2009 white paper, the Commission also detailed the establishment of a new European-wide Impact and Adaptation Steering Group (ISAG) to formulate regional and national climate change adaptation programs.[116] The ISAG is responsible for helping develop the common EU climate adaptation strategy and assisting in preparation of national adaptation strategies by EU member states.[117] The release of this January 2009 white paper was followed by a March 2009 conference (again in Brussels) titled *Climate Change Adaptation and Water: The Need for Stronger Cooperation in Europe*. [118]

D. Continental Contrasts with North America

Like North America, Europe is still at a relatively early stage in developing a regional set of policies to address the impacts of climate change on cross-border natural resources. As noted above, however, the issue of climate adaptation is being addressed with greater urgency in Europe, and a stronger consensus has emerged there that the scientific data on climate change is now sufficient to support development of specific adaptation policies. Europe therefore appears to be somewhat farther along in the process of developing continental climate adaptation policy than North America and to have set multilateral processes in motion that should provide a foundation for additional progress. The reasons for Europe's more advanced policy movement in the climate adaptation arena may be attributable to several considerations.

First, given the larger number of countries in Europe and given such countries' close geographic proximity to each other, many natural resource issues in Europe have a more direct cross-

115. COMM'N OF THE EUROPEAN COMMUNITIES, WHITE PAPER—ADAPTING TO CLIMATE CHANGE: TOWARDS A EUROPEAN FRAMEWORK FOR ACTION 7 (2009), http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0147:FIN:EN:PDF (internal citations omitted).

116. *Id.* at 15.

117. *Id.*

118. EUROPEAN WATER P'SHIP, *supra* note 114.

border dimension.[119] For instance, many of Europe's major river systems (such as the Danube) travel through multiple countries and migratory species in Europe often traverse national borders.[120] These geo-political and ecological circumstances, which are less pronounced in North America, may have compelled Europe to address climate adaptation at the continental level.

Second, the continental governance structures in Europe are far more established than those in North America. In 1987, the European Community (EC) adopted the Maastricht Treaty which helped created the EU and provided EU institutions with explicit law-making power to "preserve, protect and improve the quality of the environment."[121] This evolution from the more limited trade mandate of the EC to the more expansive mandate of the EU is sometimes referred to as "deep integration."[122] The continental institutions within North America remain at present somewhat "shallow" in this regard. The institutions created pursuant to the 1993 North American Free Trade Agreement (NAFTA), such as the North American Free Trade Commission, have no law-making powers over environmental or natural resource matters, nor does the North American Commission for Environmental Cooperation (CEC) created under the 1993 North American Agreement on Environmental Cooperation.[123]

Unlike the institutions of the European Union, to date, the countries of North America have tended to create multilateral institutions, environmental and otherwise, on an "as need" basis and often provided them with fairly limited powers. As Richard

119. ASS'N OF EUROPEAN BORDER REGIONS, GROWING REGIONS, GROWING EUROPE: PUBLIC CONSULTATION ON THE FUTURE OF EU COHESION POLICY 4-5 (2008), http://ec.europa.eu/regional_policy/conferences/4thcohesionforum/doc/contributions/aebr.pdf.

120. ROBERT A. ROBINSON ET AL., BTO RESEARCH REPORT 414: CLIMATE CHANGE AND MIGRATORY SPECIES 162 (2005), http://www.sfbayjv.org/pdfs/Migratory_wildlife_climate_BTO_9-05.pdf.

121. James J. Friedberg, *Closing the Gap between Word and Deed in European Community Environmental Policy*, 15 LOY. L.A. INT'L & COMP. L. REV. 2 (1993); PAUL STANTON KIBEL, THE EARTH ON TRIAL: ENVIRONMENTAL LAW ON THE INTERNATIONAL STAGE 144 (1999).

122. WOLFGANG H. REINICKE, DEEPENING THE ATLANTIC: TOWARD A NEW TRANSATLANTIC MARKETPLACE? (1996).

123. KIBEL, *supra* note 121, at 140-43; *see generally* GREENING THE AMERICAS: NAFTA'S LESSONS FOR HEMISPHERIC TRADE (Carolyn L. Deere & Daniel C. Esty eds., 2002).

Kiy and John Wirth, the editors of the book *Environmental Management on North America's Borders*, observed:

> [T]ransboundary environmental management [in North America] is and continues to be highly fragmented in nature . . . Indeed, the evolution of transboundary environmental management mechanisms has proceeded largely on an ad hoc and functionalist basis, tackling discrete problems either formally or informally as these were recognized at various time and at different levels of government. The few comprehensive, or near comprehensive, instruments currently in place . . . function as bilateral frameworks for an ad hoc process rather than as integrated mechanisms for comprehensive environmental management. The need for greater coordination and integration of multiple disparate management activities within the region is thus apparent.[124]

Lastly, during most of the past decade, the administration of United States President George W. Bush continued to question whether climate change was causally linked to GHG emissions and to downplay climate change's anticipated effects.[125] The administration of President George W. Bush also placed minimal diplomatic emphasis on multilateral environmental efforts.[126] The positions of the United States on these points did not help provide a foundation upon which to develop a continental climate adaptation policy in North America.

124. RICHARD KIY & JOHN WIRTH, ENVIRONMENTAL MANAGEMENT ON NORTH AMERICA'S BORDERS 45 (1998).

125. Luke O'Brien, *Bush Ripped on Global Warming*, WIRED, Feb. 7, 2007, *available at* http://www.wired.com/politics/law/news/2007/02/72672.

126. NORICHIKA KANIE, GOVERNANCE WITH MULTILATERAL ENVIRONMENTAL AGREEMENTS: A HEALTHY OR ILL-EQUIPPED FRAGMENTATION 67, 80 (2007) (finding that "[t]he United States, in particular, has recently tended to impede efforts to strengthen or deepen multilateral governance in almost all realms. The Bush administration has clearly signaled a retreat from multilateralism, as well as a profound disinterest in multilateral environmental governance and sustainable development.").

IV. CONCLUSION: AS THE SEAS RISE AND RIVERS RUN DRY

In connection with the December 2009 meeting in Copenhagen, Denmark of the parties to the United Nations Framework Convention on Climate Change, UN-Water's Task Force on Water and Climate Change released a document highlighting climate change impacts in the water sector.[127] UN-Water is an inter-agency mechanism established by the United Nations High Level Committee on Programmes in 2003 that works to improve coordination and coherence among UN entities dealing with issues related to water resources.[128] The UN-Water document called for "strengthening governance" and "stronger institutions" to address climate effects in the water sector, noting:

> Water is the primary medium through which climate change influences the Earth's ecosystems and therefore people's livelihoods and well being. Already, water-related climate change impacts are being experienced in the form of more severe and more frequent droughts and floods. Higher average temper-atures and changes in precipitation and temperature extremes are projected to affect the availability of water resources through changes in rainfall distribution.[129] Water resources and how they are managed impact almost all aspects of society and the economy, in particular health, food production and security, domestic water supply and sanitation, energy, industry, and the functioning of ecosystems.[130]

In recent years, Europe has begun the process of forging an integrated and continental strategy to adapt to climate change impacts, particularly in the water sector. The efforts undertaken pursuant to the Task Force on Water and Climate of the UNE Transboundary Watercourse Convention, the Danube River Commission and the EU Water Framework Directive evidence a strong commitment to addressing climate adaptation at the continental level, and have established processes and institutions that should provide a platform for this work to progress.

127. U.N. WATER MESSAGING DOCUMENT 1-2 (2009) (on file with author).
128. *Id.* at 2.
129. *Id.* at 1.
130. *Id.*

In North America, the Waters Treaty between Mexico and the United States, the Pacific Salmon Treaty between Canada and the United States, and North American Waterfowl Management Plan between Canada, Mexico and the United States all directly involve water resources. The Waters Treaty between Mexico and the United States sets forth the bilateral allocation of cross-border waterways such as the Colorado River. The Pacific Salmon Treaty between Canada and the United States addresses coldwater anadramous fisheries dependent on the quantity, quality and temperature of surface freshwater. The North American Waterfowl Management Plan addresses migratory bird stocks whose critical habitat is often coastal wetlands.

Notwithstanding this connection, a discernable climate adaptation agenda within these three continental natural resource regimes has yet to emerge. Although the question of climate adaptation has received brief mention in recent treaty amendments and recent diplomatic pronouncements by the parties to such treaties, to date the governance institutions within these regional multilateral regimes have not outlined a coherent set of policy guidance strategies for North America's national governments.

The result of this inaction and these omissions at the continental level is that, in terms of the cross-border natural resources these North American continental regimes are designed to conserve, important opportunities to improve climate proofing and climate policy coherence may have been lost. The national governments in North America are now starting to turn their attention, belatedly, to unilateral climate adaptation efforts. A stronger continental framework could help provide enhanced focus, resources and urgency to such domestic efforts going forward.