BUILDING CLIMATE CHANGE AND ECOSYSTEM-BASED FUNCTION CONSIDERATIONS INTO A MODERNIZED COLUMBIA RIVER TREATY: A COMMENTARY

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I. INTRODUCTION

The Columbia River Treaty (CRT) is an international agreement between Canada and the United States for the joint development, regulation, conservation, and management of the international Columbia River Basin ("Columbia Basin" or "Basin").[1] The primary objective of the CRT is to coordinate flood control and optimize power generation within the Basin.[2] In the international waters development circle, the CRT is often viewed as one of the most successful models of a transboundary waters treaty and a benchmark for how to create and share benefits between nation states sharing an international watercourse.[3] With the benefit of hindsight, the CRT reflects some of the limitations associated with many first-generation international water and energy agreements. These are outlined

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1. Treaty Relating to Cooperative Development of the Water Resources of the Columbia River Basin, Can.-U.S., *opened for signature* Jan. 17, 1961, 542 U.N.T.S. 244 [hereinafter Columbia River Treaty]. *See also* Rachael P. Osborn, *Climate Change and the Columbia River Treaty*, 2 WASH. J. ENVT'L L. & POL'Y 75 (2012); R.K. Paisley et al., *Water Diplomacy and Conflict Management: The Role of International River Basin Organizations in the Columbia International River Basin and the Senegal International River Basin*,*in* RIVER BASIN ORGANIZATIONS IN WATER DIPLOMACY 108, 108 (Anoulak Kittikhoun & Susanne Schmeier eds., 2021).

2. Paisley et al., *supra* note 1, at 110.

3. Paisley et al., *supra* note 1, at 118–20.

below. Negotiations between Canada and the United States to modernize the CRT are currently (2021) underway.[4] These negotiations are proceeding slowly in part because of continual changes in the political administrations in Canada and the United States at both the federal and state/provincial levels. The evolving roles and responsibilities of First Nations and tribes in Canada and the United States are also impacting both the substance and timing of the renegotiations.[5]

Among the issues under possible consideration in the renegotiations are whether, and to what extent, to:

1. more equitably share benefits (and burdens) within, and between, various sovereigns and stakeholders when that which is considered equitable and reasonable can change over time and vary in the eyes of various beholders;

2. incorporate the principles of adaptive management;

3. engage in more holistic watershed management;

4. return salmon to the Canadian portion of the Basin;

5. possibly implement a new, and as yet untested, flood control regime, which is currently scheduled to replace the existing flood control system in 2024, absent agreement to the contrary;

6. meaningfully address the exclusion of indigenous voices in the original negotiations. The knowledge base, culture, values, rights, titles, and perspectives of indigenous peoples were not fully considered in the existing Treaty;

7. address the environmental and socioeconomic impacts that climate change will create in the Basin, and critically review the extent of possible adaptation and resilience; and

8. add ecosystem function as a possible co-equal CRT objective along with the legacy objectives of power generation and flood control.[6]

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4. Paisley et al., *supra* note 1, at 111–13.

5. *See* Matthew J. McKinney, Richard Kyle Paisley, & Holly Smith Stenovec, *A Sacred Responsibility: Governing the Use of Water and Related Resources in the International Columbia Basin Through the Prism of Tribes and First Nations*, 37 PUB. LAND & RESOURCES L. REV., 156 (2016).

6. *See* Paisley et al., *supra* note 1, at 112.

Drawing on international experiences and lessons learned, this commentary presents some ways re-negotiators may wish to consider shaping their approaches to help build points seven and eight into a modernized CRT.

II. THE COLUMBIA RIVER BASIN

The Columbia Basin covers approximately 640,000 km².[7] It stretches from the mountains in southeastern British Columbia, Canada, south into the United States, draining across several states, including Washington, Idaho, Montana, Oregon, Nevada, Utah, and Wyoming.[8] Only fifteen per cent of the Basin is in Canada. However, the Canadian portion of the Basin importantly contributes about thirty-five percent of average river flows and possibly as much as fifty percent at flood level. The Canadian percentages are likely to further increase due to climate change.[910] High peaks, steep valleys, and snowpack from four mountain ranges contribute to the power generation potential of the Basin system.[11]

The Basin holds immense natural capital value.[12] Its waterways and mountains create a wide range of ecosystems, including grasslands, dry pine forests, interior rainforests, alpine meadows, and glaciers.[13] And the region is home to over seven hundred species of birds, mammals, fish, and reptiles.[14] The Basin also includes a diverse and important set of stakeholders and cultures, including indigenous and tribal groups on both sides of the common international border.[15]

Most discussions regarding Columbia Basin governance begin with some reference to the Boundary Waters Treaty of 1909 (BWT) between Canada and the United States, which established the International Joint Commission (IJC).[16] The Basin first began to receive serious consideration by the IJC in 1944.[17] The driving forces behind this attention were the perceived need, in both Canada and the United States, to control flooding and to develop hydropower resources.[18] Other

7. Paisley et al., *supra* note 1, at 108.

8. Osborn, *supra* note 1, at 79–80.

9. Paisley et al., *supra* note 1, at 108.

10. Paisley et al., *supra* note 1, at 108.

11. Osborn, *supra* note 1, at 79–80.

12. Osborn, *supra* note 1, at 78–79.

13. Osborn, *supra* note 1, at 78–79.

14. *Species in Columbia River Basin*, COLUMBIA RIVER BASIN BIODIVERSITY ATLAS, https://biodiversityatlas.org/species/ (last visited May 6, 2021).

15. Kim Ogren & Aaron T. Wolf, *Process Aspects of the Development of Shared Waters Agreements: The Columbia River Treaty*, in RIVER BASIN ORGANIZATIONS IN WATER DIPLOMACY 102–05 (Anoulak Kittikhoun & Susanne Schmeier eds. 2021).

16. Treaty Between the United States and Great Britain Relating to Boundary Waters and Questions arising Between the United States and Canada, Gr. Brit.-U.S., Jan. 11, 1909,36 Stat. 2448.

17. Paisley et al., *supra* note 1, at 109.

18. Paisley et al., *supra* note 1 at 110.

major uses in the Basin also included "navigation, irrigation, fisheries, recreation, and water supply."[19]

Technical studies by the IJC continued for more than fifteen years, from 1944 until 1959, when the IJC promulgated a proposed set of principles to govern the equitable sharing of benefits between Canada and the United States, which might arise as a result of joint development.[20] In making recommendations, the IJC was guided by the basic precept that the principles promulgated should result in the equitable sharing of benefits attributable to any cooperative undertakings that might take place, and an advantage to each country, as compared with any alternatives that might be available to each country.[21] The IJC also stipulated that power benefits in the United States from upstream storage in Canada should be shared on a substantially equal basis, provided that an equal split of benefits would result in an advantage to each country as compared with available alternatives.[22] When an equal split would not result in an advantage to each country, the countries would then have to negotiate and agree upon such other division of benefits as would be equitable to both countries and make cooperative development feasible.[23]

The critical acknowledgement underlying the IJC stipulation was that an international project ought not to proceed unless both of the countries affected would benefit.[24] However, to the extent that a benefit occurred in one country and costs were imposed in another, the solution was not to dispute whether the project should proceed, but rather to redistribute the benefits, so that both countries obtained an interest in them.[25] Another important aspect of the IJC's recommended principles was that the focus was on gross benefits, which eliminated the complicated necessity to calculate net benefits.[26]

III. THE COLUMBIA RIVER TREATY

Based on the above noted principles, Canada and the United States negotiated and ratified the CRT, which empowered the construction and operation of three CRT projects (Duncan Dam, Mica Dam, and Keenleyside Dam) in British Columbia in Canada and one (Libby Dam) in Montana in the United States.[27] Thus, the United States increased both the useable energy from and dependable capacity of various hydropower plants on the lower Columbia as well as obtained irrigation

19. CHARLES V. STERN, CONG. RSCH. SERV., R43287, COLUMBIA RIVER TREATY REVIEW 2 (2020).
20. Paisley et al., *supra* note 1, at 110.
21. Paisley et al., *supra* note 1, at 110–11.
22. Paisley et al., *supra* note 1, at 110–11.
23. Paisley et al., *supra* note 1, at 110–11.
24. Paisley et al., *supra* note 1, at 110–11.
25. Paisley et al., *supra* note 1, at 110–11.
26. Paisley et al., *supra* note 1, at 110–11.
27. Paisley et al., *supra* note 1, at 111.

and flood control benefits in the United States part of the Basin.[28] These would not have been possible at the same cost without the three CRT projects in Canada.[29] In return for building the three CRT projects in Canada, the CRT also specifically entitled Canada to a lump sum payment for various downstream (flood control) benefits plus one half of the additional power generated by power plants in the United States that resulted from regulated storage across the border in Canada.[30] The benefits of the CRT over the years have thus included preventing/reducing flooding and generating tens of millions of dollars in power benefits for both Canada and the United States.[31]

Effective September 2024, Canada will no longer be responsible for providing so-called "assured annual flood control," regardless of whether the CRT is continued or terminated.[32] However, under certain circumstances, Canada, after September 2024, will be responsible for providing a new, and as yet untested, alternative flood control regime, referred to as "called upon" flood control.[33] Should the United States request this type of flood protection, they would have to compensate British Columbia for operational losses and the costs associated with foregoing alternative uses of storage. This could be narrowly interpreted as the costs associated with foregoing optimal power generation to provide adequate space in reservoirs for flood protection in the United States. If the CRT is modernized to include environmental and social aspects of dam operations, then cost associated with foregoing alternative uses of storage could also include a number of issues, such as decreased access for Kokanee spawning in reservoirs.[34]

IV. BUILDING CLIMATE CHANGE CONSIDERATIONS INTO THE CRT

Climate change, which is already altering hydrological cycles around the world at an unprecedented rate, will make water availability more unpredictable and increase the frequency and intensity of floods and droughts.[35] As pressure on water and related resources increases with climate change, current systems to manage these resources will no longer suffice. According to the World Bank, "[p]opulations have to rely more on water infrastructure and water management to meet their needs and provide security against the increasing occurrence of extreme and

28. Paisley et al., *supra* note 1, at 111.
29. Paisley et al., *supra* note 1, at 111.
30. Paisley et al., *supra* note 1, at 111.
31. Paisley et al., *supra* note 1, at 111.
32. Osborn, *supra* note 1, at 101.
33. Osborn, *supra* note 1, at 101–03.
34. Osborn, *supra* note 1, at106–10.
35. Sonia I. Seneviratne et al., Changes in Climate Extremes and Their Impacts on the Natural Physical Environment, *in* MANAGING THE RISKS OF EXTREME EVENTS AND DISASTERS TO ADVANCE CLIMATE CHANGE ADAPTATION, (C.B. Fields et al., eds.), https://www.ipcc.ch/site/assets/uploads/2018/03/SREX-Chap3_FINAL-1.pdf (last visited May 6, 2021).

variable hydrological events . . . Given the hydrological interlinkages that connect territories, transboundary [watercourses] offer a logical geographic scope for countries to advance common development goals and address water-related challenges."[36]

Many transboundary international water and energy agreements existed before adaptation to climate change entered the discourse of water management. And many such agreements assumed relatively fixed water conditions. The CRT is conspicuously silent on the topic of climate change.[37] This may be because the CRT was a first-generation international water/energy agreement (1964), when the issue of climate variability over decades was not yet at the forefront of contemporary thought. For example, when undertaking Water Use Planning to renew its licenses for Mica, Revelstoke and Hugh Keenleyside dams on the Columbia River, BC Hydro did not take into consideration climate change impacts in its modelling or mention it in its report.[38] Moreover, despite this shortcoming, the Province of British Columbia renewed the licenses for all facilities.[39]

According to the Columbia Basin Trust, "climate changes are expected to broadly impact the natural environment within the Basin, which is deeply interconnected with the Basin's economy and quality of life. Floods, wildfire and extreme weather can damage and disrupt infrastructure and landscape-based

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36. *See* WORLD BANK, *Financing Climate Change Adaptation in Transboundary Basins: Preparing Bankable Projects* (Jan. 2019), http://documents1.worldbank.org/curated/en/172091548959875335/pdf/134236-WP-PUBLIC.pdf.

37. *See* Osborn, *supra* note 1, at 106.

38. *See* PROVINCE OF B.C., COLUMBIA RIVER TREATY REVIEW: ENVIRONMENTAL DISCUSSION PAPER 41 (July 2013), https://engage.gov.bc.ca/app/uploads/sites/6/2012/07/CRT-Environmental-Paper-July-2013-FINAL.pdf. "Climate change scenarios were not specifically modelled. However, variability between year-to-year inflows is incorporated by utilizing the long data set of 60 years. Climate change scenarios are predicted to result in stream flows that are within range of variability seen in the historical dataset used. Consequently, the previous 60 year data set used is within the range of predicted future variability for the next 60 years." However, a BC Hydro study in 2012 noted that while overall annual water flows would not alter significantly in the coming decades, "the decrease in ice melt contributions to August streamflow exacerbates the low flows in late summer produced by an earlier snowmelt". *See* Georg Jost & Frank Weber, *Potential Impacts of Climate Change on BC Hydro-Managed Water Resources* 19 (Jul. 2013), http://www.bchydro.com/content/dam/hydro/medialib/internet/documents/about/climate_change_report_2012.pdf.

39. *See* BC HYDRO, *Columbia River Project Water Use Plan: Revised for Acceptance by the Comptroller of Water Rights* 1 (Jan. 11 2007), https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/environment/pdf/wup_columbia_water_use_plan_revised_for_acceptance_by_th.pdf. *See also Canada-US Columbia River Treaty*, GOV'T OF CAN. (Apr. 27, 2007), https://www.canada.ca/en/environment-climate-change/corporate/international-affairs/partnerships-countries-regions/north-america/canada-united-states-columbia-river.html. "The Canadian CRT dams are licensed through Environment and Climate Change Canada under this Act [International River Improvements Act of 1955], with 50-year license terms recently renewed in 2015, although conditional with continuation of the CRT."

activities such as forestry, agriculture, mining, recreation and tourism."[40] The Columbia Basin Trust further notes the following projected climate change impacts in the Columbia Basin:

> **Increase in the frequency and severity of wildfires**: Caused by increases in summer temperature, very hot days and longer warm spells; reduced summer precipitation and extended droughts; and, increases in wildfire fuel accumulation and pest outbreaks.
>
> **More frequent and intense droughts**: Expected due to a combination of lower winter snow packs at lower elevations, less summer rainfall and warmer summer temperatures with more hot days and longer warm spells.
>
> **Changes to species and ecosystems**: Some species will be resilient to new conditions, while others may migrate north or upslope to stay within suitable climate conditions. Some species may not be able to migrate and may decline. New invasive species may take advantage and move in.
>
> **Shifts in timing and scale of flooding**: Increased risk of flooding due to more frequent and intense rainstorms; increased glacier melt, rain on frozen ground, and rain on snow; and higher peak stream flows in winter. More of these events may occur in late winter/early spring.
>
> **Changes in glacial runoff**: Between 1985 and 2013, there was a twenty-three per cent loss of total glacial area in the Basin. Glacier retreat is expected to continue.
>
> **Increase in water temperature**: Rising summer air temperatures are expected to increase water temperatures in Basin streams and lakes, affecting temperature-sensitive species.
>
> **Changing stream flow patterns**: Expect earlier peak flows in spring, a decrease in late-summer flows and more rapid runoff in rivers and streams.
>
> **More landslides and changes in avalanche frequency**: Increases in winter precipitation and the increased frequency of extreme rainfall

40. COLUMBIA BASIN TRUST, *Climate Action in the Columbia Basin: Current and Projected Climate Change Impacts*, (2021), https://ourtrust.org/grants-and-programs-directory/climate-action-program/climate-action-in-the-columbia-basin/.

> events could contribute to increased landslide frequency. The effects on avalanche size and frequency are still uncertain.[41]

Experience from other jurisdictions could help inform the development of a more climate conscious CRT. Cooley and Gleick, in their seminal paper, "Climate-Proofing Transboundary Water Agreements," drew on international experiences and best practices to advance various strategies for trying to make future international water and energy agreements more responsive to climate change.[42] Prominent among these were the following: "(1) flexible water allocation strategies; (2) extreme events provisions; (3) amendment and review procedures; [and] (4) joint management institutions."[43]

(1) Flexible Water Allocation Strategies

As a result of global climate change, alterations in the timing and availability of flows in many river basins is occurring at an increasing rate.[44] This is not just the usual drought or flooding associated with extreme events, but in some situations, the temporal shifting of what is considered a "normal year flow," which is increasing the need to address questions of water allocation and uses.[45] Water sharing states are increasingly using flexible water allocation strategies to achieve more adaptive water supply in the face of climate change. For, example, rather than allocating water based on the assumption of a fixed, often too optimistic, perpetual water supply or fixed allocation strategy, there is an emerging trend towards allocating shared water resources in accordance with evolving social, economic and/or climatic conditions.[46]

Water allocation per se has not yet been a major issue in the CRT in comparison with the legacy focus on flood control and power production. However, this could change if/when, as anticipated, California's demand for freshwater continues to increase and/or if water allocation issues in sub-basins, such as the Snake River, continue to escalate. The challenge in the Columbia will also be to see that the benefits (and burdens) of the CRT are continuously and equitably shared within and between Canada and the United States, and there is a dynamic mechanism in place to help make that happen as circumstances evolve.[47]

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41. *Id.* (some emphasis removed).

42. Heather Cooley & Peter Gleick, *Climate-Proofing Transboundary Water Agreements*, 56 HYDRO. SCI. J. 711 (2011).

43. *Id.* at 711.

44. *Id.* at 714–15.

45. *Id.*

46. Cooley & Gleick, *supra* note 47, at 716.

47. Paisley et al., *supra* note 1, at 118–20. 0

There is currently some flexibility within the CRT agreement with respect to extra storage that British Columbia has developed *(e.g.*, the so-called Non-Treaty Storage Agreement (NTSA)), which was not included in the initial CRT.[48] The NTSA has been used successfully to accommodate various interests, including fisheries and recreation.[49] This flexibility might also be used to accommodate future climate alterations. For example, decisions entirely internal to Canada to deviate from Treaty Storage Regulations may be made with respect to flows below Mica or Revelstoke, provided discharges from Arrow are not affected and flood control is protected, as stipulated by the CRT.[50] Currently, negotiations could occur for flooding to improve survivability of Kokanee Red fish in certain stretches along the river above Arrow/Keenleyside.[51] Consequently, a modernized CRT could examine the additional flexibility of all storage infrastructure to assist basin wide objectives such as salmon migration. Furthermore, actual flow releases within the CRT can vary from the Assured Operating Plan (AOP) by mutual agreement, and for mutual benefit, either at the annual level during the development of the Detailed Operating Plan (DOP), at a monthly level through the Treaty Storage Regulation Agreement, or at the weekly level through the Weekly Treaty Flow Agreement.[52] In addition, there are supplementary agreements, which have been developed for ongoing concerns, which further provide tools to deviate from the prescribed AOP.[53] Provided there is "mutual benefit" in doing so CRT operations could be shifted to address climate change concerns.

An international example where specific flexibility is incorporated in a water-related treaty is **t**he 1996 Treaty on Sharing of the Ganges Waters at Farakka between Bangladesh and India, which allocates surface waters at the Farakka Barrage near the mutual border. Under Article IV, the treaty created a Joint Committee of representatives nominated by the two governments, who are tasked with setting up suitable teams to observe and record at Farakka the daily flows below Farakka Barrage and in the Feeder Canal in India, as well as the Hardinge Bridge point in Bangladesh.[54] The Barrage, constructed in 1975, diverts water from

48. *See generally Non-Treaty Storage Agreement Key Documents*, B.C. HYDRO https://www.bchydro.com/energy-in-bc/operations/our-facilities/columbia/ntsa/documents.html (last visited May 6, 2021).

49. *Id.*

50. *See generally* Columbia River Treaty, *supra* note 1.

51. GLEN HEARNS, COLUMBIA RIVER TREATY REVIEW: ENVIRONMENTAL DISCUSSION PAPER (2013), https://engage.gov.bc.ca/app/uploads/sites/6/2012/07/CRT-Environmental-Paper-July-2013-FINAL.pdf.

52. *See generally Assured Operating Plans and Detailed Operating Plans*, U.S. ARMY CORPS OF ENG'RS https://www.nwd.usace.army.mil/CRWM/PEB/CRT-Documents/ (last visited May 6, 2021).

53. *Supra* note 51 at 20.

54. *See* Treaty between the Government of the Republic of India and the Government of the People's Republic of Bangladesh on Sharing of the Ganga/Ganges Waters at Farakka, Bangl.-India, art. IV,1996 http://extwprlegs1.fao.org/docs/pdf/bi-17351.pdf [hereinafter Sharing of the Ganga/Ganges Waters at Farakka Treaty].

the Ganges into the Hooghly River to supply water for navigational use in Kolkata. The allocations are based on seventy-five percent of the mean annual flow measured between 1949 and 1988 which allows for some buffering in terms of variation in the hydraulic regime.[55] The schedule to the Agreement details allocations to both India and Bangladesh for ten periods between January 1 and May 1, and these allocations are reduced in proportion to the flow allowing for annual and seasonal variations.[56] However, the portion allocated to Bangladesh should not fall below 80 percent of its average allocation.[57] If the flow of the Ganges falls below a specified level, Article 2(iii) of the Schedule mandates "immediate consultations to make adjustments on an emergency basis, in accordance with the principles of equity, fair play and no harm to either party."[58] In another water allocation example, the Snake River Compact[59] apportions the upper part of the River between Wyoming and Idaho, where Idaho receives 96 percent and Wyoming 4 percent of the water used (Article 3). The water allocated is calculated on an annual basis based on the measurement of flows at specified places, and as a percentage of the flow changes as the flow changes.[60]

(2) Extreme Event Provisions

Perhaps the most common mechanism for enhancing flexibility in international water agreements is to include special provisions that govern particular kinds of exceptional circumstances, including droughts and floods. Floods, although posing serious risks for lower riparian states, are often ignored in much of the contemporary discourse on climate change concerning resilience and adaptability of international agreements.[61] However, as a result of climate change, extreme weather events are becoming more frequent and intense, thereby increasing the need to address questions of water allocation.

The key challenge for many water allocation arrangements is to strike a balance between robustness and flexibility. The CRT stipulates that Canada (the upstream party) will adjust its operation of hydroelectric dams to mitigate flooding in the United States, if "called upon" to do so.[62] However, as previously noted, this "called upon" mechanism is scheduled to expire in 2024 leaving only an as yet

55. *Id. See also* CHRISTINA LEB ET AL. PROMOTING DEVELOPMENT IN SHARED RIVER BASINS:TOOLS FOR ENHANCING TRANSBOUNDARY BASIN MANAGEMENT (World Bank Grp.'s Water Glob. Prac. 2018), https://openknowledge.worldbank.org/handle/10986/29462.

56. Sharing of the Ganga/Ganges Waters at Farakka Treaty, *supra* note 54.

57. Sharing of the Ganga/Ganges Waters at Farakka Treaty, *supra* note 54.

58. Sharing of the Ganga/Ganges Waters at Farakka Treaty, *supra* note 54, at Annexure II. .

59. Snake River Compact, Pub. L. No. 81-464, 64 Stat. 29 (1950).

60. *Id.*

61. Cooley & Gleick, *supra* note 42, at 711–18.

62. *See* Columbia River Treaty, *supra* note 1, at art. IV.

untested alternative mechanism in place. Whether this as yet untested mechanism will suffice, particularly in light of the increasing probability of "extreme events" due to climate alterations, is not yet clear. However, as an increasing percentage of flood flows will likely originate in Canada, a shift to "called upon" flood control in 2024 may mean the United States will be incentivized to negotiate a more secure regime for flood control in the modernized Treaty.[63] If so, then Canada can extract a price both in dollars and in regenerating ecosystem function in the Canadian portion of the Basin.[64]

Experience in dealing with extreme events in international agreements is relatively limited. However, the decision making around the water allocation mechanism under the Albufeira Convention on waters shared by Portugal and Spain is a possible example of what appears to be a reasonably effective approach to dealing with the challenge of extreme events associated with climate change, especially droughts.[65]

Portugal and Spain share the Iberian Peninsula territory, which has five major river basins, three of which are shared between the two countries: the Douro, the Tejo, and the Guadiana, and which represent about forty-six percent of its surface and groundwater resources.[66] In all three shared basins, Spain is the upstream country and Portugal the downstream country. Several cooperation agreements have emerged dating back to the end of the 19th century.[67] These agreements have in general focused narrowly on economic use, particularly for hydropower generation on the river with the highest potential, and were inadequate to address the growing issues the countries faced such as increasing water scarcity in the shared river basins, due to the exponential growth in water demand and the limited supply of water available, extreme drought in the early 1990s, Spain's plan to divert part of the Duoro, and growing environmental concerns in both countries.[68]

Consequently, in the context of new European Union (EU) legislation on water policy and management, the countries negotiated the Albufeira Convention in 1998 to establish minimum periodic flows for all five shared river basins and set up a transboundary Commission to implement the treaty and address ongoing concerns.[69] In addition to conducting studies for transboundary effects, part of the mandate of the Commission is to assist in the development of the planning and has

63. Email from Jon O'Riordan to Richard Paisley, Honorary Rsch. Assoc. Inst. Asian Rsch., U. British Columbia Sch. Pub. Pol'y Glob. Affs. (Feb. 2021) (on file with authors).

64. *Id.*

65. Spanish-Portuguese Albufeira Convention (Jan. 8–10, 2013), https://www.un.org/waterforlifedecade/water_cooperation_2013/albufeira_convention.shtml.

66. Ramón Llamas, *Transboundary Water Resources in the Iberian Peninsula, in* CONFLICT AND THE ENVIRONMENT (Gleditsh N.P. eds), NATO ASI Series (Series 2: Environment), vol. 33, Springer. (1997).

67. Leb, et. al. *supra* note 55.

68. Spanish-Portuguese Albufeira Convention, *supra* note 65.

69. Spanish-Portuguese Albufeira Convention, *supra* note 65.

recommendation powers to the parties extending to activities in sovereign areas of the basin to ensure sustainable development and use of the shared waters.[70] River flows are guaranteed on an annual and quarterly basis, and in most cases, minimum weekly and even daily river flows are also set, in order to preserve environmental flows and related ecosystem functions.[71] Once the thresholds defining the emergency period are crossed, the parties may declare an emergency and are thereby no longer bound to any minimum flow.[72]

The Convention establishes the minimum flows and conditions for various sections of the shared rivers.[73] To determine the exception period, a set of rain gauge stations (three or four) is used for each flow control station to verify whether the accumulated average rainfall is less than sixty-five percent of the historical average (measured from October 1 to June 1 for annual flows, and from the start of the previous quarter to the end of the current quarter for quarterly and weekly flows).[74] When average rainfall is less than the historical average, Spain may declare an emergency (regime) and consequently not release the minimum flows agreed.[75] The emergency regime ends as soon as the accumulated values (after December, for the annual flows) again exceed the historical average.[76] The revised flow regime has allowed for better compliance by both countries with the 2000 Water Framework Directive environmental requirements, while ensuring a more equitable distribution over time of the water resources released (from Spain to Portugal) over the year.[77]

(3) Amendment and Review Procedures

Water insecurity is increasingly caused by climate change.[78] This is especially true of water insecurity caused by the seemingly inexorable switch from snow to rain in winter.[79] Snow acts as a storage battery for power as it releases water over the spring and summer to even out hydropower benefits.[80] However, in a hydrologic regime dominated by rain, there are flows throughout in the winter and no storage to fall back on in the critical summer months where power demand is

70. Spanish-Portuguese Albufeira Convention, *supra* note 65.
71. Spanish-Portuguese Albufeira Convention, *supra* note 65
72. Spanish-Portuguese Albufeira Convention, *supra* note 65.
73. Spanish-Portuguese Albufeira Convention, *supra* note 65.
74. Spanish-Portuguese Albufeira Convention, *supra* note 65
75. Spanish-Portuguese Albufeira Convention, *supra* note 65
76. Spanish-Portuguese Albufeira Convention, *supra* note 65
77. Spanish-Portuguese Albufeira Convention, *supra* note 65
78. *See Water and Climate Change*, UN WATER, https://www.unwater.org/water-facts/climate-change/ (last visited May 6, 2021).
79. Personal email communication with Jon O'Riordan (Feb. 2021).
80. *Id*.

high due to air conditioning, water flows are low for fish and there is a high demand for irrigation and municipal water.[81]

Amendment and periodic review procedures give riparian States opportunities to address unforeseen circumstances while re-synchronizing national and basin-wide strategies with new knowledge and changing circumstances.[82] These processes are crucial for sustainability because, through time, hydrological and climatic conditions on which agreements are based will likely change significantly.[83] Several procedural mechanisms can be used to make adjustments that are increasingly necessary and/or desirable.

Perhaps the most well-known such procedural mechanism is the "minute" system that governs relations involving the United States and Mexico regarding the Rio Grande.[84] Treaties between Mexico and the United States authorized the development of rules and the ability to issue proposed decisions, called minutes, regarding matters related to the Treaty's execution and interpretation.[85] Once issued, a proposed minute is forwarded within three days to the government of each country for approval.[86] If neither country announces its disapproval within 30 days, the minute is considered adopted.[87] If either government disapproves, the matter is removed from IBWC control and the two governments negotiate the issue.[88] If an agreement is reached between the governments following negotiation, an international river basin organization governing relations between the United States and Mexico must take any further actions "as may be necessary to carry out such agreement."[89] The Department of State is the United States agency responsible for responding to proposed minutes and attempting to negotiate a resolution if either government disapproves.[90] Minutes that have been adopted pursuant to the 1944 Treaty on the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande have addressed a range of issues, including to adjust water allocations, as well as to address salinity issues that have arisen

81. *Id.*

82. Heather Cooley & Peter H. Gleick, *Climate-Proofing Transboundary Water Agreements*, 56 HYDROLOGICAL SCI. J. 711, 711–18 (2011).

83. *Id.*

84. *See* Minutes between the United States and Mexican Sections of the IBWC https://www.ibwc.gov/Treaties_Minutes/Minutes.html (last visited May 6, 2021). *See also* Nicole T. Carter et al., *U.S.-Mexican Water Sharing: Background and Recent Developments*, CONGRESSIONAL RESEARCH SERVICE (Mar. 2, 2017), https://fas.org/sgp/crs/row/R43312.pdf. *See also* Richard Kyle Paisley et al., *Transboundary Water Management: An Institutional Comparison Among Canada, The United States and Mexico*, 9 OCEAN & COASTAL L.J. 177 (2004).

85. Nicole T. Carter et al., *U.S.-Mexican Water Sharing: Background and Recent Developments*, CONGRESSIONAL RESEARCH SERVICE (Mar. 2, 2017), https://fas.org/sgp/crs/row/R43312.pdf

86. *Id.*

87. *Id.*

88. *Id.*

89. *Id.*

90. *Id.*

since the signing of the treaty.[91] They have also been used to adjust the set delivery schedules of water allocated to Mexico, for example, due to infrastructure damage associated with an earthquake in 2010.[92] In many cases, minutes are adopted (or not objected) by the Secretary of State without involvement from the United States Congress or the United States Senate.[93] Due to the fact these minutes are agreed to by the executive branch pursuant to the authority of the 1944 Water Treaty, they are considered binding agreements between the United States and Mexico, called executive agreements, and the power to enter them lies within the executive branch.[94] The ability of the IBWC to adapt, amend and extend the institutional arrangement between the countries is a powerful tool to develop a resilient form of cooperation.[95]

Much also continues to be written in the academic literature, and the popular press, about uncertainty, resilience and adaptive management.[96] In theory, science and scientists have an important influence over the way in which good governance is implemented and applied.[97] In practice, the model of science in decision making which has largely been relied on in establishing the governance regime in e.g., the Columbia Basin has typically been an episodic interaction model where scientists have at best been called upon to prepare and submit reports that have helped to shape the policy process.[98] Such scientists have relatively seldom been called upon to participate in the selection of policy alternatives which usually involve compromise and bargaining for which they are often deemed to be unsuited.[99]

In fundamental contradistinction to an episodic interaction model of utilization of scientific information in environmental decision making is an adaptive management approach to the utilization of scientific information in decision making.[100] The advantage of an adaptive management approach is that it would allow for action in the face of scientific uncertainties as well as help keep the

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91. Leb, et. al. *supra* note 55.

92. *Id*.

93. *Id*.

94. Nicole T. Carter et al., *U.S.-Mexican Water Sharing: Background and Recent Developments*, CONGRESSIONAL RESEARCH SERVICE (Mar. 2, 2017), https://fas.org/sgp/crs/row/R43312.pdf

95. Richard Kyle Paisley et al., *Transboundary Water Management: An Institutional Comparison Among Canada, The United States and Mexico*, 9 OCEAN & COASTAL L.J. 177 (2004).

96. *See* Barbara Cosens, *Transboundary River Governance in the Face of Uncertainty: Resilience Theory and the Columbia River Treaty*, 30 J. LAND RESOURCES & ENVTL. L. 229 (2010).

97. *See* Barbara A. Cosens et al., *Designing Law to Enable Adaptive Governance of Modern Wicked Problems*, 73 VAND. L. REV. 1687 (2020); *See also* David Marmorek et al., *Adaptive Management and Climate Change Adaptation: Two Mutually Beneficial Areas of Practice*, 55 J. AM. WATER RESOURCES ASS'N 881 (2019); Richard Kyle Paisley, *Laws, the Legal System, and the Conservation and Protection of the Fraser River Estuary*, *in* FRASER RIVER DELTA, BRITISH COLUMBIA: ISSUES OF AN URBAN ESTUARY 272 (2004).

98. *See* Paisley, *supra* note 97, at 272.

99. *Id*.

100. Barbara Cosens et al., *Reconciliation of Development and Ecosystems: The Ecology of Governance and the Governance of Ecology in the International Columbia River Basin*, 18 REGIONAL ENVTL. CHANGE 1679 (2018).

powerful problem solving characteristics of the scientific method continuously engaged in the service of policy development.[101] Such a model would also be more conducive to application of a more precautionary approach to environmental management which would require policy makers act with due caution in light of scientific uncertainty, taking (cost effective) measures that are possible, regardless of whether they appear environmentally essential at the time.[102] Adaptive management done well is more than mitigating change. Done right, adaptive management is a deliberative process of trying new approaches to water management in the face of uncertainty; carefully monitoring key success factors over a number of years and then making adjustments as the hydrology continues to change.[103] Ideally a new CRT will have both an adaptive hydrologic approach and an adaptive governance approach.[104]

(4) Joint Management Institutions

Sustainable transboundary water governance is often found inextricably linked throughout the world with international river basin organizations (IRBOs).[105] Indeed, developing an institutional structure for joint management of transboundary watercourses is often considered essential for the pragmatic application of both substantive and procedural principles governing transboundary watercourses.[106] A logical next step in the dynamic evolution of Columbia governance could well be the establishment of an appropriate IRBO—especially an IRBO with meaningful indigenous participation.[107]

Far from being mere technical institutions, many IRBOs are key mechanisms of water diplomacy, with capacity and effectiveness varying on various interrelated factors, including their legal and institutional development and the effectiveness of their legal and strategic resources.[108] IRBOs also support countries' adaptation and resilience building beyond what any individual country could achieve on its own.[109]

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101. *See* Paisley, *supra* note 97, at 272.

102. *Id.*

103. Jon O'Riordan *supra* note 79.

104. *Id.*

105. GLOB. INST., RIVER BASIN ORGANIZATIONS IN WATER DIPLOMACY 2–3, 22 (Susanne Schmeier & Anoulak Kittikhoun eds., 2020).

106. Glen Hearns & Richard Kyle Paisley, *Lawyers Write Treaties, Engineers Build Dikes, Gods of Weather Ignore Both: Making Transboundary Waters Agreements Relevant, Flexible, and Resilient in a Time of Global Climate Change*, 6 GOLDEN GATE U. ENVTL. L.J. 259, 262 (2013).

107. *Matthew J. McKinney et al., A Sacred Responsibility: Governing the Use of Water and Related Resources in the International Columbia Basin Through the Prism of Tribes and First Nations,* 37 Pub. Land & Resources L. Rev. 159 (2016).

108. GLOB. INST., RIVER BASIN ORGANIZATIONS IN WATER DIPLOMACY 3 (Susanne Schmeier & Anoulak Kittikhoun eds., 2020

109. *Id.*

The World Bank states that "[I]RBOs can [also] help coordinate policies and planning, support effective implementation, and avoid the pitfalls of maladaptation, in which good intentions result in unwanted or unpredicted results.[110] For example, engaging [I]RBOs in the process of developing regional or national investment plans can provide a broader regional perspective and thereby help to mitigate risks and capitalize on broader opportunities."[111] Several IRBOs are taking specific cooperative approaches to addressing climate change, including by taking action by collecting climate-related data, developing adaptation strategies, and implementing activities on the ground.[112] Sometimes the need for cooperation on climate change can even facilitate transboundary cooperation more broadly. [113]

An example is in the Mekong River Basin, where the Mekong River Commission (MRC) has helped parties to identify ways to maximize and share benefits and ultimately unlock entrenched or zero-sum positions, allowing parties to develop cooperative and constructive relationships that have been successfully carried over to other areas.[114] The Mekong Climate Change Adaptation Strategy and Action Plan (MASAP) 2018–2022 supports the MRC member countries in planning for addressing transboundary impacts of climate change and needs for transboundary adaptation in the Lower Mekong Basin.[115] The MASAP, which was approved in 2017, sets out the MRC's strategic priorities and actions at the basin level.[116] These include the following: "Mainstream climate change into regional and national policies, programs, and plans; Enhance regional and international cooperation and partnership on adaptation; Prepare transboundary and gender-sensitive adaptation options; Support access to adaptation finance; Enhance monitoring, data collection, and sharing; Strengthen capacity on development of climate change adaptation strategies and plans; and Improve outreach of MRC products on climate change and adaptation. . . ."[117]

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110. WORLD BANK, FINANCING CLIMATE CHANGE ADAPTATION IN TRANSBOUNDARY BASINS: PREPARING BANKABLE PROJECTS 4 (2019), http://documents1.worldbank.org/curated/en/172091548959875335/pdf/134236-WP-PUBLIC.pdf.

111. *Id.*

112. *Id.*

113. *Id.* at 5.

114. Richard Kyle Paisley, Patrick Weiler & Taylor Henshaw, *Transboundary International Waters Governance Through the Prism of the Mekong River Basin*, *in* TRANS-JURISDICTIONAL WATER LAW AND GOVERNANCE.57 Janice Gray, Cameron Holley & Rosemary Rayfuse eds., 2016).

115. MEKONG RIVER COMM'N FOR SUSTAINABLE DEV., MEKONG CLIMATE CHANGE ADAPTATION STRATEGY AND ACTION PLAN (2018), https://www.mrcmekong.org/assets/Publications/MASAP-book-28-Aug18.pdf.

116. *Id.*

117. *Id.* at 30.

V. BUILDING ECOSYSTEM FUNCTION INTO THE CRT

Among the driving forces behind current initiatives to renegotiate the CRT is the expressed interest to address various negative social and environmental consequences that have come to be associated with the CRT.[118] Inundation of land created by the CRT dams flooded an estimated 40,000 ha of lake systems, 8,500 ha of rivers, 12,000 ha of wetlands and 20,000 ha of floodplains largely in Canada.[119] Inundation of various rivers and lake systems in Canada, as a result of the CRT, continues to have a significant impact on fish and wildlife populations.[120] Fluctuations in reservoir levels for power production purposes has resulted in diminished littoral productivity, which appears to have led to declines in resident fish populations.[121]

Before the CRT, and the advent of large-scale industrial fisheries, the Columbia may well have been the most productive salmon bearing river on the west coast of North America.[122] Migration of Pacific salmon in the 1930s into the upper Basin was negatively affected by the American Bonneville and Rock Island dams in the lower portion of the river.[123] Subsequently, the passage of salmon from the United States into Canada was terminated by the building of the Grand Coulee (1948) and Chief Joseph (1955) dams in the United States portion of the Columbia. Input from communities and indigenous groups into decisions regarding the establishment, and ongoing operation, of the original CRT was limited.[124] This alone has led to various demands for more, and better, public participation in decision-making by a combination of local governments, non-governmental organizations, and, especially, indigenous peoples.[125]

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118. CHARLES V. STEIN, CONG. RESEARCH SERV., R43287, COLUMBIA RIVER TREATY REVIEW 10 (version 23, 2020), https://fas.org/sgp/crs/misc/R43287.pdf.

119. FISH AND WILDLIFE COMPENSATION PROGRAM, *Columbia Region: Overview and Action Plans* 6 (2019) https://fwcp.ca/app/uploads/2019/08/Action-Plan-Columbia-Region-Overview-Aug-21-2019.pdf.

120. *Id.*

121. *Id.*

122. Willis E. McConnaha & Richard N. Williams, *Forward* in RETURN TO THE RIVER: RESTORING SALMON TO THE COLUMBIA RIVER ix (ed. Richard Williams) (2005).

123. FISH AND WILDLIFE COMPENSATION PROGRAM, *supra* note 121, at 19.

124. GLEN HEARNS, THE COLUMBIA RIVER TREATY: A SYNOPSIS OF STRUCTURE, CONTENT, & OPERATIONS 14 (2008). http://www.ccrf.ca/uploads/Hearns_CRT_Structure_and_Content_Finalrev_20091207.pdf

125. *See* Matthew J. McKinney, Richard Kyle Paisley & Molly Smith Stenovec, *A Sacred Responsibility: Governing the Use of Water and Related Resources in the International Columbia Basin Through the Prism of Tribes and First Nations* 37 PUB. LAND & RES. L. REV. 157, 187 (2016).

According to Flores et al., "Ecosystem-based function"[126] describes nature's value as inherent and independent of any human assessment.[127] Rather, humans are an integral part of the ecosystem as opposed to users or benefactors of the ecosystem. The concept recognizes that nature has a voice and a value simply by virtue of existing, and that this value does not depend on any human estimation of what nature provides."[128]

According to the Columbia Basin Tribes, "the ecosystem-based function of the Columbia River watershed is its ability to provide, protect, and nurture subsistence and cultural resources, traditions, values, and landscapes throughout its length and breadth. Clean, abundant water is a core part of this concept. This resource must be sufficient to sustain life, healthy fish, wildlife, and plant populations that are vital to tribal traditions and way of life".[129] A restored, resilient and healthy watershed, the Columbia Basin Tribes note, will demonstrate ecosystem-based function through:

- Increased spring and early summer flows resulting in a more natural hydrograph;
- Higher and more stable headwater reservoir levels;
- Restored and improved fish passage to current and historical habitats;
- Higher river spring flows during dry years;
- Lower late summer water temperature;
- Reconnected floodplains throughout the river, including a reconnected lower river estuary ecosystem

126. Various indigenous peoples dislike this concept as it may imply such services are up for grabs so long as the price is right. They talk only about ecosystem functions as they feel a spiritual and emotional link to ecosystems that are unpriced. Jon O'Riordan, *supra* note 79.

127. *Id.*

128. LOLA FLORES ET AL., EARTH ECONOMICS, THE VALUE OF NATURAL CAPITAL IN THE COLUMBIA RIVER BASIN: A COMPREHENSIVE ANALYSIS 31 (2017). They note that "natural capital and ecosystem services, on the other hand, are economic concepts that specifically apply to natural products and processes that produce a benefit for humans and that can be valued monetarily. In this report, the term ecosystem services applies to all natural benefits that are assigned a monetary value." *Id.*

129. *See Ecosystem Based Function*, COLUMBIA BASIN INTER-TRIBAL FISHERIES COMMISSION (2021), https://www.critfc.org/tribal-treaty-fishing-rights/policy-support/columbia-river-treaty/definition-of-ecosystem-based-function/.

- Enhanced Columbia River plume and near shore ocean through higher spring and early summer flows and lessened duration of hypoxia; and,

- An adaptive and flexible suite of river operations responsive to a great variety of changing environmental conditions, such as climate change and population demand.[130]

Proposed mechanisms to improve ecosystem function include:

- Adding Ecosystem Function (EF) as a third and equal primary purpose of the CRT;

- Ensuring equal and effective representation of EF objectives in all dam operations and related decision-making;

- Increase operational flexibility for all the dams in the upper Columbia and Kootenay systems to allow for experimentation under an "active adaptive management" program to explore changes that will restore and/or enhance terrestrial, wetland and stream ecosystems and habitats within reservoir footprints and river reaches downstream of dams (including peaking impacts). Experimental implementation of the Mid-Arrow third scenario2 provides a starting point for such exploration;

- Explore greater coordination between the US and Canada regarding operations on the Kootenay River system, including the Libby Dam, with a focus on increasing EF throughout the system; and,

- Significantly increase secure long-term funding to the Fish and Wildlife Compensation Program for the Columbia Basin and other ecosystem programs like the Creston Valley Wildlife Management Area to enhance and expand ecosystem restoration and environmental impact mitigation activities in the Upper Columbia Basin.[131]

130. *Id.*

131. *See* IMPROVING ECOSYSTEM FUNCTION IN THE CANADIAN (UPPER) COLUMBIA BASIN DISCUSSION PAPER 2 (2018), https://engage.gov.bc.ca/columbiarivertreaty/review/technical-studies/.

Clearly current negotiations between Canada and the United States on modernizing the CRT provide an unprecedented opportunity to also consider ways to improve ecosystem function within the Columbia Basin.[132] This will require developing objectives for what a healthy ecosystem would look like and ways to measure whether these objectives are being met.

Applying ecosystem-based function within a modernized CRT will also require a deft balancing of environmental interests with those of flood control and power generation. This will only legitimately be achieved through concerted communication with the various stakeholders and interested parties throughout the basin on an ongoing basis to ensure environmental function is adequately defined and maintained as climate change impacts the Basin. In the Great Lakes, Canada and the United States achieves this dialogue through the Great Lakes Public Forum, which convenes tri-annually to discuss environmental issues, such as restoration and protection of Great Lakes water quality and ecosystem health, and to share ideas and visions for the future.[133] It provides a platform to bring together the diverse stakeholders and groups, such as local communities, academics, NGOs, indigenous governments, and local and federal government to exchange understanding and interests, review actions and studies and help set current and future priorities.[134]

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132. Payments for Ecosystem Services are also likely to be exceedingly important in any re-negotiation of the CRT because of the Canadian Entitlement ("CE"). The CE is the amount the United States pays to Canada annually as the only source of compensation from the US to Canada for Canada having built, and continued to operate in a coordinated manner, various dams upstream in Canada which significantly increase the value of power generated downstream at various US dams. *Supra* note 51 at 119. Canada would like to see the CE, or the equivalent, continue for so long as Canada suffers detrimental impact from the construction and operation of the dams upstream and/or for so long as activities/structures in Canada continue to provide benefits to the United States. *Supra* note 51 at 119. Canada says those benefits are particularly significant and include ecosystem services. *See* BC MINISTRY OF ENERGY AND MINES, *U.S. Benefits from the Columbia River Treaty – Past, Present and Future: A Province of British Columbia Perspective* 16, https://engage.gov.bc.ca/app/uploads/sites/6/2012/07/US-Benefits-from-CRT-June-20-13-2.pdf.

133. *See Great Lakes Public Forum*, BINATIONAL.NET, https://binational.net/engagement-participation/forum/ (last visited Apr. 19, 2021).

134. *Id.*; *see also* John D. Hall, et al., *Progress Toward Delisting a Great Lakes Area of Concern: The Role of Integrated Research and Monitoring in the Hamilton Harbour Remedial Action Plan*, 113 ENVTL. MONITORING & ASSESSMENT 227 (2006); Thomas C Beierle & David M Konisky, *What are we Gaining from Stakeholder Involvement? Observations from Environmental Planning in the Great Lakes*, 19 ENV'T AND PLANNING C: GOV'T AND POLICY 515 (2001). Despite the success of Annex 9 to the 2012 Great Lakes Water Quality Agreement (GLWQA)—which commits the Parties "communicate and coordinate bi-nationally regarding ongoing developments of domestic science, strategies and actions to build capacity to address

The Danube River Basin has the effective "Danube Environmental Forum" to balance interests of flood control, navigation, and power generation.[135] Indeed, the Danube provides an example of how environmental interests can be integrated into existing priorities in a highly internationalized river basin. The Danube is arguably the most international river basin in the world. Covering some 801,463 km^2, the Danube drains territories from 19 countries before discharging into the Black Sea.[136] Governance of the river has evolved over centuries through a series of international agreements.[137] Indeed, international governance of the parts of the basin date back to the initial Danube Commission in 1856 which focused on navigation.[138] Water management regimes have thus evolved over time for specific areas, such as navigation or environmental protection, and a complex series of cross linkages between regimes now exists –often at odds with each other. The cornerstone agreement that has significantly influenced the use of the Danube waters was the Convention for the Regulation of Navigation on the Danube (Danube Navigation Convention) was signed in 1948 and came into force the following year.[139] The convention is coordinated by the Danube Commission (DC). While ostensibly dealing with navigation, the Commission addresses maintenance

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the climate change impacts on the Great Lakes Basin Ecosystem" *See* Great Lakes Water Quality Agreement: annex 9, Can.-U.S., 2012, ¶B. https://www.canada.ca/en/environment-climate-change/services/great-lakes-protection/2012-water-quality-agreement/annex-9.html.—the Parties have not been able to develop a long-term binational framework for action supporting climate change adaptation and resilience, and resiliency planning continues to be taken at a municipal or local levels without adequate resources or connection to the larger ecosystem perspective. *See* Pamela A. Jordan, *Hands across the water: climate change and binational cooperation in the Great Lakes Basin*, 161 CLIMATE CHANGE 479 (2020).

135. Gerhard Nagl, *New Infrastructure Projects and a Biodiversity Strategy in the Danube River Basin*, 20 RIVER SYS. 111–112 (2012); *See also* Michael Schillmeier & Wiebke Pohler, *The Danube and Ways of Imagining Europe*, 58 THE SOC. REV. 26 (2011)

136. Robert McInnes, *Danube River Basin Regional Management Agreement*, *in* THE WETLAND BOOK I: STRUCTURE AND FUNCTION, MANAGEMENT, AND METHODS 546 (2018);

See also Countries of the Danube River, INTERNATIONAL COMMISSION FOR THE PROTECTION OF THE DANUBE RIVER, https://www.icpdr.org/main/danube-basin/countries-danube-river-basin (last visted June 29, 2021). The Danube Basin contains parts of Albania, Austria,* Bosnia i Herzegovina,* Bulgaria,* Croatia,* Czech Republic,* Germany,* Hungary,* Italy, North Macedonia, Moldova,* Montenegro,* Poland, Romania,* Serbia,* Slovak Republic,* Slovenia,* Switzerland and Ukraine*. A * refers to member countries of the ICPDR.

137. *See Danube River Basin*, IW-LEARN INT'L WATERS LEGAL FRAMEWORKS, https://iwlearn.net/documents/legal-frameworks/danube-river-basin (2021).

138. Joanne Yao, *'Conquest from barbarism': The Danube Commission, International Order and the Control of Nature as a Standard of Civilization*, 25 EUROPEAN J. OF INT'L RELATIONS 335, 336–37 (2018).

139. Übereinkommen über die Regelung der Schifffahrt auf der Donau [Convention for the Regulation of Navigation on the Danube], Aug. 18, 1948 [1949], 33 U.N.T.S. 181. Members include Austria, Bulgaria, Croatia, Germany, Hungary, Moldova, Serbia and Montenegro, Slovakia, Romania, Russia, and Ukraine. *Id.*

of shipping channels, safety issues, regulation of hydropower structures, hydrometeorology, and environmental impacts of navigation.[140]

However, the Danube Navigation Convention was not sufficiently broad to address growing environmental understanding in the 1980s.[141] This increasing awareness of the importance of ecosystems and environmental issues prompted the "Convention on Co-operation for the Protection and Sustainable Use of the Danube River (DRPC)," which was signed in 1994[142] and ratified in 1998. Its substantive scope addresses river basin management, environmental and water protection, regional sustainable development, flood protection, the effects of hydraulic works, transboundary groundwater, research, and monitoring.[143] The International Commission for the Protection of the Danube River (ICPDR) implements the convention and together with the Danube Commission developed principles for balancing environmental objectives with the intensive hydropower generation, flood protection, navigation and land use that exists in the Danube basin.[144] The balancing of the competing interests in the basin is partially achieved through a robust platform for dialogue called the Danube Environmental Forum (DEF) that has been operating since 1994 to coordinate activities of non-governmental organisations and civil society.[145] DEF has a strong secretariat, serving 174 member organizations and national focal points from 13 Danube countries.[146] The success of the Environmental Program for the Danube River for controlling pollution and addressing biodiversity is in part due to the active inclusion of NGO and public participation in the DEF. Involvement of NGOs, in particular, helps to diffuse the confrontational setting within the basin and allows interaction between local levels.[147] Moreover, the DEF has helped shape regional

140. Joanne Linnerooth, *The Danube River Basin: Negotitating Settlements to Transboundary Environmental Issues*, 30 NAT. RES. J. 629, 630–631 (1990); Joanne Linnerooth & Susan Murcott, *The Danube River Basin: International Cooperation or Sustainable Development*, 36 NAT. RES. J. 521, 635–34 (1996).

141. Joanne Linnerooth & Susan Murcott, *The Danube River Basin: International Cooperation or Sustainable Development*, 36 NAT. RES. J. 521, 636 (1996).

142. Convention on Cooperation for the Protection and Sustainable Use of the Danube River, June 29, 1994, E.U.T.S. 68; OJ L 342. Members include Austria, Bosnia i Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Moldova, Romania, Serbia and Montenegro, Slovak Republic, Slovenia, Ukraine, and also the European Community.

143. *Id.*

144. *Joint Statement: Navigation & Environment*, INT'L COMM'N FOR THE PROT. OF THE DANUBE RIVER, http://www.icpdr.org/main/activities-projects/joint-statement-navigation-environment (last visited Apr. 19, 2021).

145. Alister Rieu-Clarke, *An Overview of Stakeholder Participation Within the Danube Basin: Current Practices and Future Challenges*, 18 COLO. J. INT'L L. AND POL'Y 628 (2007).

146. Kari Aina Eik, *International Development of NGOs: Danube Environmental Forum (DEF)*, INT'L WATERS EXPERIENCE NOTES 3 (2006), https://iwlearn.net/resolveuid/a8aa848ad0ee79b6ed412f06babda9a6.

147. Rieu-Clark, *supra* note 145, at 632.

policy documents, such as the European Union Strategy for the Danube Region, which includes developing basin and sub-basin level biodiversity strategies to assess impacts and promote species and habitat protection, while acknowledging the benefits of navigation and hydropower development for climate change mitigation.[148] Part of the power of DEF, is that as it contains citizens and politically independent non-profit-organizations from the Danube countries it goes beyond trying to gain direct influence over local, national and international policies.[149] It can therefore promote and discuss ideas and actions which might be out of bounds from a political perspective allowing new viewpoints to enter into the decision-making arena.

Two key issues under consideration in the CRT renegotiations are (1) how and to what extent should the environmental and socioeconomic impacts of climate change be addressed; and (2) how to include ecosystem function as a possible co-equal CRT objective along with the legacy objectives of power generation and the flood control. Undoubtedly, a greater awareness of the impacts of climate change is required when critically reviewing the extent of possible physical and operational adaptation and resilience mechanisms needed in the Columbia River and how these can be addressed within a revised Treaty. Additionally, and equally important, is the need to incorporate climate conscious planning and adaptation into the decision-making institutions which will implement the revised CRT. Likewise, incorporating ecosystem function as an objective alongside flood control and power generation will not be satisfied through application of a well-crafted scientific or even cultural definition, but rather will demand on-going interaction and dialogue with those communities and groups who engage with the River and its environment on a daily basis. On-going dialogue is all the more important when considering the potential uncertainty associated with climate change.

148. Nagl *supra* note 135, at 127; *see also EU Strategy for the Danube Region*, EUR. COMM'N, https://ec.europa.eu/regional_policy/en/policy/cooperation/macro-regional-strategies/danube/ (last visited Apr. 19, 2021).

149. Michael Schillmeier & Wiebke Pohler, *The Danube and Ways of Imagining Europe*, 58 SOC. REV. 25 (2011).

The above commentary provides some strategies and corresponding examples from the international experience[150] that those tasked with renegotiating CRT could consider during their deliberations to modernize the governance regime of the Columbia Basin. Only time will tell whether, and to what extent, a modernized CRT will succeed keeping in mind:

> …there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things. Because the innovator has for enemies all those who have done well under the old conditions, and lukewarm defenders in those who may do well under the new. This coolness arises partly from fear of the opponents, who have the laws on their side, and partly from the incredulity of men, who do not readily believe in new things until they have had a long experience of them.
>
> Machiavelli, The Prince, 1532[151]

150. Shared international waters agreements and their associated governance regimes vary greatly throughout the world in regard to their political, hydrological, biological, economic and social circumstances. This needs to be considered with great humility when attempting to transfer knowledge and/or institute change.

151. NICCOLÒ MACHIAVELLI, THE PRINCE 31 (W.K. Marriott, trans., 1908, Lerner Publ'g Group, 2019) (1532).