

BRIEFER

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Climate Change and the India-Pakistan Rivalry

Sarang Shidore

KEY TAKEAWAYS

- The rivalry between nuclear powers India and Pakistan is one of the world's most dangerous, with multiple risk factors present simultaneously including a common land border, a bitter territorial dispute, history of warfare under the nuclear shadow, the ready spark of terrorism, and deepening conflict over the shared Indus river basin.
- South Asia is one of the world's most vulnerable regions to climate change, which is acting to melt Himalayan glaciers and increase rainfall intensity in the Indus river basin. This will lead to more volatile flows and heightened risk of severe floods in disputed Kashmir and adjoining regions.
- Both India and Pakistan are highly water-stressed countries. The Indus Waters Treaty, which governs sharing of the basin's waters, is under unprecedented stress due to a number of factors including climate change.
- Environmental degradation and climate change are inducing dam designs that open the door to both bad-faith actions and misunderstandings between the parties. Pakistan's darkest fears are that India will manipulate dam storage levels to magnify downstream floods. India on the other hand worries that Pakistan will use floods caused in part due to climate change to falsely accuse India of water manipulation to score geopolitical points.
- However, India faces many serious constraints in weaponizing Indus waters against Pakistan. Pakistan, as the downstream actor, faces even greater constraints. It is conceivable but unlikely that India will abrogate the Indus Waters Treaty.
- The China-Pakistan strategic partnership, which includes joint hydropower projects, acts to increase tensions in South Asia.
- The IWT urgently needs expansion and updating to move away from its core idea of partitioning water resources to the concept of their joint and sustainable management.

BACKGROUND

The decades-long rivalry between nuclear powers India and Pakistan is one of the most fraught rivalries on the global stage, with potentially existential implications for South Asia and the wider region. The two countries have fought four wars with each other since their independence from the British Empire in 1947. The last of these, the Kargil war of 1999, was fought under the nuclear shadow. There has been concern that another armed conflict, this time with possible nuclear use, could be triggered in our time.

The India-Pakistan conflict is unique among nuclear rivalries in terms of all of the following escalatory factors present simultaneously – a long shared land border, a fiercely contested territorial dispute, a history of warfare under the nuclear shadow, the major presence of subconventional tactics (i.e. militancy and terrorism), and deepening natural resource conflicts (water). This coupled with frequent exchanges of deadly fire on their border leading to casualties makes this rivalry among the most serious and risk prone in the world.

Traditionally, issues of cross-border terrorism and control of the territory of Kashmir have been central to fueling the India-Pakistan rivalry. In the 21st century however, the rivalry is being further exacerbated by the growing environmental crisis, which includes the impacts of human-induced climate change. South Asia is among the most affected regions due to climate change. Climate hazards in the subcontinent include extreme and changing precipitation patterns, water stress, droughts, flooding, sea level rise, and intensified cyclone activity on the coasts.

The central pathway through which climate change is manifesting itself in the India-Pakistan rivalry is water - specifically that in the shared Indus River Basin (IRB), currently governed by the Indus Waters Treaty (IWT). This will therefore be the focus of this brief.¹ Deep disagreements over the IWT are increasingly an important factor in the conflict. Each side has of late escalated accusations of illegal water usage by the other. As we approach the middle of the century and beyond, climate change is projected to have a major impact on the IRB (as in the rest of the subcontinent), adding to the complexity of the water dispute.

A BITTER SUBCONTINENTAL RIVALRY

The rushed partition of the subcontinent by colonial Britain led to the severing of centuries-old ties between the people of the region and an enormous human cost in terms of ethnic genocide and economic devastation, particularly in the divided Punjab province.

Partition left issues unresolved on two planes, one territorial and the other ideological. The mountainous territory of Kashmir was claimed by both countries and quickly led to the first India-Pakistan war within months of independence, and two other wars subsequently.² The ideological contest involved Muslim nationalism as the organizing principle for Pakistan ranged against a secular idea of India conceived by its founding fathers.

Both planes have become more contentious over time, even as India's foundational secular ideology is being increasingly challenged from within by an assertive Hindu nationalism. The nuclearization of the subcontinent has added a new level of risk to the rivalry.

¹ Climate change is also having an adverse impact on marine life and fisheries in the Arabian sea. Fishing in the region has long been a contentious issue between India and Pakistan, and is a secondary pathway through which climate change could enhance tensions.

² There's also a much less significant maritime dispute over the demarcation of Sir Creek, located on the border of the Indian state of Gujarat and the Pakistani province of Sindh.

Disputes involving the territory of Kashmir (which lies in the Indus River Basin) have been the proximate cause of three of the four wars fought between the neighbors. The dispute is complicated by the presence of a third claimant – China. Kashmir is currently partitioned between the three (Figure 1).



FIGURE 1: Kashmir's zones of control by India, Pakistan and China. Map generated using ArcGIS® software by ESRI.

India and Pakistan view Kashmir differently. Whereas India has traditionally seen the issue as primarily that of terrorism fueled by the Pakistani state, achieving control over all of Kashmir has been a key strategic goal of Pakistan since independence. However, Indian-held Kashmir was mainly peaceful (except during wartime) till 1989, when growing unrest among in the wake of an allegedly rigged state election escalated into a violent campaign against the Indian state. Kashmiri militants sought to either merge the region with Pakistan or achieve independence from both countries. Over time, the pro-Pakistan and radical Islamist groups have come to dominate the militancy.

The intensity of Kashmiri militancy is prone to cycles. The 1990s were a particularly violent year culminating in the Kargil war high in the Himalayas in the summer of 1999. This was followed by an eyeball-to-eyeball confrontation between the two countries in 2001-02 with more than a million troops mobilized on the border for a full-scale war.

After a significant thaw and formal ceasefire in the wake of these crises, during which a lasting settlement on Kashmir seemed plausible, militancy began to increase again. One particular attack in November of 2008 stood out both for its intensity and its by unusual reach as far as the Indian financial capital of

Mumbai, located 2000 km from Kashmir. The horrific attack unfolded over three days and killed 166 people, including six Americans, in railways stations and hotels across the business district of the giant metropolis. The Mumbai attack effectively ended the peace process between New Delhi and Islamabad.

Kashmiri militants struck most recently in February, 2019 when a suicide bomb attack killed 40 Indian troops near Pulwama in Kashmir. The Pulwama terror attack led to a major armed clash between the two countries involving aerial dogfights and a missile strike by India on an alleged terror camp in Balakot, deep inside Pakistani territory. Since then, tensions have been high on the Kashmir border with frequent exchanges of artillery fire and casualties on both sides. A few months after this incident, the Indian government abolished the state of Kashmir's autonomous status and additionally partitioned and demoted it to two centrally-controlled territories, further escalating tensions in the region.

India has long alleged Pakistani arming and training for Kashmiri militant groups – an allegation that gained international credibility after strong evidence linked the Mumbai terrorist attack to the Pakistan-based group Lashkar-e-Tayyiba (LeT). LeT has been classified as a Foreign Terrorist Organization by the US state department. Pakistan however has denied it provides anything more than diplomatic and moral support for what it considers to be a freedom struggle of the Kashmiri people against Indian occupation.

Escalatory Pathways to Nuclear Use

Although conventional warfare itself between India and Pakistan could be enormously destructive for both countries, it is nuclear escalation that has truly existential potential, not just for the subcontinent, but also for the wider region and even the world (Parthemore, 2019; Toon et al., 2019). In studying past crises under the nuclear shadow, scholars have vigorously debated the efficacy of various factors including nuclear deterrence and the role of US mediation in preventing escalation to full-blown war (Kapur 2007, 2008; Mistry, 2009; Lavoy, 2009; Nayak and Krepon, 2012; Ganguly and Hagerty, 2005; Ganguly and Kapur, 2010). Scholars have also examined deeper historical factors such as strategic culture in explaining India and Pakistan's nuclear behavior (Basrur, 2001; Shidore, 2015; Rais, 2015).

Escalatory scenarios of the rivalry most commonly begin with a terrorist attack in Kashmir or mainland India attributed to Pakistan by New Delhi and a retaliatory conventional strike by Indian troops. However, a terror attack is not the only potential trigger for escalation in South Asia. Enhanced firing across the border could take on a life of its own and potentially escalate to cross-border strikes. Recent exchanges in Kashmir have involved heavier weapons and much more artillery fire than before. Since the Balakot air strike it is also feasible that the next crisis will be triggered by a pro-active Indian operation to seize territory in Pakistani-held Kashmir (Dalton & Kalwani, 2019).

The next section will analyze the impact of climate change on the Indus river basin.

THE INDUS RIVER BASIN AND CLIMATE CHANGE

The Indus River Basin

One of Asia's largest river systems, the Indus River Basin (IRB) consists of the key artery, the Indus river, and a number of tributaries, most of which are major rivers in their own right (figure 2). These include the Jhelum, Chenab, Ravi, Sutlej, and Beas rivers. Together these six rivers carry approximately 0.2 billion cubic meters of water annually. The IRB rivers originate in the Himalayas, the Karakoram, and the western end of the vast Tibetan plateau. This region has been dubbed the "third pole" as it contains the greatest amount of frozen freshwater next to the north and south poles. Glaciers in the third pole form a key source of flows in the IRB.

The Indus originates in Tibet and flows along the Karakoram mountain range before entering the plains of Pakistan and emptying into the Arabian Sea. The Sutlej too originates in Tibet and passes through the Himalayas before entering the plains. The other four rivers begin in Indian territory in the Himalayas

(figure 2). Under the terms of the Indus Waters Treaty (see below), three western rivers (Indus, Jhelum, Chenab) have been allocated to Pakistan, while India has the rights to the waters of the three eastern rivers (Ravi, Beas, and Sutlej).

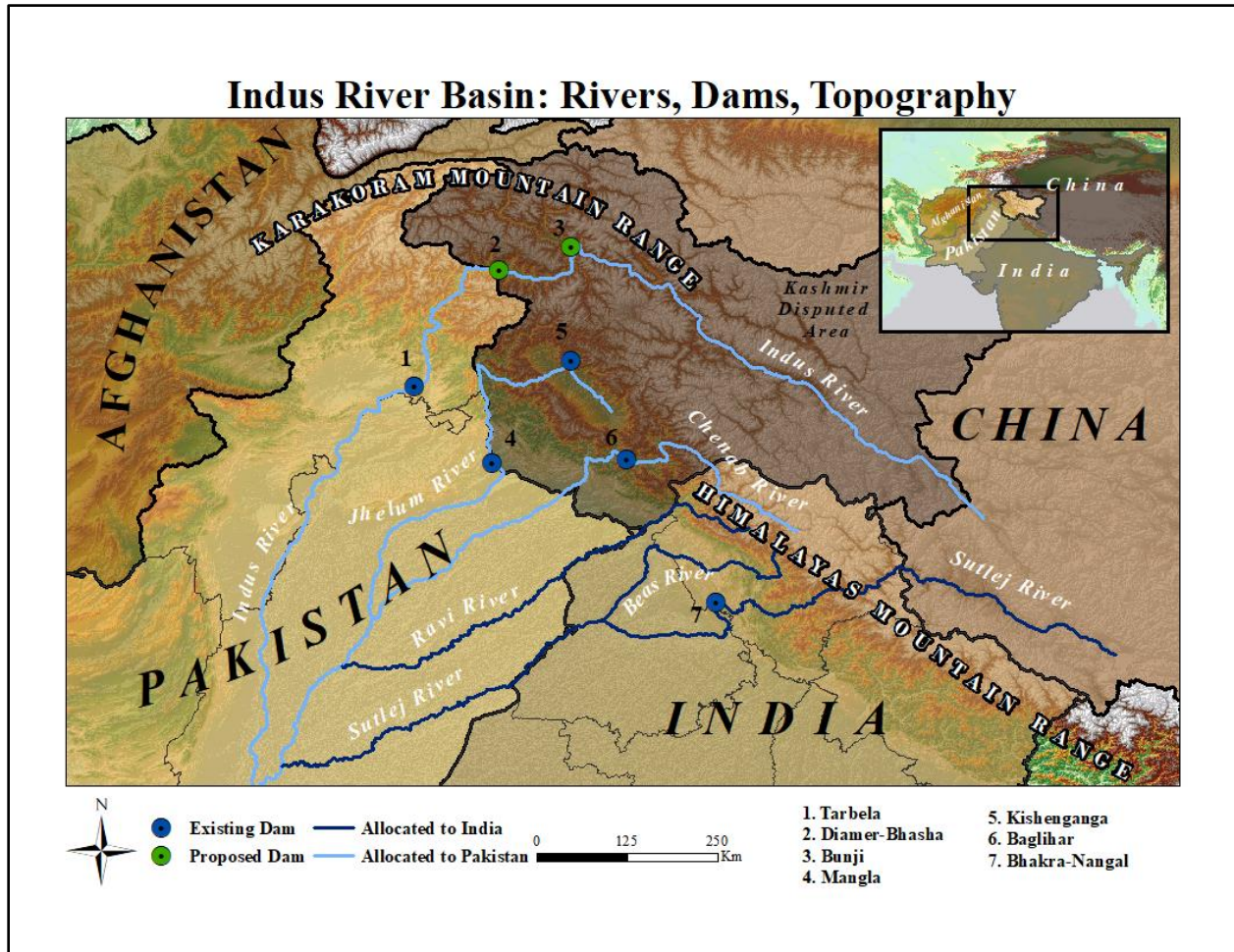


FIGURE 2: The Indus River Basin and its key dams. Map generated using ArcGIS® software by ESRI.

The IRB is the world's largest irrigated area from a single river system, with 26 million acres under cultivation in India and Pakistan. It is much more central to Pakistan's economy than India's, as 80% of Pakistan's agricultural output lies within the IRB. The IRB is also key to livelihoods and water supply in northwestern India, in the states of Punjab, Haryana, Rajasthan, and centrally-administered territories of Jammu and Kashmir and Ladakh, with inter-state disputes on water sharing a complicating factor (figure 3; also see Box 2). Hydroelectric projects in the IRB are important to both countries, but particularly to Pakistan's energy needs.

Indus River Basin: Rivers, Dams, Federal States

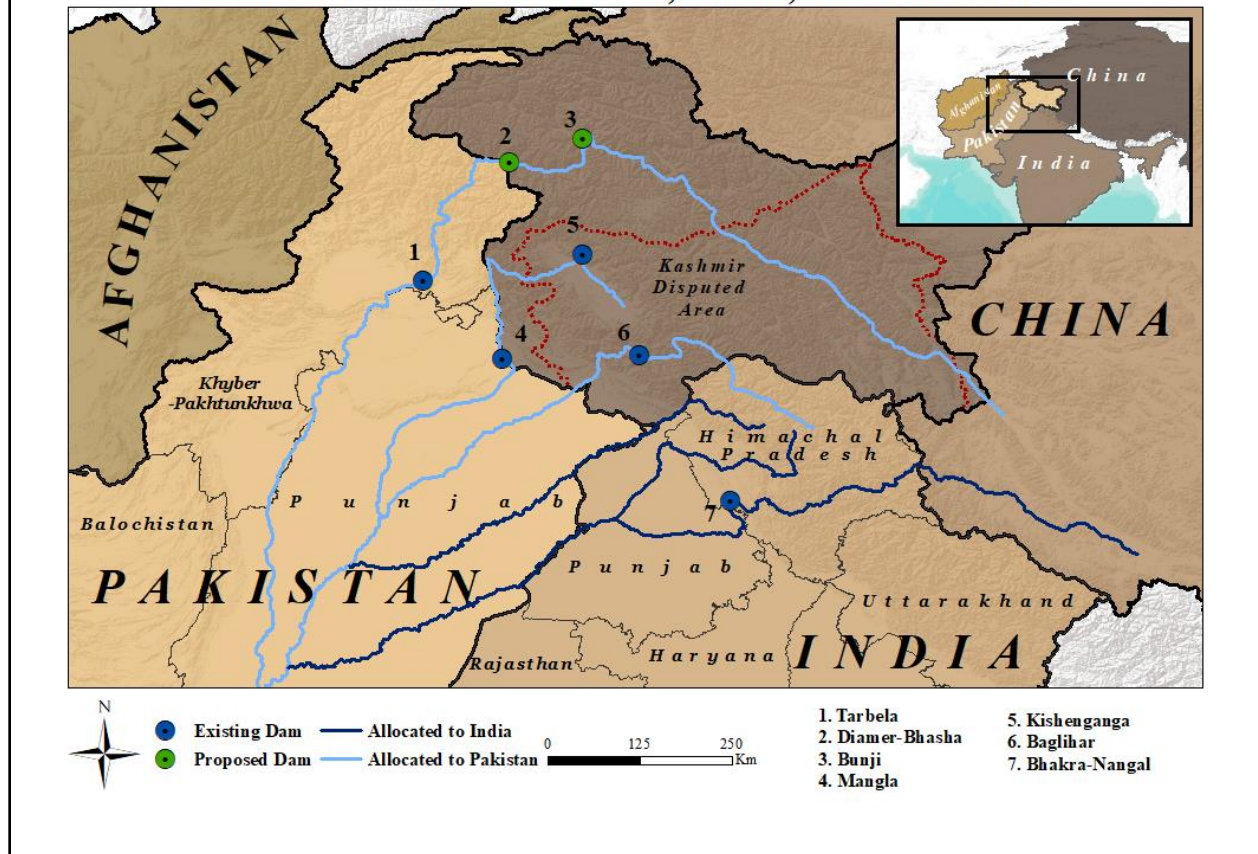


FIGURE 3: The Indus River Basin with adjacent federal states within India and Pakistan displayed. Map generated using ArcGIS® software by ESRI.

Two major precipitation cycles nourish the IRB – Western Disturbances (WD) from December to March, and then again with lesser frequency in the pre-monsoon season and the Indian monsoon from June to September. The Indus and Jhelum basins primarily receive precipitation from WD while Ravi, Sutlej, and Beas from the monsoon. Chenab is about evenly split (figure 4).

Precipitation flows into the rivers in three ways – runoff from rainfall, snowmelt, and glacier melt (Savoskul and Smakhtin, 2013). While rainfall runoff is close to immediate, snowmelt and glacier melt occur later when temperatures rise with the ebbing of winter. Thus, the latter two provide the means for maintaining river flows through the spring and summer. Snowmelt tends to peak in spring while glacier melt in late summer. An estimated 31% of net IRB flow originates from glacier and snow melts, almost evenly distributed between the two (Savoskul and Smakhtin, 2013, 25). This fraction is greater for the western rivers as compared to the eastern rivers.

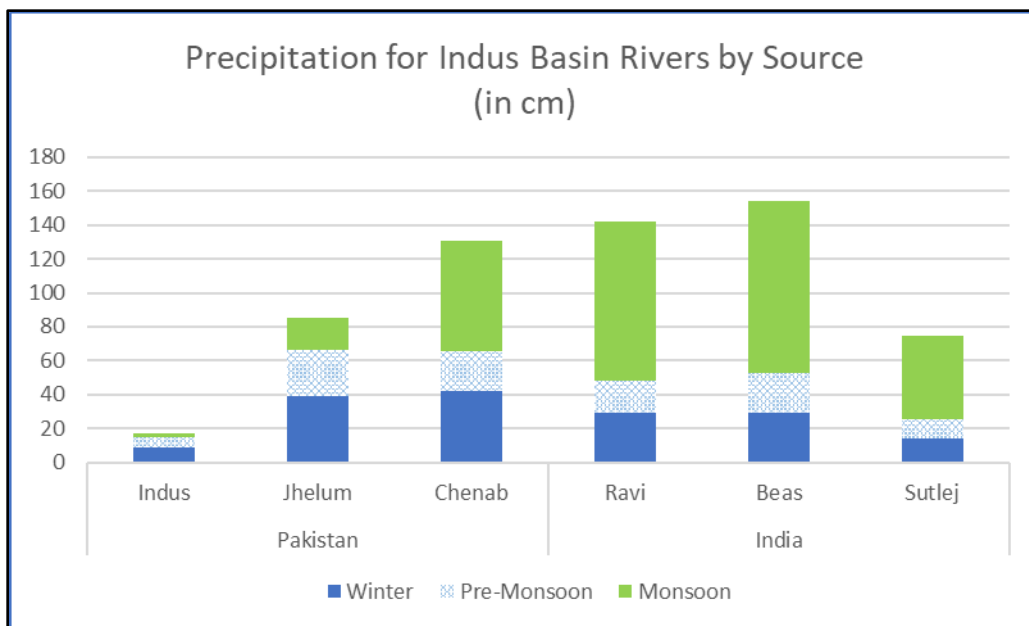


FIGURE 4: Precipitation for Indus basin rivers up to the India border by source. Winter and pre-monsoon precipitation is from Western Disturbances while summer precipitation is from the subcontinent’s Summer Monsoon. Source – Author from data in (Deshpande and Kulkarni, 2015).

Climate Impacts on IRB

Scientists have demonstrated that climate change is already impacting the IRB. Increased rainfall and increased concentrated precipitation events over western Himalayas have been shown to be caused due to climate change (Krishnan and Sabin, 2019).

Observations for glaciers within the IRB however show major local variations. Glaciers in the Karakoram mountain range (in the northernmost portions of Kashmir) are stable or increasing, as the net rainfall due to WD in these regions is actually increasing (Krishnan and Sabin, 2019; Muhammad et al., 2019). This unusual behavior is known as the “Karakoram Anomaly,” and mostly affects the Indus river. However, glaciers in the western Himalayas through which most of the IRB rivers pass through or originate, are shrinking at a substantial rate, which is mostly relevant to the other five rivers.

Scientists have also attempted to forecast climate trends on the subcontinent generally and the IRB specifically up to the next few decades, as reported in the most recent (i.e. fifth) assessment report from the Intergovernmental Panel on Climate Change (IPCC), the global body that assembles and publishes scientific climate projections on a periodic basis. The complexity of climate phenomena means that these forecasts inevitably come with uncertainties.

The main climate phenomenon in the region is the Indian monsoon. For India as a whole, the IPCC projects increased interannual variability, extreme rainfall incidents as also longer monsoon duration (IPCC, 2013a, 1229-1232, 1272-1273).³ The IPCC projects increasing mean precipitation for the monsoon, but model results have large associated uncertainties⁴(IPCC, 2013b, Figure A1:63).

³ Since the IPCC AR5 was published in 2014, modeling accuracy for the Indian monsoon at local scales has not advanced significantly. However, the first results from more accurate, low-resolution models will be published in 2020 and are likely to provide a better understanding of localized trends.

⁴ The Clausius-Clapeyron equation in climate science yields a roughly 7% increase in water vapor per 1 C of warming.

Observed data however shows that mean rainfall has actually been decreasing in many parts of India since the 1950s (Koll and Ghosh, 2017), though this is likely due to some combination of the well-established 60-year cycle of monsoon variation, effects of air pollution, and land use changes. There is much greater certainty that we will see greater intensity of rainfall in the future.

Forecasts specifically for the IRB region are of greatest relevance to the India-Pakistan question. The entire IRB is projected to have bursts of rainfall with greater intensity and smaller area of coverage due to climate change, according to a climate model simulation (Deshpande and Kulkarni, 2015). Simulations also suggest that the intensification of the WD activity and enhanced precipitation over the Karakoram is likely to continue several decades into the future. On balance, it would be reasonable to assume that mean precipitation in the IRB is unlikely to decrease in the longer run, and the intensity of precipitation events is likely to increase.

Glacier melt is an important contributor to IRB flows. The most recent study of glacier trends in the IRB forecasts stable glacier mass associated with the (Pakistani-allocated) western rivers, especially the Indus river, for most of the century, but much faster glacier loss for the (Indian-allocated) eastern rivers. Glacier melt runoffs will decrease sharply after 2050 for the Sutlej, for instance (Prasad et al., 2019, Figure 5). The shrinkage of glaciers for the eastern rivers will not reduce mean annual flows (if anything, increasing them in the shorter run), but will make them much more seasonal and uneven. This increased volatility will be further compounded by increasing extreme precipitation events and glacial lake outburst floods (below). Snowmelt will also happen earlier in the year and glacier melt will initially increase and then decrease for the eastern rivers. (Jeelani et al., 2012; Hasson et al., 2017).

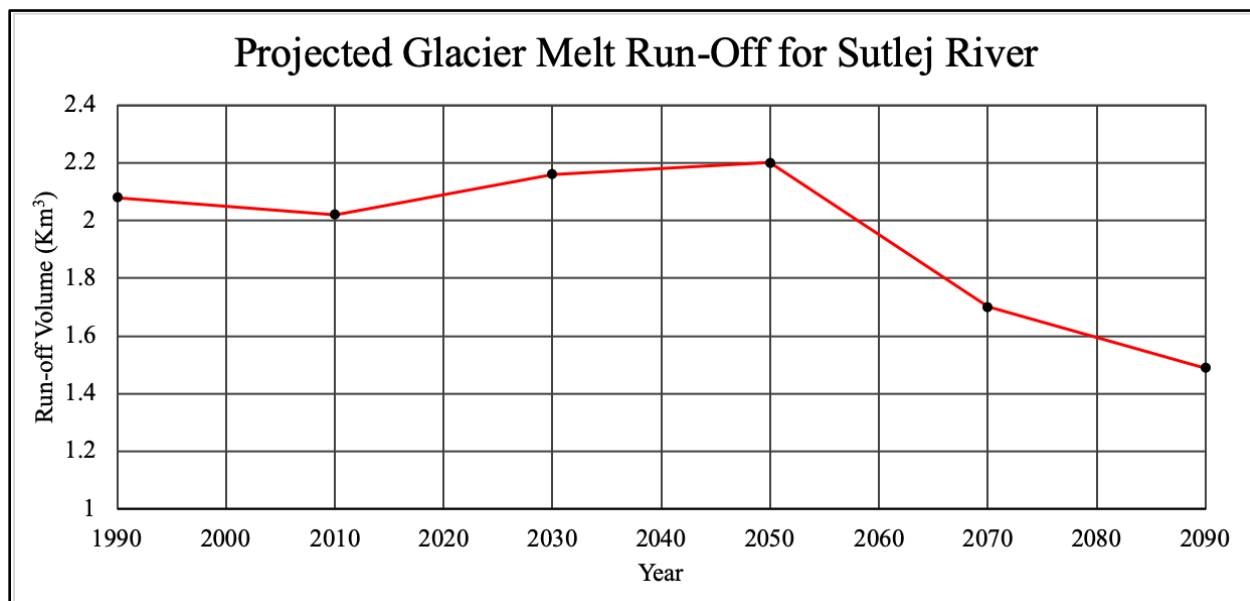


FIGURE 5: Glacier melt for the Sutlej river through the 21st century. Source – Prasad et al., 2019

In case of the western rivers, flow from glacier melts will likely increase till about 2070 and then begin to slowly decrease. For the Indus river specifically (which is mainly fed by glacier and snowmelt up to the Indian border), net flow is likely to be relatively the same or increasing till late in the 21st century, due to the Karakoram Anomaly.

Glacial Lake Outburst Floods (GLOF) are other phenomena that climate change will worsen. These floods are triggered by the collapse of a lake formed within a glacier, causing a sudden outburst of water. Faster melting glaciers make such lakes more vulnerable to collapse. A recent study has detected thousands of such lakes at risk of collapse in the Himalayan region (Yirki, 2019).

The take-away from the science therefore is that mean flows in the rivers of the IRB are likely to increase until at least the middle of the century. However, these flows will become much more volatile and seasonal, especially in the cases of the three eastern rivers allocated to India.

The principal climate risk in the IRB therefore is the increasing frequency and intensity of flood and flash flood events. Spring is likely to be a flood-prone season. More intense rainfall and GLOFs will likely lead to increased summer flooding as well, though after 2050 reduced glacier melt flows could also imply more drought events in the summer in eastern rivers. Some of the flooding events in the IRB will very likely be severe, exceeding past cases such as the “super-flood” of 2010 in Pakistan which was partly attributable to climate change (Gronewald, 2010, Asian Development Bank, 2013).

THE INDUS WATERS TREATY

The partition of the subcontinent also divided the IRB between India and Pakistan, leading to bilateral disputes after 1947 over sharing its waters (including contestations between federal states – see Box 1). After several rounds of World Bank-facilitated negotiations, the two governments signed the landmark Indus Waters Treaty (IWT) in 1960 (World Bank, 1960).

BOX 1: Subnational Complications

Though international water disputes often get the most attention, the more intense water conflicts in the world tend to take place at local and subnational levels (Conca, 2012). Prior to 1947, there were major disputes over sharing the Indus River Basin between colonial states of Punjab, Sindh, Bahawalpur, and Bikaner, in spite of all of them being ruled or dominated by Britain. In more recent decades, bitter disputes between the Indian states of Punjab, Haryana and Rajasthan over sharing waters of the Sutlej and Beas rivers (figure 3) was one driver behind the separatist Sikh insurgency which wracked Punjab in the 1980s.

There has long been anger in Indian-held Kashmir at perceived diversion of the state’s hydroelectricity to other parts of India, as only 12% of the generation is allocated to state residents (Dar, 2013). In Pakistan a major dispute between Punjab state and the states of Sindh and Khyber-Pakhtunkhwa has for decades stalled the construction of the proposed Kalabagh dam on the Indus river.

Farther afield from the IRB, the peninsular Indian states of Tamil Nadu and Karnataka regularly battle over the use of Cauvery river waters. The Cauvery however is only one of several unresolved river water disputes within India. A number of tribunals have adjudicated some of these disputes, but others remain in litigation. In extreme circumstances, there is the potential of subnational river basin disputes contributing to outright separatism, as the case of Indian Punjab in the 1980s demonstrates.

Structure of the Treaty

The IWT partitioned the six main rivers of the system such that Pakistan received the rights to the waters of the three western rivers Indus, Jhelum (known as Neelum in Pakistan), and Chenab, while India was awarded unrestricted rights of three eastern rivers Ravi, Beas, and Sutlej (figure 3). Overall, Pakistan was awarded 133 MAF, or 80% of the IRB waters, with India getting 33 MAF, or 20%.⁵ (Although the Indus

⁵ MAF = Million Acre Feet, a unit of water volume commonly used in assessing river flows.

and Sutlej rivers also flow through China (Tibet), Beijing was not a party to the treaty and remains outside its purview – see Box 2.)

The IWT consisted of detailed clauses defining permissions and constraints on the use of these waters by each country. For example, India is allowed to use the waters of the western rivers (allotted to Pakistan) for “non-consumptive purposes” such as hydroelectric generation, navigation, and a limited amount of irrigation as well as limited storage to the extent of 3.6 MAF.

A dispute settlement mechanism is also provided in the treaty. A Permanent Indus Commission (PIC) consisting of a commissioner each from India and Pakistan is mandated to meet at least once a year, and inspect desired river sites every five years. The PIC is the first stop for the raising and resolution of any differences between the parties. If the PIC cannot resolve a dispute, it can be referred to a Court of Arbitration. If the dispute is however technical in nature, a World Bank-appointed “Neutral Expert” is to adjudicate the matter. Verdicts are binding on both parties.

Multiple Disputes

Unsurprisingly, almost all objections within the IWT have been raised by Pakistan, the downstream country, against Indian upstream projects. Negotiations within the PIC itself have resolved several of these questions in the past, such as over India’s Dulhasti and Salal dams (Water Power & Dam Construction, 2007). Two items however were escalated beyond the PIC’s ambit, namely the 900 MW Baglihar and 330 MW Kishanganga hydroelectric projects on the Chenab and a tributary of the Jhelum river respectively. The resultant rulings, in 2007 and 2013 respectively, are seen as landmarks in international water law.

In Baglihar, a key Pakistani objection was the positioning of gated spillways in the dam well below its ‘Dead Storage Level’ (DSL) for ‘drawdown flushing’ (a method for de-silting), which it feared would allow India to manipulate flow downstream (Hussain, 2007; Water & Power Magazine, 2017) to create floods or droughts in its territory. In Kishanganga, Pakistan argued that diversion of waters from one Indus tributary to another was not allowed under the IWT and water levels in the planned reservoir could not fall below the Dead Storage Level (DSL), which India planned to do for de-silting purposes.

The technical ruling by a ‘Neutral Expert’ went mostly in India’s favor in the Baglihar case. The Kishanganga case was adjudicated by a Court of Arbitration and therefore took up deeper questions of interpretations of the treaty. The ruling largely favored India on the question of water diversion. But drawdown flushing by reducing water levels below the DSL was disallowed. This meant that the Baglihar ruling’s allowance of this technique was not accepted as a general principle - a setback for New Delhi.

The survival of the IWT through four wars by these bitter rivals, and the fact that the two parties could avail of and essentially abide by the dispute resolution processes specified in the treaty can be taken as a sign of the strength of the IWT. However, Baglihar and Kishanganga are by no means the only disputes in the IRB; Pakistan has also objected to several other dams (see below). Continuing terrorist attacks and India’s recent demotion of Kashmir’s status in the Indian federal structure has further raised tensions between the neighbors. The future survivability of the IWT under these circumstances is now a legitimate question.

BOX 2: The China Factor

Though China is not usually in the news on IRB disputes, the rivers Sutlej and Indus originate deep within Tibet. China is also the key upstream actor when it comes to the Brahmaputra River Basin (BRB) in the far east of India. India has a data sharing agreement on these rivers with China (Economic Times, 2018a), but retains a fear of possible water diversion projects Beijing may undertake on the river. China has also been a close security partner of Pakistan for decades.

Chinese diversion of IRB waters is unlikely, due to the vast distances separating the basin from demand centers nearer to the coast. It is more logical for China to undertake such projects for rivers such as Brahmaputra in eastern Tibet. However, joint Chinese-Pakistani strategies on dam building have intensified of late raising concern in New Delhi (Grover, 2017). China has agreed to assist Pakistan in the construction of a cascade of five major dams on the upper Indus river in Pakistani-held Kashmir and the Pakistani province of Khyber-Pakhtunkhwa as a part of Beijing's Belt and Road Initiative (BRI). The five dams, namely Diamer Bhasha, Patan, Thakot, Bunji, and Dasu (Sehgal, 2019) are slated to have a net power generation capacity of 22 GW. Pakistan however subsequently rejected a Chinese role in the Diamer-Bhasha dam (Chaudhary, 2018).

The projects remain in their early stages, with only Diamer-Bhasha and Dasu moving forward (Abbas, 2019). Still, the potential entry of China in such a consequential manner in a territory claimed by India has raised major concerns in New Delhi (Singh, 2017). India objects to some of these projects principally on grounds of sovereignty rather than water security, though it could in principle raise objections to some of them under the redressal mechanisms of the IWT.

WILL THE INDUS WATERS TREATY SURVIVE?

Water emerged as a major issue in the India-Pakistan dynamic after many decades when Pakistani militant and Lashkar-e-Taiba leader (as well as the alleged mastermind of the 2008 terrorist attack on Mumbai) Hafiz Saeed began accusing India of using water as a tool of hostility back in 2010 (Economic Times, 2010).

However, the role of water acquired a new prominence in the wake of a terrorist attack by alleged Pakistani-backed militants on an Indian army camp in Uri, Kashmir in September 2016. "Blood and water cannot flow together at the same time," Indian Prime Minister Modi famously said in a reaction to the attack, implying tough Indian action on Indus waters.

Indian water resources minister Nitin Gadkari reiterated this sentiment in the wake of the Pulwama attack in February 2019, tweeting that India had "decided to stop our share of water which used to flow to Pakistan."⁶ India set up a high-level task force was set up under the stewardship of the Principal Secretary to the Prime Minister to ensure that India makes full use of the waters it is entitled to under the Treaty" (Indian Express, 2019). Pakistan's responses were equally bellicose, warning that any such move would be taken as an "act of war" (Jorgic and Wilkes, 2016).

⁶ https://twitter.com/nitin_gadkari/status/1098567044574916608

Climate Complications

The effects of climate change act to magnify growing stresses on the IWT. Though net flows in the rivers are not yet affected and are unlikely to reduce due to climate change, they will almost certainly become more volatile.

Thus, flooding events will very likely increase in the IRB (see above). Pakistan's darkest fears are that India will manipulate dam storage levels to magnify downstream floods, hurting Pakistani farmers badly. However, any such moves by India will also adversely affect inhabitants in Indian-held Kashmir that reside downstream of the dams. India on the other hand worries that Pakistan will use floods caused in part due to climate change to falsely accuse India of water manipulation to score geopolitical points.

Due to the younger geology of the Himalayas, the Indus basin rivers suffer from a problem of silt, which builds up behind dams over time, greatly reducing their efficacy. Large Pakistani dams in the IRB such as Mangla and Tarbela already suffer from a major silt problem. Deforestation, partly due to climate change, is only increasing silt load, particularly in the Jhelum and Chenab rivers (Asian Development Bank, 2013). These are precisely the rivers on which Indian projects are the most contested by Pakistan.

The growing silt load puts pressure on India for embracing dam designs that can combat silt. Designs that allow flushing well below DSL also allow for greater flow manipulation. The 'dual use' nature of these designs has the effect of making Indian intent difficult to gauge from the Pakistani standpoint, and Pakistani attempts to scuttle Indian projects easier from the Indian standpoint. Given a general environment of a massive lack of trust between India and Pakistan, climate complications are only deepening distrust and raising tensions over the IWT.

India's Options

Since 2016, there has been much speculation in the Indian and Pakistani media on a unilateral Indian pullout from the IWT. Rhetoric aside however, what are India's realistic options with respect to the IWT as climate impacts grow, and how might Pakistan react?

In principle, India has two ways of hurting Pakistan over water. The first is, as Indian official Gadkari said, to ensure that it uses all the water of the eastern rivers for consumptive purposes, so that almost none flows into Pakistan. This is allowed under the IWT.

However, India already uses more than 95% of the eastern rivers' water through dams it has built over the decades such as the giant Bhakra-Nangal project (Patel, 2019). Only about 1 MAF currently flows into Pakistan (Hasnain, 2019). Announced projects such as Shahpur Kandi will mop up most of the trickle that does flow across the border. In any case, Pakistan does not object to these moves (Hasnain, 2019), so there's little chance they will raise bilateral tensions.

The second option is to prevent more of the water in the western rivers (allocated to Pakistan) from flowing across the border. This can be done through diversion and/or building large dams in Kashmir. Diversion is extremely difficult given the formidable terrain in the region.⁷ The cost and engineering challenges are prohibitive, especially so for the financially constrained Indian state and is therefore practically ruled out. Diversion of this magnitude would also be a clear treaty violation.

Building more storage on western rivers is a more realistic option for weaponizing water. In theory a large enough storage volume will allow India to manipulate flows in the western rivers, blocking them during

⁷ There is however a smaller diversion project currently being constructed by India and opposed by Pakistan, the Tulbul navigation/Wullar barrage project on the Jhelum river, which also includes a storage facility. This specific project however seems sanctioned by the treaty (Annexure D, para 16) which allows such a diversion on the Jhelum river. The clause was added in the treaty as India had already planned the project during its drafting stage.

the dry season and releasing extra water during the wet season making downstream Pakistan prone to greater droughts and floods. But India's existing major dams on the western rivers (Kishenganga, Baglihar, Salal, and Dul Hasti) are run-of-the river types, which involve minimum storage India has utilized only 0.5 MAF of the 3.6 MAF of storage allowed so far (Grover, 2019).

There is therefore scope for expanding storage on the western rivers. Planned Indian dams such as Bursar, Pakal Dul, Ratle, Lower Kalnai, Jispa, and Sawalkot have raised major concerns in Pakistan on this score (Waqar, 2019). India views these dams as staying within its storage obligations. Pakistan disagrees and is especially concerned about the cumulative storage magnitude on the Chenab river. Pakistan may invoke the dispute resolution process on Pakal Dul and Lower Kalnai projects, as PIC-level talks have deadlocked (Economic Times, 2018b).

Any Indian attempt to breach storage limits allowed under the IWT will be taken to arbitration by Pakistan and likely ruled illegal. Also, the Kishenganga ruling by the Court of Arbitration did not generalize the earlier Baglihar ruling on allowing drawdown flushing below DSL. This limits India's legal pathway to reproduce the Baglihar design for its future dams, thereby constraining manipulation-prone storage. Then there is the question of who will use all the extra stored water during peacetime - demand for irrigation has actually gone down over the years in Indian-held Kashmir as many farmers have switched to horticulture (Sinha, 2019).

Pakistan believes India's strategy is to present it with a *fait accompli* of completed projects before any legal process concludes. But building these dams will also take India a long time – at least a decade or two in spite of a renewed push for construction (Sen, 2019). State-owned NHPC, tasked with the construction, has a track record of delays across India. Thus, and Pakistan has plenty of time to raise objections at each stage. Local protests by affected villagers against several of these dams are likely to snarl the projects further (The Wire, 2019; The Tribune, 2017). There has long been deep resentment in Indian-held Kashmir on the Indian government's perceived diversion of a large majority of generated hydropower outside the territory (Dar, 2013).

Unilateral Indian Abrogation?

As the downstream party, it is clearly not in Pakistan's interest to formally pull out of the IWT, but rather raise as many objections as possible within the treaty mechanism to slow down or halt Indian projects. If bilateral tensions continue to grow however, is it conceivable that India could openly flout or even abrogate the treaty unilaterally?

The IWT (Article XII) does not provide for unilateral abrogation by either party. Thus, any abrogation by India without the express consent of Pakistan will be in material breach of the IWT. The Vienna Convention on the Law of Treaties (VCLT) (UN, 1969), allows for a unilateral exit under Article 46 if a state can show that a treaty is in contradiction with an internal law of fundamental importance. However, it will be difficult for India to make this case given that it has accepted and operationalized the treaty for nearly six decades without invoking this argument.⁸

The political costs of unilateral abrogation would also be steep as much of the international community will likely oppose any such Indian move. This fact coupled with the relatively limited material gains India can make even if freed from the treaty's constraints makes it unlikely that New Delhi will choose unilateral abrogation as a strategy.

However, this conclusion comes with two caveats. One is the tolerance for high risk in India's post-2016 Pakistan policy, which has brought withdrawal from the IWT within the bounds of plausibility. The second is a still-unlikely scenario of a general breakdown of core norms of the global order, which would

⁸ Although India is not a signatory to the VCLT, its wide global acceptance means that it has emerged as a global norm. Besides, Indian courts have cited the VCLT in some of their rulings, lending it legitimacy within India.

make an Indian abrogation much easier.

Pakistan's Options

Pakistan's approach has relied on utilizing the IWT-mandated process to raise its objections and, in the cases of Baglihar and Kishenganga, take India through a judicial process. From India's standpoint, Pakistan raises objections at every stage to stall projects on western rivers. Pakistan also uses India as an excuse to divert attention from its own major failures on water management - being on track to reach high levels of water scarcity as early as 2025, well before India (Kugelman & Hathaway, 2009).

But Pakistan also has kinetic options of interfering with Indian dam construction through inciting attacks by Kashmiri militant groups, which Islamabad has a long track record of supporting. There has been at least one case of such an attack during the early stages of the Kashmir militancy. Indian projects could also be targets for any direct hostilities that may take place on the Kashmir border between the two armies, a scenario more likely now in the wake of the February 2019 clashes. The faster India completes its projects, the more target-rich environment is the result for Pakistan and its proxies.

However, increased militant attacks in Kashmir carry major risks for Islamabad if they can be shown to have their origins in Pakistan, which now includes the plausibility of an Indian counter-strike. India's Balakot air attack was a strategic surprise for many in the Pakistani military. The Modi government has clearly shown an unprecedented will to take risks when it comes to Pakistan.

CONCLUSION: CLIMATE, WATER AND SUBCONTINENTAL CONFLICT

The relationships between climate change and conflict are complex and case-specific (Busby, 2019; Tir and Stinneett, 2012; Risi, 2019, Wolf et al., 2003). The use of water as one weapon in an armed conflict determined by other factors has been recorded many times. For example, Turkey halted water flow from Euphrates to Syria in April-May 2014, when it was allegedly arming factions opposed to the Syrian government. Israel has also cut freshwater supplies to the Gaza strip on several occasions. The IRB itself has experienced such an event when India cut-off water in some of the rivers flowing to Pakistan in 1948 during an ongoing war between the two over Kashmir.

Climate impacts are having their greatest impact on the IRB in terms of variability and volatility of river flows. Variability rather than scarcity is also a better indicator of conflicts over water, as existing practices and institutions have a harder time coping with higher levels of unpredictability (Risi, 2019). Thus, while water wars may not be our future, water as a tool of coercive diplomacy may become more frequent (Conca, 2012).

The IWT, designed six decades ago (well before the modern environmental movement emerged), is simply inadequate to manage the growing environmental and demographic challenges it is being subjected to over time. A core problem is that the treaty is a partition agreement, not an integrated water management pact. In a sense it is a logical continuation of the partition of the subcontinent.

But while territory may be divided definitively, dividing a flowing, dynamic resource such as water increasingly subject to the vagaries of climate change is much more challenging. In fact, the IRB encompasses not just India and Pakistan but also China (see box) and Afghanistan. Ideally all four countries ought to evolve a joint approach to basin management. This could include electricity trade, joint flood control and disaster management, and coordination on climate adaption projects.

Very few instances of cooperation of this sort have occurred. Indian and Pakistani militaries sometimes aid each other during disasters such as avalanches. India, Pakistan, and China have recently launched an initiative on climate cooperation on western Himalayas (Koshy, 2019), a first such tri-nation initiative. But these steps fall far short of what is needed.

The most likely conflict trigger linked to climate change is a natural calamity in the IRB. This could involve a major flooding event triggering release of waters by upstream dams in Indian-held Kashmir. Pakistani allegations of deliberate Indian manipulation of such an event to magnify damage, whether true or not, may lead to an armed clash.⁹

But ultimately, water and climate change are magnifying factors for what are at their root historical, ideological and territorial tensions in the India-Pakistan rivalry. By themselves, water tends to induce cooperation more than conflict, but if refracted through the prism of variability and uncertainty induced by climate change and existing deep political-ideological hostilities, it may increase chances of armed conflict.

Current geopolitical trends in the region indicate that India and Pakistan are on a collision course. The trigger for any serious outbreak of armed conflict is likely to be terrorist attack or a border clash in Indian-held Kashmir. Targets of any terrorist strike could be military or civilian, including expanding Indian hydropower projects. Climate change is unlikely to be the proximate cause for an escalation between the subcontinental neighbors. Rather, increased stress on the IWT, partly climate-induced, magnifies the already-present risk of armed conflict and makes it more likely.

In the worst-case scenario, such a conflict may turn nuclear. Nuclear deterrence, which has been a major factor in preventing large-scale warfare in South Asia since the two nations went nuclear in 1998, is weakening due to shifts in Indian strategic culture (Shidore, 2015) and a combination of technology advances and changes in capability on both sides. A nuclear exchange, should it occur, could have major and devastating effects on the global climate, including a global cooling of 2 to 5 C (Parthemore, 2019; Toon et al., 2019).

Thus, India and Pakistan face a clear choice. They can view the increasing water and climate crisis as an opportunity for a whole new level of institutional cooperation that eventually extends to other neighbors. Or, they can turn inwards and view growing climate and water stress as simply another reason to double down on their current zero-sum framing of their conflict. The choices they make will be decisive in determining the subcontinent's future.

Sarang Shidore is a Senior Fellow at the Council on Strategic Risks and a Senior Research Analyst at the Lyndon B. Johnson School of Public Affairs at the University of Texas at Austin, specializing in geopolitical risk and the energy-climate nexus.

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⁹ Climate change could also conceivably escalate the India-Pakistan rivalry in more diffuse ways. The increased frequency of extreme rainfall, enhanced drought, decreased groundwater and river flows in the region more broadly can deepen distress of the population and stall economic growth. Governments may then be tempted to play up external rivalries and causes in order to safeguard their domestic legitimacy, which can set in place an escalatory dynamic. In any such situation climate change would however be only one of many factors involved.

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