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Redefining Water Wars: The Impact of Climate Change on South Asia's River Conflicts

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Abstract

The Indus River, essential for approximately 300 million people, is transitioning from a geopolitical flashpoint to a socioecological system increasingly threatened by climate change. Accelerated glacial retreat, rising temperatures, and unpredictable monsoon patterns are diminishing seasonal water flows and exacerbating floods, droughts, and water scarcity, as evidenced by the devastating floods in Pakistan in 2022 and the severe drought in India in 2023. Climate models forecast a potential reduction of up to 20% in water discharge by 2050. These alterations heighten long-standing tensions between India and Pakistan, particularly exacerbated by hydropower projects such as Ratle, which adversely affect the Indus Delta and destabilize vulnerable glacial regions. This situation results in population displacement, ecological degradation, and heightened political instability. Nonetheless, shared vulnerabilities may present opportunities for cooperation, such as the establishment of bilateral adaptation funds for glacier monitoring, drought-resistant agricultural practices, solar desalination, and the collaborative sharing of hydrological data. By reconsidering the Indus Waters Treaty through a climate-focused perspective, it may be feasible to promote cooperative management, perceiving water as a resource for trust-building rather than a tool for conflict.

Key Words: Climate Change, South Asia, Indus River Basin, Water Conflicts, Indus Waters Treaty, Nuclear Security.

Introduction

In July 2022, Pakistan was hit with catastrophic floods that submerged a third of the country, displace 33 million people, destroying a third of agriculture in the country and injuring an estimated 1,000 people. Towns were washed away in their totality; major infrastructure was damaged and millions of people were left homeless and jobless. Just a year later, India had to cope with one of its worst droughts in more than a century. Several states such as Maharashtra and Karnataka had devastating

crop failures, turned pale under green landscapes, and practiced strict urban water rationing (Higgs, 2024).

At 3,200 kilometers long, the Indus River is at the heart of South Asia's climate upheaval, providing life for nearly 300 million people living in India, Pakistan and Afghanistan. The Indus has been largely cast in terms of geopolitical variables for most of the past three decades, as an homage to the rivalry and conflict between India and Pakistan. Their pitiless history of territorial and national animosities, aggravated by the tragic partition of 1947, have lain, again, at the heart of their enmities. The Indus and its tributaries have not been exception to water, having been seen as another resource to be fought for in an already tense relationship. But, climate change is nevertheless radically changing this story.

The flows in the river—the source of the Indus fed by Himalayan glaciers melting at unprecedented rates and the monsoon season becoming more and more erratic—have become disgustingly unpredictable. Farmer's and city planner's former practice of managing seasonal patterns is breaking down, leaving food security, urban water supply and energy production subject to uncertainty. It is treading on very delicate balance of the Indus Basin and it is giving rise to new stresses in system already burdened with political distrust (Hasnain, 1999).

The water disputes between India and Pakistan are not an added branch to the environmental diversity of this region; to the contrary, this environmental diversity itself is an active driver of conflict. The increase in competition over irrigation, drinking water, hydro power projects is intensified by climate change. Yet water theft, dam construction and treaty violations are increasingly becoming more frequent and the diplomatic relations are further strained. Once hailed as a model of cooperation, even in time of war, the 1960 Indus Waters Treaty is under enormous pressure as both nations have struggled to cope with a river system behaving in a manner never witnessed before.

However, climate change also comes at a paradoxical opportunity, and growing risks. Climate impacts will make India and Pakistan exactly the same vulnerable and hence could function as a catalyst for unprecedented cooperation. The two nations could work together to save themselves, by working together to manage the Indus more sustainably, to share climate data, to coordinate early warning systems, to invest in adaptive infrastructure, and other means. The survival in this new era might take place more from water war winning to water war forging the frictional death hold partnerships (Arshad & Khan, 2024)

The Indus River is more than just a geopolitical battleground, this article claims, as it is a climate vulnerable system whose fate will be decided at least as much by collaboration as by competition. The stakes, though, are changing with the warming, forcing South Asia's old rivals to ask if they can afford to fight over a river that may, like the storms and droughts that dominate the region now, be as capricious as it is persistent.

The Indus Basin in Peril

The Indus Basin, the lifeline for millions of people in South Asia, is facing a crisis that is profound and rapidly growing. This doesn't paint a pretty picture of a region more and more exposed to the ill effects of glacial retreat, erratic monsoons and

rising temperatures by climate science. Furthermore, each other factor compounds the prior, creating a holistic web of risks that secure the food of Pakistan, India, and other nations (Mustafa & Wrathall, 2011).

Glacial Retreat: The Disappearing Water Tower

Most of the flow of the Indus River depends on the Himalayan glaciers, also known as the Third Pole, for their massive ice reserves (Mukhopadhyay & Khan, 2015). About 70–80 percent of the river's water is from glacial drainage. But the IPCC says that these glaciers were shrinking at a rate of 1.5 percent a year, double the loss rate of the 1990s. By 2050, this trend could result in up to 20% loss of the Indus River's volume. Reliable irrigation also provides the expertise for the region's agriculture, which heavily relies on them, while the hydropower generation is a major source of energy in the region. First, communities living downstream, where they are already facing water scarcity, would suffer the impacts, resulting in possible social, economic and political tensions.

Erratic Monsoons: Feast or Famine

Traditionally, the South Asian monsoon has supplied Indus Basin as a dependable seasonal replenishment. But there is new evidence that the monsoon is getting less predictable (Ummenhofer et al., 2024). Based on a 2023 study in Nature Climate Change found that monsoon variability has increased 30 per cent since 1950. The impact of instability — floods in 2022 blamed on manmade climate change that flooded a third of the country, and by 2023 areas of Punjab remained in dire drought-like conditions where they were — have fallen heaviest on Pakistan. These extreme fluctuations jeopardize crop yields and cause great strain on long standing water sharing agreements that founded on climate stability assumptions. With less predictable monsoon behavior, cooperative management of the Indus waters will be even more difficult, and there is a greater prospect of regional disputes.

Temperature Rise: The Silent Throttle

The most insidious threat to the Indus Basin might be the increase in temperature that's occurring so fast. The region is warming at about 0.5 °C faster than the global average. Today, summer temperatures over 50°C are common in some areas of Pakistan and India (Rasul, 2012). Dramatically accelerating evaporation rates from reservoirs, rivers, irrigation canals and all the rest, it compounds what are already already considerable water losses. Estimates by the World Bank indicate that a 1°C rise in the temperature would pump up the reduction of per capita water availability in the Indus Basin basin by at least 15 per cent – 20 percent by 2040. Slowly ebbing out of the water resources of the region would be as damaging as sudden floods or droughts — slowly eroding the region's ability to sustain its populations and the economies developing within.

Case Study: Climate Pressuring Water as a 'Weapon'

It is intensifying existing tensions over water resources in South Asia making rivers strategic and thorny issues of thorns. Stagnating temperatures, retreating glacial, erratic monsoons, all are already landlocked in the Indus basin, where geopolitical stakes are high, being considerably aggravated by the advent of national policies and

military actions. Once the lifeline of water, it is meanwhile turning into a weapon of regional rivalries (Ranjan, 2019).

India's Hydroelectric Ambitions: Energy Security vs. Downstream Scarcity

As India is looking to address increasing energy demand and climate induced heatwaved, hydroelectric power has been singled out as a major pillar of India's energy strategy. Hydropower is viewed as a renewable and climate friendly replacement to fossil fuel, particularly during extreme weather events, when present electricity demand spikes (Mishra, 2023). Projects such as the 850 MW Ratle dam on the Chenab River are designed to be 'run of the river' systems and were not only approved in 2023 despite Pakistani protests but have gone on since. According to rules, these projects are technically designed to conform to the Indus Waters Treaty (IWT) of 1960 that specifies the usage of the Indus Waters Basin waters between India and Pakistan. But Pakistan says the combined effect of many Indian dams is crippling during the dry seasons. Downstream flows from dams reduce Pakistan's farming sector and most critically, its contributors to downstream supplies particularly in water stressed provinces such as Punjab and Sindh during periods when such applications are critical to support agricultural activities. India's dam building spree is not just an environmental or technical issue for Islamabad but a matter of food and water security and strategic maneuvering that Islamabad considers threatening.

Pakistan's Agricultural Collapse: A Delta in Distress

Once the Indus Delta provided a mecca for fishing and agriculure for 1.2 million of its people, it is today an allegory for environmental and humanitarian crisis. The culprit for collapse of the delta, according to the United Nations Environment Programme (UNEP) 2023 report, are two: reduced freshwater inflow due to upstream dams and intrusion of saline water from rising sea levels. It has been catastrophic overall. More than 1.2 million acres of farmland have become saline and infertile, leaving the local communities the breadwinner stripped of their livelihood and a means of sustenance. While around 200,000 people leave conditions in the delta each year, many of whom are made to live in precarious camps in Karachi's rapidly expanding informal settlements. Away from a thriving center where South Asia's animals found food and sometimes even matrimonial partners, is a stark reminder that climate change and human action don't have to be opposites of one another—just opposite poles—the capacity for environmental degradation and mass displacement (Kidwai et al., 2019).

The Siachen Factor: Militarizing Melting Glaciers

What is happening in Siachen also signals redrawing of ecological boundaries: not just the environment, but also strategic calculations on the world's highest battlefield. Siachen has been occupied by India and disputed by Pakistan since 1984 and has seen serious glacial retreat with the glacier giving up 2 kilometers of ice since 1990. With the redrawing of land and new tactical routes made visible by the retreat India and Pakistan are doing everything they can to bolster military installations and deployment in the area. The revelation of these fresh terrains have not ushered in opportunities for demilitarization and peace rather, they have turned into flash points for each side to fear losing critical advantage. Climate change is

increasingly an invisible but potent factor in South Asia's military strategies, as stealing glaciers and reshaping topographies are melting ice caps that are turning the battleground (Joshi, 2017).

Consequences of Climate-Driven Water Competition

The problem of climate change is not just about changing ecosystems, but also about transforming water from being an agent of ecological collapse, humanitarian crises and security risks. This is perhaps nowhere more dramatic than in the Indus Basin region where high water competition among rising environmental pressures is re-shaping societies in ways that vary from cautious to dangerous and inescapable.

Humanitarian Crises: Displacement and Desperation

Massive humanitarian fallout is due to the impact of climate driven water stress in Pakistan. Millions were displaced by the 2022 floods; some considered among the worst in the country's history (Shahid, 2024) Crops were wiped out, entire villages were submerged, families were forced to abandon their homes. And unlike floods which made headlines last year, 2023 brought a different disaster: drought. Drying rivers and dying irrigation systems made it impossible for the countless numbers of Punjab's heartland of Pakistan's agriculture to sell their livestock at distress prices and move to urban areas. The poor found themselves in precarious, overcrowded slums with few opportunities for employment. The International Organization for Migration says these patterns of displacement are neither humanitarian nor national security concerns. Especially in areas prone to political and ethnic tensions, these kinds of displaced populations combine with the poverty and hopelessness to exploit them in the recruitment by extremist groups (Shahid, 2024).

Meanwhile, sheer groundlessness in urban centers is being exposed in India by climate pressures. Historically, the Beas and Sutlej river tributarie to the Indus system have been drawn on by major cities of Chennai and Delhi to support their water requirements through inter basin water transfer. During Delhi's 2023 water supply shortfall, 30 percent of supply was in short as people protested and disputes grew sharp between neighboring states about allocation rights. Hours were spent lined up at water tankers, and politicians traded accusations for mismanagement. A national challenge of how to keep booming urban populations supplied with traditional water as the sources run dry is reflected here in the growing stress on urban water systems.

Indus Delta: Ecocide of a Carbon Sink

One of the Indus' twin pressures now undermining the region is the reduction of freshwater flows; the other is rising sea levels. For example, the World Wildlife Fund (WWF) reported in 2023 that the mangrove forests in the delta have shrunk by 86% since 1980— which are critical ecosystems highly effective at sequestering carbon four times greater than many other terrestrial forests. By obscuring the area that mangroves would have provided as a natural first barrier to storm surge and cyclones, coastal communities are rendered dangerously exposed. Desolation of habitats has also brought the local fisheries, once the lifeline of thousands of families, to their knees. And the country has gone a long way toward ensuring that fish stocks do not keep redeeming themselves. Coastal populations, already under

stress from drought and internal displacement in cities, are pushed further into poverty, and desperately abandon traditional livelihoods to migrate inland, much of this population flooding already stretched urban resources (Wells et al., 2023).

Security Risks: Water Wars in the Nuclear Shadow

Perhaps the most threatening outcome of all is climate driven water scarcity pulling India and Pakistan, two nuclear armed nations with a long history of conflict, into increasingly high security risks (Klare, 2020). The 2024 Annual Threat Assessment of the U.S. Intelligence Community notes that 'water scarcity would feed crisis miscalculations,' even if it does not explicitly mention water disputes as a 'crisis trigger.' One fear is that official talks could break down in stress, a second one is that non-state actors take advantage of the situation. Jaish-e-Mohammed groups have stated publicly that they want to target dams and water infrastructure, which would likely result in an out of control escalation between the two countries. A volatile new layer of insecurity coupled with trust in short supply already in the playing field.

Pathways to Climate-Resilient Cooperation

The growing tensions in regions with shared water resources as a result of climate change will only be resolved cooperatively for the sake of resilience and stability. There are several pathways by which collaboration can be fostered and adaptation and mitigation strategies properly enacted in the Indus Basin and other transboundary river systems. Such balance between environmental concerns and human security will have to be pursued among all parties through strategies that seem to fulfill the needs of all involved (Link et al., 2016).

Pooling Resources for Joint Climate Adaptation Funds

Collaborative financial mechanisms are one of the most potent ways to combat the climate impacts in these watersheds. India and Pakistan may set up a bilateral climate adaptation fund to link resources to mitigate the risk from climate change through projects that mitigate impacts. Key initiatives could include: Himalayan Glaciers Retreat Alarming Rate: Metrics for setting up early warning systems for glacial lake outburst floods (GLOFs) that will protect lives and infrastructure in case of glacial lake outburst floods. These floods usually consist of rapid glacier melt and pose serious risk to downstream communities. A joint fund might help to fund the establishment of monitoring stations to enhance early detection and warn systems in both countries.

Climate Smart Agricultural Techniques: There are also collaborative efforts on drought resistant crops and climate smart agricultural techniques that could be beneficial to both the farmers on both sides of the border. The ultimate product of these research initiatives may be crops that are more resilient to the extreme weather, whether floods or droughts, which are increasingly part of the changing climate of the region.

Decarbonizing Water Management

In the Indus Basin, climate sensitive region, innovative solutions that also tackle carbon emissions are required for water management. The role of collaborative

efforts in the decarbonization of water infrastructure as a key tool for both the mitigation and adaptation to climate change is highlighted.

Solar Powered Desalination: Solar powered desalination plants, which are viable models to supply water in coastal regions like Gwadar, Pakistan, can minimize the dependency on freshwater. As the Gwadar plant has operated since 2023, it provides a scalable model for other regions around the world where saltwater intrusion and dwindling freshwater resources are of concern. Such solar powered systems can be expanded to diversify the region's water supply and reduce environmental impacts.

Transmission Losses in Pakistan's energy sector stand at 25% of the total energy generated in the country, and estimates this rate to be robust. And these losses undermine the reliability of hydropower when it becomes an overly dependent source, as it is becoming more uncertain because of climate impacts. In investing in smart grids and enhancing the energy efficiency, Pakistan will be able to decrease its dependence on hydropower, and have a more stable and sustainable power system. In addition, it could relieve stress on the water resources used in generating power (Shaikh et al., 2020).

Transboundary Water-Climate Task Force

A transboundary water-climate task force could be constituted to foster cooperation for better management of the shared water resources. This could be a body modeled on the Mekong River Commission and could focus on Real Time-Sharing Hydrological Data. It is important to have access to real time data of river flows, rainfall patterns and reservoir levels so that right decisions can be taken during droughts, floods and other water focused crises. This would enable a joint task force to ensure that India and Pakistan have a quick access to timely information, which would help better coordinate water resources management.

Joint Task Force for Coordinating Disaster Responses: As the frequency and intensity of climate related disasters, e.g. floods, are increasing, there is an urgent need for a joint task force which can be coordinated to help provide relief and responses during such time of disasters. It could involve deploying joint relief efforts in case of emergencies and sharing expertise in flood management, and also in developing flood warning systems.

Global Solidarity: Tapping Climate Finance

The role of international climate finance can also be used in support of critical adaptation efforts; in addition to regional cooperation. Opportunities to raise funds to finance climate adaptation projects lie in the UNFCCC's Loss and Damage Fund that was operationalized in 2023. Areas of support key could include:

Indus Delta's mangrove forests, wiped out by falling down of the river flows and rising sea level could be financed by the Loss and Damage Fund. Restoring 250,000 acres of mangroves, a largely carbon sink and natural coastal storm protection, could use an estimated $500 million (Kidwai et al., 2019).

Grants for community-led adaptation: To give local populations the opportunity to proactively adapt to mitigate water scarcity, the community led adaptation: could be one such grant. This could include rainwater harvesting systems in drought prone

areas or rural communities that would improve water availability for communities, allow rural communities exploit alternative methods to surface water availability.

Conclusion

The Indus Basin's climate crisis is daunting indeed, but it presents a paradoxical opportunity for transformation. Shared vulnerability to the increasingly adverse impacts of climate change could work to both form common sense solutions for the region. In this situation, for instance, India and Pakistan (two countries with a history that is fraught, yet evidently continued, due to their deep interrelatedness in connection with the shared waters of the Indus River) have an opportunity to reframe their purported competition and distrust towards symbiotic cooperation and stewardship in one. Part of the survival of the basin's ecosystems, and of the hundreds of millions of people who use it, depends on this shift.

There are precedents for cooperation even in the midst of a political and military conflict between India and Pakistan. An unprecedented degree of the cross-border aid and collaboration in the earthquake of 2005 that devastated the divided countries shows the capacity for joint action in situations of crisis. Most importantly, the Indus Waters Treaty (IWT), linked in 1960, has lived through and even survived three wars and many political bickering. Given its success, this treaty is a particularly forceful example of the ability of bilateral cooperation to deal with shared resources even in the clearest case of deep-seated animosities (Raazia, 2022). The IWT's ability to weather the dusty politics, however, is an indication that successful cooperation can still be achieved if leaders of both nations recognize their respective interests.

This is also supported by global examples. This is probably a case study of something where the tensions of the region have kept Egypt and Sudan from doing whatever it is they wanted to do on their own, and they've still worked together on the main thing: water management. These countries have managed to transcend their historical competition over such water rights by acting first to prioritize data driven governance, and secondly by adhering to the creation of the joint management frameworks. Based on this model, similar approaches can be adopted in the Indus Basin where real time hydrological data, joint disaster response mechanisms, and collaborative research work on climate risks plague not only India, but also Pakistan.

It is, however, a matter of closing windows for cooperation. The urgency of action arises due to patterns of increasing temperatures and the increasing vulnerability of the Indus Basin to extreme weather events. Both India and Pakistan need to re-think their equation on the basis of climate resilience. Climate adaptation strategies can be integrated into the IWT, disaster protocols can be established between countries and global climate finance can be used to sustain the region's water resources (Khalid et al., 2024).

Unchecked competition and conflict over ever more scarce water resources are a priori coupled into the alternative to cooperation that have dire consequences. This approach not only recklessly endangers the ecological collapse of the basin but also heightens the prospect of a political and military clash in a region in which 20 percent of the planet's people live. The Indus, the water of life, the symbol of prosperity, now represents the restraint of the strength of survival of the species. The

solution is one that calls upon India, Pakistan and the international community to rise above national interests and undertake cooperation, instead of rivalry, in future use of the Indus waters that are shared.

Conflict of Interest

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