WATERS OF RECONCILIATION: MODERNIZING THE INDUS WATERS TREATY FOR CLIMATE RESILIENCE AND COOPERATION

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The Indus Waters Treaty (IWT), signed in 1960 between India and Pakistan, remains a cornerstone of water-sharing in South Asia but faces unprecedented challenges due to climate change. This paper explores the current challenges arising from climate variability, such as glacial melt, altered precipitation patterns, and extreme weather events, which threaten water security and regional stability. It emphasizes the need to modernize the IWT to enhance climate resilience and promote cooperation. This paper evaluates the limitations of the IWT in addressing climate-induced challenges and explores potential legal and institutional reforms to make the treaty climate-resilient. Key recommendations include enhancing the role of the Permanent Indus Commission (PIC), incorporating adaptive management practices, expanding the treaty's mandate to address groundwater resources, and improving data-sharing mechanisms. Drawing lessons from international frameworks, the analysis highlights the necessity of integrating environmental considerations to ensure the treaty remains relevant in an era of environmental uncertainty.

I. INTRODUCTION

In 1995, Ismail Serageldin, then Vice President of the World Bank, warned "if the wars of this century were fought over oil, the wars of the next century will be fought over water . . . ."[1] The mention of Serageldin's prognosis provides a constant reminder of how vital fresh, pure water is to human survival. It

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1. VANDANA SHIVA, WATER WARS: PRIVATIZATION, POLLUTION AND PROFIT vii (South End Press 2016).

is imperative to consider the frequency with which communities turn to violence in response to water-related challenges. However, we should also investigate whether the nature of water as a necessity could promote cooperation and peace between nations rather than acting as a crisis multiplier. His remarks are even more pertinent now, as disputes over shared waterways erupt everywhere from South America to Eastern Europe.[2] Despite tense geopolitical ties between India and Pakistan, the 1960 Indus Water Treaty ("IWT"),[3] which divided the shared Indus River System between the two nations, is a unique example of international diplomacy that has endured over the past 60 years.

The IWT was concluded in 1960 after nine years of discussions between India and Pakistan, with assistance from the World Bank, which is also a signatory. Eugene Black, former president of the World Bank, initiated the negotiations. Former U.S. President Dwight Eisenhower referred to it as "one bright spot . . . in a very depressing world picture that we see so often."[4]

The IWT has long been hailed as a successful framework for managing water resources between India and Pakistan, two nations often mired in geopolitical tensions. The Treaty gives Pakistan the Western Rivers (Indus, Jhelum, and Chenab) and India the Eastern Rivers (Ravi, Beas, and Sutlej Main).[5] The Treaty also permits specific uses by each nation on the rivers that are allotted to them.[6]

However, climate change poses a new set of challenges that the IWT, in its original form, may not be equipped to handle. South Asia, particularly the Indus Basin, is highly vulnerable to climate-induced disruptions, including rising temperatures, shifting precipitation patterns, and accelerating glacial melt.[7] These changes threaten the stability of water resources,

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2. Ian James, *Water increasingly at the center of conflicts from Ukraine to the Middle East*, L.A. Times (Dec. 28, 2023), https://www.latimes.com/environment/story/2023-12-28/water-related-conflicts-on-the-rise-worldwide.

3. Indus Waters Treaty, India-Pak., 419 U.N.T.S. 125, Sept. 19, 1960, [hereinafter IWT].

4. Fact Sheet: The Indus Waters Treaty 1960 and the Role of the World Bank (2018), https://www.worldbank.org/en/region/sar/brief/fact-sheet-the-indus-waters-treaty-1960-and-the-world-bank.

5. IWT, *supra* note 3, at arts. I, II and III.

6. *See id.*

7. Usaid Siddiqui, *What makes South Asia so vulnerable to climate change?*, Aljazeera (July 8, 2023), https://www.aljazeera.com/news/2023/7/8/what-makes-south-asia-so-vulnerable-to-climate-change.

with profound implications for agriculture, food security, and economic development in both nations.[8] According to the Intergovernmental Panel on Climate Change, increased temperatures, changing precipitation patterns, and extreme weather events are becoming more frequent.[9] Populations in South Asia are vulnerable to such changes.[10] Further, changing rainfall patterns pose an additional challenge; the Himalayan glaciers, which feed the Indus River, are melting at an alarming rate.[11] Short-term increases in river flows will be offset by long-term reductions in water availability.[12] Current provisions in the IWT lack mechanisms to address these evolving challenges, necessitating a revision of the treaty to incorporate climate resilience and cooperative frameworks for sustainable water management.

This commentary examines the limitations of the IWT in light of current climate realities and explores legal reforms that could strengthen the treaty's ability to adapt to future climate variability, with a particular focus on enhancing the role of the Permanent Indus Commission, improving data-sharing practices, and fostering cooperative management of shared water resources by drawing lessons from disputes between the countries with respect to the IWT. India recently asked to amend the IWT,[13] pointing to Pakistan's "intransigence" in settling unresolved issues.[14] Since water is a resource that may be used

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8. IPCC, *Climate Change 2023: Synthesis Report*, at 35–115 (Core Writing Team, H. Lee and J. Romero eds., 2023), https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_FullVolume.pdf [hereinafter IPCC 2023].

9. *Id.* ¶ A.2.1.

10. *See id.* at 51 (highlighting that "high vulnerability to climatic hazards . . . [were] observed in . . . South Asia).

11. *Glaciers of the Himalayas: Climate Change, Black Carbon, and Regional Resilience*, S. Asia Dev. F., WBG, 1 (Muthukumara Mani ed. 2021), https://documents1.worldbank.org/curated/en/976841622778070962/pdf/Glaciers-of-the-Himalayas-Climate-Change-Black-Carbon-and-Regional-Resilience.pdf.

12. *Id.* at 33, 80.

13. Article XII (3) of the Indus Waters Treaty (1960) states that the provisions of the treaty "may from time to time be modified by a duly ratified treaty concluded for that purpose between the two Governments." IWT, *supra* note 3, art. XII ¶ 3.

14. *India issues notice to Pak seeking review, modification of Indus Waters Treaty*, The Econ. Times (Jan. 28, 2023), https://infra.economictimes.indiatimes.com/news/water/india-issues-notice-to-pak-seeking-review-modification-of-indus-waters-treaty/97389091.

to pressure Pakistan in a future conflict, India has sought for changes to ensure that its national security interests are not compromised.[15] India's position on amending the treaty has evolved to address challenges like population pressures and climate change, which were not included in the treaty's initial 1960 purpose.[16]

While this commentary does not focus on the geopolitical tensions between India and Pakistan, the diplomatic situation will significantly affect the context in which future revisions to the IWT are made.[17]

II. Effective Legal Innovations: How to Modify the IWT to Adapt to Climate Change

A. Focusing on the Indus Commission

The Indus Waters Commission, or the "Permanent Indus Commission" ("PIC"), is a permanent bilateral body of the IWT made up of two commissioners — one from India and one from Pakistan, typically a senior engineer with expertise in hydrology and water utilization; this body handles technical issues in cases involving water disputes.[18] Three projects — Baglihar,

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15. Brig SK Singh, *India's Approach to Indus Water Treaty: National Security Perspective*, Ctr. for Joint Warfare Stud. (Jan. 29, 2024), https://cenjows.in/indias-approach-to-indus-water-treaty-national-security-perspective/ (proposing a series of recommendations for India's approach to the IWT moving forward).

16. *See* Abid Hussain, *Is the Indus Waters Treaty the latest India-Pakistan flashpoint?*, Aljazeera (Sept. 22, 2024), https://www.aljazeera.com/news/2024/9/22/is-the-indus-waters-treaty-the-latest-india-pakistan-flashpoint (reporting that "on September 18, 2024, India sent a formal notice to Pakistan, citing various concerns, including changes in population demographics, environmental challenges, and other factors . . . .").

17. For literature on the geo-political issues surrounding the IWT, *see generally* Waseem Ahmad Qureshi, *Combating Climate Change in the Indus River Basin*, 10 Ky. J. of Equine Agric., & Nat. Res. L. 1, 24 (2017) (arguing that "[t]he relationship between scarcity and political discord is illustrated perfectly by Pakistan's indignation at India's purported storage and diversion of its water . . . ."); Sushant Mahajan, *Strategies for Successful Negotiation of International Disputes: Positional Bargaining vs. Principled Negotiation in the Indus Water Treaty Negotiations*, 2024 J. Disp. Resol. 64, 68 (March 2024) (explaining the pre-partition disputes between the countries and the process of negotiations that led to the formalization of the Indus Water Treaty in 1960).

18. IWT, *supra* note 3, art. VIII.

Kishanganga, and Ratle — have used legal means, i.e., either through the Permanent Court of Arbitration or through the World Bank neutral process, to settle disputes in almost 60 years.[19]

Each Commissioner must represent their respective government in all situations arising from the IWT and serve as a regular point of contact for all topics pertaining to the execution of the IWT, especially those pertaining to: the furnishing or exchange of information or data provided for in the IWT; and giving any notice or response to any notice provided for in the IWT.[20] Establishing and preserving cooperative agreements for the execution of IWT and encouraging collaboration among member nations in the development of river waters are further goals and duties of the PIC.[21]

When a dispute emerges between the parties about the interpretation or application of the Treaty or the existence of any fact that, if proven, could constitute a breach of the Treaty, paragraph 1 of Article IX mandates that the PIC mediate the matter. If the Commission is not able to reach an agreement over an issue, a "Neutral Expert",[22] mediators, and/or a Court of Arbitration may be utilized to help resolve the dispute.[23]

According to Article IX, paragraph 1 of the IWT, the parties must agree on a resolution mechanism. The phrase "endeavor to resolve the question by agreement" (found in paragraph 1 of Article IX) can still be interpreted broadly to include a more facilitative role for the PIC, which would help achieve specific goals of the aforementioned agreement that might not even necessitate an amendment to the IWT.

The PIC may be able to guarantee informed discussion and consensus-building by playing a facilitative role. In order to

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19. Pia Krishnankutty, *Why India Wants to Modify Indus Waters Treaty with Pakistan*, The Print (Jan. 27, 2023, 06:09 pm IST), https://theprint.in/diplomacy/why-india-wants-to-modify-indus-waters-treaty-with-pakistan/1338494/; *see also* Anuttama Banerji, *A Shared Interest: Why India and Pakistan Should Strengthen the Indus Waters Treaty*, Stimson (June 27, 2024), https://www.stimson.org/2024/a-shared-interest-why-india-and-pakistan-should-strengthen-the-indus-waters-treaty/. *See also*, *Fact Sheet: The Indus Waters Treaty 1960 and the Role of the World Bank*, WBG, (June 11, 2018), https://www.worldbank.org/en/region/sar/brief/fact-sheet-the-indus-waters-treaty-1960-and-the-world-bank.

20. IWT, *supra* note 3, arts. VIII and IX.

21. *Id.*

22. IWT, supra note 3, art. IX and annexure F.

23. IWT, *supra* note 3, arts. VIII and IX.

assist each party in using water, the PIC may confer with them while taking the traditional "reasonable and equitable use"[24] and "no harm"[25] standards into account. It might also make it easier for both sides to create strategies for the future that take climate change into account. The PIC may also assist in identifying "mutual interests" between India and Pakistan, which is crucial for promoting collaboration.

Despite the fact that the PIC's role is to effectively resolve questions regarding water allocation and utilization,[26] it does not address emerging challenges posed by climate change.[27] The IWT was negotiated in 1960 in a context that did not anticipate the current climate realities—melting glaciers, changing precipitation patterns, increasing water demand, and worsening flood and drought cycles.[28] This commentary argues that such developments profoundly affect the Indus Basin and necessitate a regime capable of adaptive and forward-looking management. The PIC will need to address issues like water scarcity, rising water demand, floods, and melting glaciers; however, the PIC's mandate, as outlined in the IWT, is limited to monitoring compliance, exchanging data, and resolving disputes through bilateral engagement.[29] This structure works well for addressing technical disagreements under stable climatic conditions, but falters in tackling dynamic, long-term challenges like climate change. For instance, the existing PIC lacks the expertise

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24. *See* Territorial Jurisdiction of the International Commission of the River Oder, Judgment, 1929 P.C.I.J. (ser. A) No. 23, at 27 (Sept. 10) (articulating that the "community of interest in a navigable river becomes the basis of a common legal right, the essential features of which are the perfect equality of all riparian States in the use of the whole course of the river and the exclusion of any preferential privilege of any one riparian State in relation to the others").

25. As the I.C.J. specified in the Pulp Mills judgment, the principle of prevention, or the no harm principle, as a customary rule, has its origin in the due diligence that is required of a State in its territory. A State is this obligated to avoid and prevent activities which take place in its territory, or in any area under its jurisdiction, causing damage to the environment of another State. *See generally* Pulp Mills on the River Uruguay (Arg. v. Uru.), Judgment, 2010 I.C.J. 14 (Apr. 20).

26. *Fact Sheet: The Indus Waters Treaty 1960 and the Role of the World Bank*, WBG (June 11, 2018), https://www.worldbank.org/en/region/sar/brief/fact-sheet-the-indus-waters-treaty-1960-and-the-world-bank.

27. *See generally* IWT, *supra* note 3, *passim.*

28. *Id.*

29. IWT, *supra* note 3, art. VIII.

or institutional capacity to address climate-induced variability in water flows comprehensively, creating uncertainty. Furthermore, the treaty does not explicitly recognize or incorporate climate change as a factor in water management, leaving the PIC constrained by its original technical and reactive scope.[30] Examples can be drawn from the Zambezi Action Plan Project, which established a river basin organization through the Agreement on the Establishment of the Zambezi Watercourse Commission ("ZAMCOM Agreement").[31] The agreement established the Zambezi Watercourse Commission ("ZAMCOM"), introduced procedural and substantive rules, and provided mechanisms for dispute resolution. ZAMCOM's objectives include promoting equitable and reasonable utilization of water resources while ensuring sustainable development and efficient management.[32] Unlike the primarily technical focus of the PIC, ZAMCOM actively integrates climate resilience and sustainable development into its mandate. ZAMCOM has also established the Programme for Integrated Development and Adaptation to Climate Change, which aims to increase climate-smart resilience by addressing challenges that impact livelihoods and development in the Zambezi Watercourse.[33]

The PIC's ability to manage climate impacts could also be significantly enhanced by including climate change specialists in its advisory structure. Drawing on the example of the International Commission for the Protection of the Rhine ("ICPR")[34], which adopted a basin-wide adaptation plan in 2010, the PIC

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30. *See generally* IWT, *supra* note 3, *passim.*

31. Agreement on the Establishment of the Zambezi Watercourse Commission, July 13, 2004, LEX-FAOC180628 [hereinafter ZAMCOM Agreement].

32. *See id.* art. 5 (outlining the objective and functions of the Commission).

33. *See Multinational - Programme for Integrated Development and Adaptation to Climate Change in the Zambezi River Basin (PIDACC Zambezi) - Project Appraisal Report*, Afr. Dev. Bank Grp. 1 (Dec. 16, 2022), https://www.afdb.org/en/documents/multinational-programme-integrated-development-and-adaptation-climate-change-zambezi-river-basin-pidacc-zambezi-project-appraisal-report (stating that the PIDACC Zambezi shall seek to ensure that "(i) available resources are sufficient to match the challenges, (ii) there is convergence of activities in same geographic zone, (iii) there shall be increased ownership and access to land for sustainability, and (iv) community-level sub-projects are demand-driven.").

34. *See* ICPR – International Commission for the Protection of the Rhine, https://www.iksr.org/en/icpr/about-us (last visited Nov. 26, 2024) (helping "[n]ine states and regions in the Rhine watershed closely co-operate . . . to harmonize the many interests of use and protection in the Rhine area.")

could similarly develop mitigation and adaptation strategies.[35] Following climate change discussions initiated at a ministerial meeting in 2007, the ICPR created the Expert Group which developed hydrological scenarios and provided scientific assessments, which culminated in an adaptation strategy by 2011.[36] The ICPR's strategy integrates interdisciplinary efforts across themes like water quality, ecology, and flood risk management. Drawing from such instance, these experts would assist in assessing climate-induced risks, such as glacier melt or altered river flows, and propose basin-wide measures to address them. Such an expansion would not require amending the treaty, but rather redefining the scope of "reasonable and equitable use" and "no harm" principles within the context of climate change.

India and Pakistan could also expand the PIC's responsibilities and give it the authority to suggest and implement mitigation strategies for the effects of climate change.[37] Empowering the PIC to proactively recommend and implement measures—without requiring immediate approval from both nations—would reduce potential roadblocks to cooperation. This authority would allow the PIC to act as a neutral body fostering consensus on complex climate issues before escalating to arbitration or neutral experts. Including additional experts chosen by mutual agreement could enhance institutional capacity while preserving the treaty's bilateral spirit. Inspiration can be drawn from the European model governed by an overarching Water Framework Directive, which "embodies the precautionary principle by taking action to mitigate the risk of anthropogenic

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35. Natalie A. Nax, Looking to the Future: the Indus Waters Treaty and Climate Change 29 (June 2016) (M.S. Thesis, Graduate School of the University of Oregon) (available online at https://transboundarywaters.ceoas.oregonstate.edu/sites/transboundarywaters.ceoas.oregonstate.edu/files/Publications/Nax%20-%202016%20-%20Indus%20Treaty%20and%20Climate%20Change%20-%20Thesis.pdf).

36. *See Study of Scenarios for the Discharge Regime of the Rhine,* ICPR Technical Report No. 188 (Apr. 2011), https://www.iksr.org/fileadmin/user_upload/DKDM/Dokumente/Fachberichte/EN/rp_En_0188.pdf (analyzing climate scenarios for the Rhine region up to 2011).

37. *See* Sahana Rao, *Governance of Water Resources Shared by India and Pakistan under the Indus Waters Treaty: Successful Elements and Room for Improvement*, 25 N.Y.U. ENV'T. L.J. 108, 136 (2017) (arguing that "India and Pakistan could enlarge the scope of PIC duties and empower the PIC to propose and enforce climate change impact mitigation measures.").

discharge into aquifers despite the relative uncertainty regarding the magnitude of harm associated with this risk."[38]

Because the PIC Commissioners shoulder their fair share of tasks, such as treaty-mandated monitoring and initial attempts at conflict resolution between state parties, the modernization of the IWT will require increasing its institutional capacity.[39] For example, the PIC's mandate should be broadened to oversee groundwater resources, since the IWT does not currently include it within its scope.[40] This could involve capacity-building initiatives for current members and recruiting relevant experts to lead the sustainable sharing of aquifers.[41] Going beyond such recommendations, this could also involve establishing a dedicated climate change and sustainability division staffed with experts in environmental law climatology, in order to handle issues that could come up in relation to climate change. Drawing from the Rhine example above,[42] the division could propose basin-wide adaptation and mitigation measures and monitor their implementation. Such integration would align the PIC's functions with contemporary water management practices, ensuring more comprehensive governance of the Indus Basin.

B. *Data Streams and Data Collection*

The IWT forecasts assumed water supplies would stay stable, as projections were based on past data. But because of

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38. *Id.* at 133.

39. *IWT*, *supra* note 3, arts. VIII and IX; *see also Rao, supra* note 37, at 138 (noting that "[i]ncorporating other elements into the Treaty, like groundwater and climate change impacts, will require a simultaneous expansion of institutional capacity.")

40. Frank Jaspers, U.N. Env't Programme Rep., Towards Integrated Water Resources Management. International Experience In Development Of River Basin Organisations, at 10, 26–27 (Apr. 2014).

41. *See Rao, supra* note 37, at 138 (arguing that "[t]he current PIC structure could probably accommodate the additional responsibility of groundwater management; at most, . . . adding more hydrogeological experts to the cadre of experts already contributing to the PIC, or integrating capacity-building training measures for current experts.")

42. *See Study of Scenarios for the Discharge Regime of the Rhine,* ICPR Technical Report No. 188 (Apr. 2011), https://www.iksr.org/fileadmin/user_upload/DKDM/Dokumente/Fachberichte/EN/rp_En_0188.pdf (analyzing climate scenarios for the Rhine region and responsibilities of the ICPR Expert Group).

climate change, this is no longer the case.[43] The IWT should prioritize developing methods to measure and gather data about climate change while simultaneously bolstering current data collection and sharing streams which do not contemplate changing river flows.

The IWT currently lacks robust mechanisms to address climate change and ensure compliance with its provisions, particularly regarding data collection and sharing. This reduces transparency, undermines trust between India and Pakistan, and limits the treaty's capacity to adapt to changing hydrological realities. By incorporating new methods for data collection and exchange, as well as stronger enforcement mechanisms, the treaty can address climate change impacts and ensure adherence to its obligations.

The IWT requires parties to report flow data, but compliance with these provisions has been inconsistent.[44] Without reliable and up-to-date data, it becomes difficult to assess the treaty's effectiveness or predict future challenges arising from climate change. Further, the absence of a neutral oversight mechanism to verify data sharing and enforce compliance diminishes accountability. To address these issues and establish accountability, the IWT should require:

The development of standardized methods for climate-related data collection and sharing;

Annual basin-wide hydrological assessments conducted jointly by India and Pakistan, focusing on flow variability caused by human activity, land use changes, and climate change; and

Mandatory submission of these reports to the World Bank, the designated mediator under the treaty.

Further, the IWT can also borrow from the Nile Basin Initiative ("NBI") that serves as a prominent example of successful cooperative water management among countries sharing a

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43. *See* Jayashree Nand, *Glacial melt in Indus raises water concerns*, HINDUSTAN TIMES (Mar. 6, 2023), https://www.hindustantimes.com/india-news/glacial-melt-in-indus-raises-water-concerns-101678094974028.html (noting that "global warming is likely to raise strategic concerns over the sharing of water in the region.").

44. *See* Muhammad Uzair Qamar, Muhammad Azmat & Pierluigi Claps, *Pitfalls in transboundary Indus Water Treaty: a perspective to prevent unattended threats to the global security*, NPJ CLEAN WATER (Nov. 5, 2019), https://www.nature.com/articles/s41545-019-0046-x (citing current challenges around the compliance of IWT and proposing solutions).

transboundary river system. Launched in 1999, the NBI aims to promote sustainable management of Nile waters through collaborative projects and shared goals.[45] The NBI has certain features that integrate water resource management and promote joint projects that benefit all member countries. These include water, food and energy security planning, the Nile River Basin Investment Plan, as well as measures to adapt to climate change.[46] These measures establish platforms for sharing hydrological and climate data among member states to foster transparency and trust.

The NBI also establishes an annual water withdrawal limit from the Basin, while ensuring that rivers, lakes, wetlands, and the plants and animals that rely on the Basin are adequately supplied. This framework is particularly relevant in addressing tensions such as Ethiopia's damming of the Nile, after Ethiopia announced that it had started filling the GERD's reservoir,[47] which has raised significant concerns over equitable water distribution and the rights of upstream versus downstream countries. A fundamental component of the Basin's water resource management approach is adaptive management, or "learning as you go", through the testing of new methods, ongoing observation, and necessary modification.[48] Adaptive management offers a pathway for countries like Ethiopia, Sudan, and Egypt to adjust their strategies in response to evolving climate conditions, new hydrological data, and emerging local knowledge, which may help ease disputes. Similarly, the IWT could adopt an adaptive management framework that involves continuous observation, testing, and revision of water management strategies. Adaptive management would allow both nations to

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45. *History*, NILE BASIN INITIATIVE, https://nilebasin.org/about-us/history (last visited Nov. 11, 2024).

46. *Our Goals*, NILE BASIN INITIATIVE, https://nilebasin.org/our-goals (last visited Nov. 11, 2024).

47. John Mukum Mbaku, *The controversy over the Grand Ethiopian Renaissance Dam*, BROOKINGS (Aug. 5, 2020), https://www.brookings.edu/articles/the-controversy-over-the-grand-ethiopian-renaissance-dam/; *see also* Elias Meseret, *Ethiopians celebrate progress in building dam on Nile River*, WASH. POST (Aug. 2, 2020), https://www.washingtonpost.com/world/africa/ethiopians-celebrate-progress-in-building-dam-on-nile-river/2020/08/02/77041354-d4e8-11ea-a788-2ce86ce81129_story.html.

48. Ann Moote, *Closing the Feedback Loop: Evaluation and Adaptation in Collaborative Resource Management,* NAT'L FOREST FOUND. (May 2013), https://www.nationalforests.org/assets/files/Sourcebook.pdf.

adjust their approaches to account for new climate data and evolving conditions in the Indus Basin. Enhanced cooperation could draw from successful examples like the NBI, where member states share hydrological and climate data as part of broader collaborative projects. For India and Pakistan, a similar approach would establish a platform for mutual accountability, foster trust through transparency, and support joint projects addressing shared challenges such as flood management and water scarcity.

Furthermore, under the IWT, the World Bank's involvement is primarily limited to resolving disputes through "Neutral Experts" or arbitration.[49] However, climate change presents a systemic challenge requiring ongoing oversight. Since the World Bank serves as the guarantor of the IWT, its role could be expanded to include periodic reviews of compliance with data-sharing obligations. This could involve:

- Establishing a neutral review committee under World Bank mediation to assess and verify the accuracy of shared data; and
- Creating a mechanism to impose consequences, such as funding restrictions for non-compliance, to incentivize cooperation.

C. *Lessons from the Kishenganga Dispute – The PCA's Recommendation*

In the Indus Waters Kishenganga Arbitration (*Pakistan v. India*), an arbitral tribunal declared that international environmental law principles "must be taken into account even when . . . interpreting treaties concluded prior to the development of that body of law."[50] The tribunal adopted an evolutive interpretation of the relevant treaty; the panel considered it necessary to "interpret and apply this 1960 Treaty in light of the customary international principles for the protection of the environment in force today."[51]

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49. IWT, *supra* note 3, at art. IX.

50. Indus Waters Kishenganga Arbitration (Pak. v. India), Partial Award, PCA Case Repository Case No. 2011-01, ¶ 452 (Feb. 18, 2013) [hereinafter Kishenganga Partial Award].

51. *Id.* at ¶ 452.

Pakistan's claim in the above case, which aimed to protect downstream flows, referenced the idea of minimum flow to stop India's hydroelectric facility from diverting a portion of the downstream flow of the Neelum River, which would have an impact on Pakistan's hydropower and agricultural activities. India, on the other hand, declared that there will always be a minimum and specific quantity of environmental flow downstream of the proposed facility.[52] The tribunal explicitly declared that customary international environmental law must inform the interpretation of treaties, even if those treaties predate the development of such norms.[53] By referencing the necessity of maintaining a minimum downstream flow to safeguard the environment and balance competing uses, the tribunal underscored the importance of integrating environmental considerations into water-sharing arrangements.

In response to environmental protection concerns, the Tribunal further emphasized the necessity of maintaining a "minimum flow downstream of the KHEP."[54] The Tribunal considered the need to safeguard the environment in addition to party interests. Furthermore, the Court held that if parties seek reconsideration of the Court's determination of the minimum flow, the parties are "entitled to seek such reconsideration through the Permanent Indus Commission and the mechanisms of the Treaty."[55] However, considering the current political issues between the countries, it might not be always possible to re-negotiate terms.

This decision exposed a significant gap in the IWT's framework: the treaty does not explicitly address environmental flows, leaving it to dispute resolution mechanisms to reconcile environmental concerns with competing hydrological and economic interests. The tribunal's decision to allow either party to seek reconsideration of minimum flow requirements through the PIC further illustrates the treaty's reliance on mechanisms that lack the capacity to address complex environmental challenges effectively. While the tribunal in the Kishenganga Arbitration provided a pathway for reconsideration through the

52. *See id.* at ¶ 453 (the Court notes "India's commitment to ensure a minimum environmental flow downstream of the KHEP at all times.").

53. *Id.* at ¶ 452.

54. *Id.* at ¶ 455.

55. Indus Waters Kishenganga Arbitration (Pak. v. India), Final Award, PCA Case Repository Case No. 2011-01, para. 119 (Dec. 20, 2013).

PIC, the entrenched political tensions between India and Pakistan make collaborative renegotiation difficult. The treaty does not mandate periodic reviews or updates to reflect evolving scientific knowledge, international legal standards, or environmental priorities. This rigidity undermines its ability to respond to challenges like climate change, which exacerbates water scarcity, alters flow patterns, and threatens ecosystems in the Indus Basin.

The Kishenganga Arbitration serves as a cautionary tale of the treaty's limitations in proactively addressing such issues. The reliance on case-by-case arbitration to resolve disputes over environmental and hydrological matters is inefficient and leaves the parties without a long-term, adaptive framework for managing shared resources. The tribunal's focus on environmental flows illustrates the broader challenge of reconciling hydropower development with ecological sustainability—a challenge that is exacerbated by climate change. Climate variability affects river flows, increasing the risk of disputes over minimum flow requirements. Without explicit mechanisms in the IWT to address these changes, disputes like Kishenganga are likely to recur.

III. Conclusion

In the face of accelerating climate change, the Indus Waters Treaty stands at a crossroads. While it has successfully mediated water-sharing between India and Pakistan for over six decades, its provisions are ill-suited to address the growing climate-induced pressures on water resources in the region. This paper has demonstrated the critical need to modernize the IWT by incorporating climate resilience, strengthening the institutional role of the Permanent Indus Commission, and enhancing cross-border data-sharing mechanisms. Drawing from successful international examples, the IWT can incorporate mechanisms for transparent data-sharing, mutual accountability, and proactive conflict prevention.

As the region faces increased water scarcity, erratic weather patterns, and the urgent need for sustainable resource management, it is essential for India and Pakistan to recognize water as a shared resource rather than a divisive commodity. By embracing these reforms, India and Pakistan can transform

the IWT into a dynamic and future-ready framework, ensuring the sustainable management of the Indus Basin's water resources and fostering long-term peace and cooperation in the region. Furthermore, the treaty must integrate environmental considerations, as highlighted in the Kishenganga Arbitration, to reconcile hydropower development with ecological sustainability.

Emphasizing collaborative strategies, integrated water resource management, and climate adaptation measures will not only bolster regional stability but also safeguard the livelihoods of millions dependent on the Indus River system. Ultimately, a forward-thinking approach that prioritizes cooperation and resilience is vital for navigating the complex interplay of environmental change and geopolitical dynamics in South Asia. By adopting such a forward-looking approach, India and Pakistan can transform the IWT into a robust framework that not only mitigates the risks of climate-induced water conflicts but also promotes sustainable and equitable resource management for future generations.