INDO-PACIFIC STRATEGIC PAPERS

The Thirsty Elephant – India's Water Security Challenges: A test for regional relations over the next decade

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Later postings included National Defence Headquarters, Deputy Commanding Officer of NSE Joint Task Force Afghanistan (Operation ATHENA) and to 5 Brigade. In 2009, he was appointed Commanding Officer of 5e Bataillon des services du Canada, during which time his unit provided support to the 2010 Olympics (Operation PODIUM) and the G8/G20 Summit (Operation CADENCE). Later, as Commanding Officer of the Joint Task Force Support Element, he took part in the impromptu disaster relief Operation HESTIA in Haiti, and provided support to the floods in Monteregie (Operation LOTUS).

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Abstract

This paper examines India's water security challenges. It notes that if trends persist, more than 100 million Indians will soon face desperate domestic, agricultural and industrial water shortages, with serious implications for longer-term food security, livelihoods and economic growth. It contends that there is also potential for India's water security challenges to aggravate existing interstate tensions, with significant consequences for regional stability.

The paper asserts that a key issue will be whether India can secure its water requirements without further aggravating tensions with its neighbours. It argues that it clearly is in the interests of all parties that India—but also its neighbours Pakistan and China—strive to resolve the issue cooperatively on a region-wide basis, ideally under the auspices of broader, multilateral forums. Otherwise, increased competition and the potential for confrontation seem longer-term possibilities, posing significant risk for India's continued socio-economic rise, as well as the security and stability of the broader region.

The Thirsty Elephant – India's Water Security Challenges: A test for regional relations over the next decade [1]

Introduction

Water plays a vital role in sustaining livelihoods, human well-being and socio-economic development. Over the past decades, however, concerns over 'water security'—the capacity of a nation to guarantee the availability of quality water in a sustainable fashion—have emerged.[2]

The World Water Council reports that while the world's population tripled during the 20th century, the use of water for human requirements multiplied sixfold.[3] According to the UN, 1.2 billion people—nearly 15 per cent of the world's population—live in areas of physical water scarcity today, while 500 million others are approaching similar circumstances.[4] Furthermore, the global demand for water is projected to increase by 55 per cent by 2050 to satisfy increased manufacturing, power generation and domestic requirements.[5] In turn, water availability is affected by multiple non-traditional security issues, including unpredictable natural disasters, global warming, pollution, health and disease, and population migration. As a result, UNESCO assesses that 'the growing global water crisis threatens the security, stability and environmental sustainability of developing nations'.[6]

Water security has been a major issue for many regions, including those with high population density such as South Asia.[7] India, Pakistan, Bangladesh, Nepal and rising Asian superpower China 'alone account for nearly half the world's total groundwater use'.[8] Still, because South Asia is surrounded by the Himalayas to the north, and the sea in the southeast and southwest, as well as being endowed with a variety of climates and watered by a substantial inland river network in the form of the Indus, Ganges and Brahmaputra Rivers, few would suspect that South Asia is already a 'water-stressed' region.[9] Nonetheless, the Asian Development Bank 'confirms South Asia as a hot spot where populations and economies are being adversely impacted by poor water security' in terms of household (including sanitation), urban and environmental water security, as well as resilience to water-related disasters.[10]

Indeed, India faces daunting water security challenges. The 'demands of a rapidly industrialising [Indian] economy and urbanising society come at a time when the potential for augmenting supply is limited … and water ... issues have increasingly come to the fore'.[11] While India hosts approximately 17 per cent of the world's population, it holds only about four per cent of its required annual water resources.[12] According to the World Bank, India is the world's most important user of groundwater; moreover, if trends persist, 'an estimated 114 million Indians will soon face desperate domestic, agricultural and industrial [water] shortages … [with] serious implications for … long-term food security, livelihoods, and economic growth'.[13] Each year, in addition to significant economic losses equivalent to more than 6 per cent of India's GDP, nearly 38 million Indians suffer from water-borne diseases while some 600,000 children under the age of five die due to deficient water supply and sanitation.[14]

There is also potential for India's water security challenges to aggravate existing interstate tensions. A regional examination reveals that 'between India and Pakistan … water disputes exacerbate already strained bilateral relations…. [while] for Bangladesh and Nepal, Indian approaches to water are a primary source of distrust'.[15] A case in point is the Farakka Barrage on the Ganges River, which has been the source of longstanding friction between India and Bangladesh since its construction in 1975.[16]

It also appears that these tensions extend beyond the geographical boundaries of the Indian subcontinent. Indeed, China's contentious plans for dam constructions on the Brahmaputra River are of concern for lower riparian states India and Bangladesh, not only because of the potential 'repercussions for water flow, agriculture, ecology, and lives and livelihoods downstream; it could also become another … issue undermining Sino-Indian relations'.[17]

In addition, the effectiveness of current national water management strategies and transboundary frameworks is questioned. For example, in Pakistan it is deemed that 'if no significant national policy and development strategy or clear laws and regulations that monitor water use are established, unemployment, poverty and food insecurity are likely to increase and could become recruitment grounds

for extremism'.[18] As well, a longstanding mechanism for water sharing between India and Pakistan, the 1960 Indus Waters Treaty and Permanent Indus Commission, appears to have lost its relevance in the face of emerging non-traditional security challenges, such as climate changes and pollution, as they were not initially factored into the terms of the treaty.[19]

What then are the possible consequences of India's water security challenges over the next decade? This paper posits that India's increased water security requirements will test regional relations over the next ten years. The paper first will review the foundations that underpin current global water security problems by reviewing key water-related terminology, concepts and hydrological features. It will then examine the magnitude of internal water management problems in India, to identify that the issue is a serious and worsening security challenge of domestic concern for the rapidly-rising power.

The paper will then extend the scope of study to include consideration of water security in relation to India's neighbours, Pakistan and China, to demonstrate that the matter is both of regional and national concern. Finally, the paper will analyse the possible consequences for regional security in the decade to come. The paper argues that the best case scenario for India is a path of cooperation with its neighbours over better management and conservation of their water supplies, while competition and confrontation remain probable outcomes should regional cooperation not be initiated, expanded and institutionalised.

Understanding water

It is important to gain an understanding of key water conceptual underpinnings in order to establish a benchmark to analyse the implications of India's water security challenges. This section will review key concepts and terms related to water, and outline salient hydrological features that characterise the 'Himalayan Water-Commons', since they are determinants in shaping the Indian subcontinent water-supply scheme.

Global water distribution

The world's total volume of water is of approximately 1.4 billion cubic kilometres (km^3).[20] Oceans hold 97.5 per cent of these finite water reserves, which are not readily available for human consumption unless subjected to desalination treatment—a costly and complex process requiring a high level of expertise, not yet easily accessible to developing countries.[21] The remaining 2.5 per cent of freshwater available—but again, not necessarily easily accessible or fit for human use—is either 'locked' elsewhere in glaciers (68.7%), groundwater (30.1%) and permafrost (0.8%) or contained in surface waters (0.4%).[22]

In turn, freshwater lakes account for most of surface waters (67.5%), while soil (12%), atmosphere (9.5%), wetlands (8.5%), rivers (1.5%) and vegetation (1%) make up for the rest.[23] Most of the human water withdrawal occurs in rivers, lakes and groundwater; this amounts to less than one per cent of global water resources.[24] In addition, poor access to safe water resources presents humans with complex challenges when considered against their various intended uses.

Furthermore, a look at global water resources usage patterns reveals that both its consumptive and non-consumptive uses—sourced mainly from lakes, rivers and groundwater—is for agriculture (68%) and domestic and industrial requirements (19%), as well as power generation (10%), while three per cent is lost to evaporation.[25] Therefore, despite water being a 'renewable resource', in fact, the earth's reserves that are readily available and fit for human utilisation are extremely limited, already being used to their capacity and mostly consumed for agricultural purposes.[26]

Terminology and concepts

The principal tenets of water security—availability and quality—are increasingly challenged by a variety of 'water problems', broadly defined as 'conditions of water shortage (where water demand exceeds water supply), poor water quality (inadequate for its intended use) or excessive water (floods)'.[27] Water experts assess, quantify and categorise the magnitude of water problems by considering a range of factors and, in the final analysis, by looking at the population-water equation to determine renewable water resources availability per capita.

Accordingly, the UN qualifies a population as being under 'water stress' when annual water supplies drop below 1700 cubic metres (m^3) per person; in turn, a region faces 'water scarcity' when annual per capita water supplies drop below 1000m^3 and, in extreme cases, a state of 'absolute water scarcity' exists when supplies drop below 500m^3.[28] Figure 1 provides a recent worldwide snapshot of the availability of renewable water resources per capita, indicating that both India and Pakistan already suffer from water stress, while China is in a position of vulnerability to water stress.

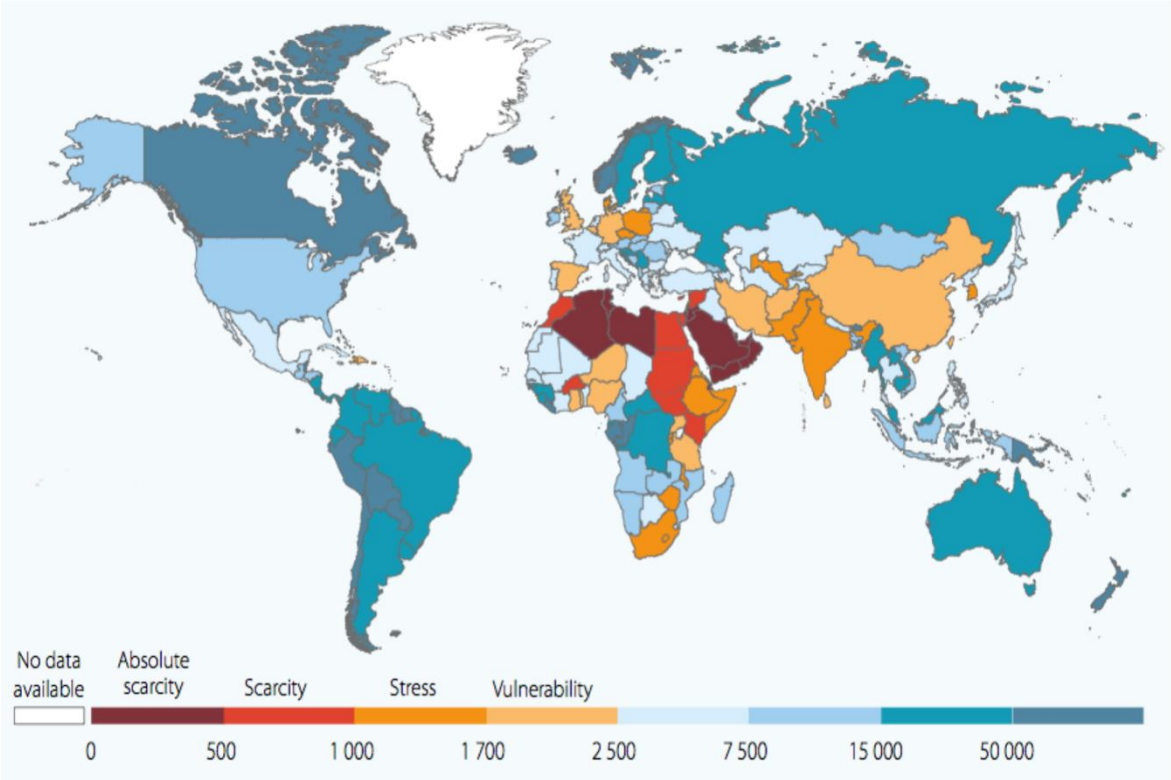

Figure 1: Total renewable water resources per capita (2013)[29]

In addition, the Asian Development Bank's 'national water security' framework offers a complementary assessment methodology to determine the extent of a country's water problems, by taking into account five key dimensions: household, economic, urban and environmental water security, as well as resilience to water-related disasters.[30] In a recent empirical study, both India and Pakistan were found to be at National Water Security Index (NWSI) Stage 1—the worst on a scale from 1 to 5—indicating that their 'national water situation is hazardous and [that] there is a large gap between the current state and the acceptable levels of water security'.[31]

In another regard, China's NWSI Stage 2 shows notably that 'institutional arrangements [are] improving; and levels of public investment increasing', albeit still inadequate.[32] These observations indicate that India, Pakistan and China have yet to make significant progress in order to reach the ideal NWSI Stage 5, where a 'country may be considered a model for its management of water services and water resources, and … as water-secure as possible under current circumstances'.[33]

An important characteristic of the comprehensive national water security framework is its holistic perspective on water. The model also reflects that water is tightly nested with other resources such as food and energy. Because of this inter-connectedness, water is susceptible to affect—and to be affected by—a wider range of traditional and non-traditional security issues, with UNESCO (the UN Educational, Scientific and Cultural Organization) noting that:

> [E]conomic, social and political crises have been emerging at an accelerated rate. Although often described individually – their underlying causes often boil down to the ever-increasing competition for a few key – often-limited – resources, of which water is common to all.[34]

Therefore, from the outset, India's precarious water situation suggests that the country is already sensitive—and arguably, to a certain degree, predisposed—to a wide array of potential crises. So too are the co-riparians Pakistan and China.

Water without borders

Of the 276 transboundary river basins worldwide, 60 are found in Asia.[35] Although Asian countries are cartographically distinct, they are functionally bound together as a single coherent hydro-region, namely the Tibetan plateau or 'Himalayan Water-Common', commonly referred to as the world's 'Third Pole'.[36] As noted by Brahma Chellaney, 'no other area in the world is a water repository of such size, serving as a lifeline for large parts of a continent…. Stretching 2400 kilometers from east to west, and 1448 kilometers from north to south, this unique water bank is the world's largest plateau ... [and] Asia's water tower'.[37] The Indus, Ganges and Brahmaputra Rivers—three of the longest, largest and most vital in the region—originate in the Himalayas (see Figure 2). Four billion people—more than half of the world's population—in China, India, Pakistan and elsewhere in South and Southeast Asia depend on these rivers for water, energy and food.[38]

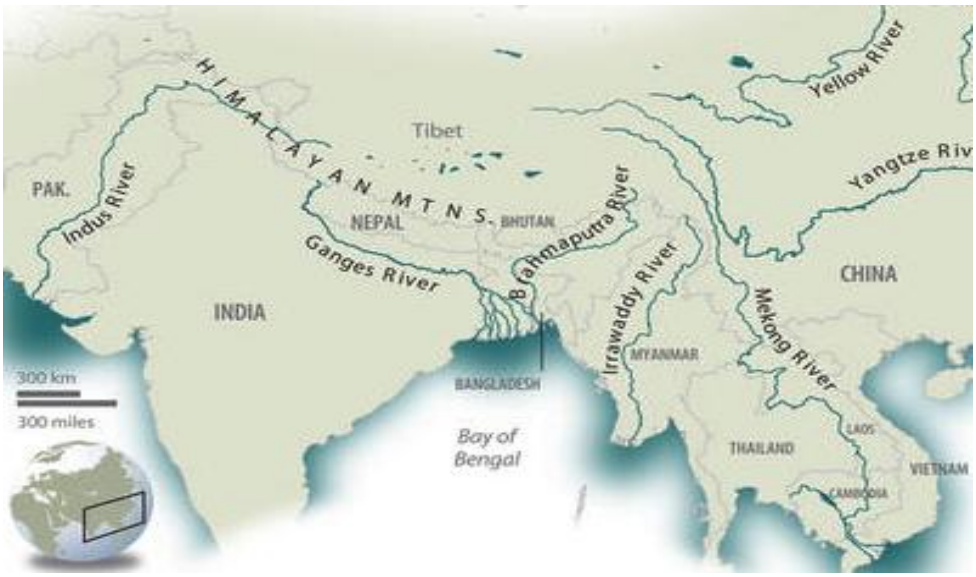

Figure 2: Major rivers fed by Himalayan Glaciers[39]

Within this impressive network, water flows from one nation to another, transcending geographical boundaries: 'the Indus basin links China, Afghanistan, Pakistan and India, while the Brahmaputra and the Gang[es] connect China, Bhutan, India, Nepal and Bangladesh'.[40] These river networks are essential to sustaining the basic needs of millions region-wide through the provision of water, energy, food and livelihoods. According to Sophie le Clue:

> [Y]et the transboundary nature of many of these water resources and China's ownership of the upper reaches of key rivers provides an ideal environment for political jockeying and conflict. In particular, China has the political clout and access to capital if it should choose to manage water reserves in a manner that may not be in the interests of neighboring countries.[41]

This feature of inter-connectedness through water indicates that India, by virtue of its geostrategic position relative to thirsty emerging giant China and other water-starved co-riparians, is predisposed for tensions ahead. Indeed, as noted in a 2014 report by the UK Ministry of Defence, 'a shortage of water could lead to countries (and communities within them) diverting water for their benefit to the detriment of others…. [and] as demand for water intensifies, it could lead to conflict'.[42]

Summary

In sum, this initial review of key water conceptual underpinnings highlights many factors of relevance for the analysis to follow. First, water is an extremely limited commodity of strategic value for India, Pakistan and China. Second, not only do these countries face precarious water security circumstances, they are also linked through a coherent 'water common' and hence share transboundary concerns. Third, China has a geostrategic advantage over India and other co-riparians as it 'controls' the headwaters. Finally, the water-energy-food nexus renders India, Pakistan and China more sensitive to a range of potential external pressures which could exacerbate their current difficult positions in relation to water security.

Having highlighted the key conceptual underpinnings, the following sections will analyse in more detail the implications of India's water security challenges.

India's water security: sufficiency, scarcity or depletion?

India is undergoing a very dynamic socio-economic transformation, characterised by changing demographics, rapid urbanisation and agricultural development. While striving for socio-economic improvement is desirable, the trends associated with this significant growth represent driving forces that affect India's ability to achieve its water security requirements in terms of both availability and quality. According to the World Resources Institute, half of India is facing high to extremely-high water stress, owing to insufficient supply to match household, urban and economic requirements.[43] India's domestic water security challenge is twofold. First, India is suffering a scarcity crisis; there is simply not enough safe, adequate water to satisfy national demands. Second, the management of existing water resources is deficient.

Approximately 224 million Indians currently lack access to adequate levels of safe drinking water.[44] Although the Indian Government has enforced measures to enhance both the availability and quality of urban drinking water systems over past decades, India's large and growing population has already overwhelmed planned water resources.[45] Surface water, due to high levels of pollution, tends to be unsafe for consumption, so many Indians are resorting to using groundwater.

This increased demand creates a problem of aquifer depletion.[46] A third of Indian aquifers have reached an unsustainable level of utilisation, suggesting that reliance on groundwater for drinking purposes is reaching its limits.[47] In addition, rural communities' access to water has been marginalised; left to their own devices, rural people rely on wells for their drinking water requirements, only to find brackish and contaminated water.[48] In sum, the lack of drinking water for people is an important factor that contributes to India's water security challenge.

India's water resources for agriculture to feed people are also under stress. Hosting 25 per cent of all undernourished people worldwide, food insecurity remains a serious issue for India. The World Food Programme states that 'any global impact on hunger requires progress in food … security in India'.[49] Water is vital to Indian food security that hinges on increased agricultural output to meet the demands of a growing population.[50] Agriculture is by far the most avid consumer of water, with close to 90 per cent of all freshwater withdrawal appropriated for irrigation.[51]

Irrigation is key to India's agrarian strategy, yet the indiscriminate use of water has harmed the soil and hampered productivity.[52] Water for agriculture is also competing with other demands such as urbanisation and changing lifestyles, resulting in increased water requirements.[53] Any type of water stress will affect agriculture, which will invariably affect Indian food security. Employment is also at risk since nearly 60 per cent of Indians depend on agriculture for their income.[54] Therefore, it is evident that the issue of water for agriculture to feed India's people is an additional key water security challenge.

Another water security issue for India is related to water use for industrial development and, hence, economic growth. The industrial sector in India is the second highest user of water after agriculture, and all indications are that this demand will only increase in the future.[55] In addition, a comprehensive survey of 27 major Indian industrial sectors found that most companies were operating in already stressed areas, with 75 per cent indicating difficulties in accessing the required water, which affected their business.

A 2012 report by the Columbia Water Centre noted that 'as competition for water increases across different sectors, the temporal variability in available supply leads to increasing pressure to … use groundwater resources unsustainably'.[56] This indicates that sustained economic growth will not only compete with other resource users but also add considerable pressure on already strained water resources. The lack of safe and adequate water to meet intended national purposes is therefore a major water challenge for India.

India also faces many challenges caused by the inefficient management of existing water resources. First, India's water resources are unevenly distributed in time and space. The monsoon season regularly leads to floods in some areas, such as Brahmaputra, Barak and Ganga, and droughts in others like Rajasthan, Gujarat, Andhra Pradesh, Karnataka and Tamil Nadu.[57] Second, poor water quality is a major environmental issue in India as most of its river networks, lakes and surface water are polluted.[58] As a result, more than 100 million Indians live in areas where water is severely polluted.[59] Third, due to leakages and lack of proper technology, up to 50 per cent of India's piped water supply is wasted.[60]

A further factor is that internal tensions over water availability and between water resource consumers is highly sensitive in India, exemplified by the protracted domestic disputes between the states of 'Delhi, Haryana, Himachal Pradesh, Punjab and Rajasthan [for] the sharing of water from the Sutlej and Yamuna rivers and the associated link canal'.[61] Finally, India faces the difficult issue of obtaining sufficient water for the future. This would seem to be virtually impossible according to the World Bank's predictions, given that unless India takes immediate corrective actions, its ground water table will begin to dry up by 2025.[62] The future appears even starker for India as its national water supply is expected to fall 50 per cent below demand by 2030; a position of severe deficit.[63] Therefore, rectifying poor management of existing water resources is a key security challenge for India, both now and in the future.

One of the main causes of India's poor management record is its lack of a coherent and effective domestic water strategy. Indeed, water challenges in India have not only permeated to every level, they are intensified by the paucity of policies and mechanisms to properly manage the use of water resources. A recent Royal Institute of International Affairs survey reported widespread discontent among Indian government officials and policy experts' circles *vis-à-vis* water management and water policies in general, owing to the lack of a holistic approach on the part of the Indian Government.[64]

In essence, water presents India with three very difficult managerial issues to tackle.[65] First, while India should enable effective vertical coordination across the multiple levels at which water is used and managed, the division of power between the centre and states concerning water management is unbalanced. This situation reinforces a centralised water management scheme where local, regional, cultural and geographical variations and the needs of each state are marginalised.[66]

A second issue is the inability on the part of the Indian Government to effectively regulate competition between various stakeholders and users of water. Despite the existence of a Central Ground Water Authority for the control and protection of ground water, pollution and the environment, there is no regulatory authority. While water policies and environmental legislation are deemed to be comprehensive 'on paper', there is blatant disparity between policy and implementation. Moreover, these policies are neither fully implementable nor enforceable.[67]

A third factor that illustrates the lack of a coherent water management strategy becomes evident when looking at India's managerial approach to dealing with the issue of geopolitical, hydrological and administrative boundary misalignment. Indeed, Indian transboundary and diplomatic interactions towards other stakeholders tend to be overly statist or nationalistic. This attitude prevents mutually beneficial, regional water management interactions. India's apprehensions towards its co-riparians and its lack of transparency inhibit cooperation.

Unless India adopts a more open, basin-oriented approach in its dealings with other water stakeholders, the current water problems will not only remain extant but also almost certainly worsen.[68] Clearly, India's 'National Water Policy' is proving inadequate to deal with today's complex water situation, despite the Government's considerable effort and investments since 1987.[69] This lack of an effective water management policy puts additional stress on an already challenged system and failure to resolve this shortcoming will only perpetuate, if not intensify, India's water security challenges.

Summary

In sum, the examination of water management in India reveals serious and worsening internal water security challenges, providing a 'hazardous' outlook, according to the Asian Development Bank.[70] The UN's World Water Assessment Program warns of the stark implications, such as lack of freshwater resources on economic prosperity and security.[71] In addition, water challenges in India have not only permeated to every level, they are intensified by the paucity of policies and mechanisms to properly manage the use of existing water resources.

These serious deficiencies have the unintended consequence of fostering internal tensions over water availability and between water resource consumers, which can be highly sensitive in India, as exemplified by the protracted disputes over the Sardar Sarovar Dam on the Narmada River, in the exceptionally water-stressed state of Gujarat.[72] Notwithstanding these domestic frictions, India—owing to its contiguous borders with neighbouring countries, its status as both an upper and lower riparian, and despite a number of agreements and treaties—is confronted with significant transboundary water challenges.[73]

Water security – interstate relations

Having examined India's internal water security challenges, the paper will now consider water security in relation to its neighbours Pakistan and China, to show how India's challenges exacerbate existing tensions, extending beyond the national realm into a transboundary, regional matter.

India-Pakistan relations

Relations between India and Pakistan have been tense for many decades and continue to be so. Certainly, of all the transboundary relationships between India and its riparian neighbours, this is the most sensitive and potentially dangerous. Legacies of the colonial past leave both countries in a state of mutual distrust, military tension and political acrimony.[74] Since the partition of British India into the independent states of India and Pakistan, the two countries have fought three wars, and experienced a number of armed clashes.[75] Other examples of longstanding tensions between them include the Jammu and Kashmir insurgency and alleged Pakistan-backed terrorist acts across India. Consideration of India's water security in relation to its neighbour Pakistan reveals that the Indo-Pakistani water problem is multi-faceted and bound to persist into the future.

According to Sumit Ganguly, the polarisation between India and Pakistan, leading to the enduring tension between the two nuclear-armed rivals, is deeply rooted in three main causes. The first is the ideological divergence between respective elites opposing India's secular and Pakistan's Islamic nationalisms. The second rests with Pakistan's irredentist claim to the Muslim-majority state of Jammu and Kashmir. The third relates to actions by both parties leveraging opportunities to damage each other's territorial claims over Kashmir or to their broader nation-building agendas.[76]

India's stance on the central issue of Jammu and Kashmir appears to have been consistent over the years. In essence, India takes the view that Jammu and Kashmir is an integral part of India, and that accession of Jammu and Kashmir to India is legal and final.[77] In turn, Muhammad Ali Jinnah, founder and first Governor General of Pakistan, stated that 'Kashmir is the Jugular vein of Pakistan and no nation or country would tolerate its Jugular vein remain[ing] under the sword of the enemy'.[78] These words still resonate in political and military discourses today, and epitomise the continued polarisation between the two countries.[79]

It thus appears that 'identity'—and issues of ideological, emotional, political and geostrategic pertinence over Kashmir in particular—is central to the protracted tensions between India and Pakistan.

Nonetheless, today the 'conflict over Kashmir is not exclusively ideological but also fundamentally connected to the control of … water resources'.[80] Consequently, the magnitude of Pakistan's water resources security challenge also warrants consideration.

Pakistan, like India, faces a serious and worsening water security problem. Daanish Mustafa and colleagues contend that:

> [B]ecause of overuse and misuse, the country is facing declining water availability and quality, growing water pollution, and overall environmental insecurity…. Water shortages may well pose the greatest future threat to the viability of Pakistan's economy.[81]

Pakistan's domestic water security challenge is multi-dimensional. It is confronted with a severe and deteriorating water shortage issue, with an estimated 50 million Pakistanis lacking access to safe drinking water, while 74 million others are without proper sanitation.[82] Another factor that contributes to Pakistan's water shortage problem is its inefficient use of water for agrarian and industrial purposes. According to Michael Kugelman:

> Pakistan's entire economy is driven by the textile industry…. The problem … is that most of the major industries use a [lot] of water – [for] textiles, sugar, wheat – and there is a tremendous amount of water that is not only used, but wasted.[83]

An additional issue that aggravates Pakistan's water shortage is the mismanagement of its existing water resources. Indeed, a number of serious deficiencies—such as inadequate water harvesting methods, a lack of reservoirs and storage facilities, as well as poor irrigation—are contributing to a marginal rate of water systems efficiency (less than 40 per cent), with the most critical being the lack of an effective national water policy to enable a holistic approach to water management.[84]

To compound the problem even more, Pakistan is wrestling with a severe energy crisis, partly caused by a lack of sufficient water and priority. For example, because of 'variations in the natural availability of water and regulation of water supplies that gives first priority to agriculture needs … [hydroelectric power] efficiencies in some plants are as low as 24 per cent'.[85] Consequently, energy shortages in Pakistan have 'adversely affected the economy and disrupted social life in the country … [causing losses of] over [US]$1 billion from export earnings and a potential displacement of 400,000 workers'.[86]

Pakistan's water security challenge currently 'affects both the country's vital agricultural sector and its booming cities; has implications for livelihoods, public health, and the environment; and, because of global warming, will undoubtedly worsen before it abates'.[87] As the water supply dwindles and demand continues to increase, Pakistan's water scarcity will only get worse. It is predicted that Pakistan's global water shortfall—which was 11 per cent a decade ago—will triple to an alarming 31 per cent by 2025.[88]

Furthermore, with a population projected to continue to grow from 184 to 227 million by 2025[89]—at which point Pakistan will have reached a state of 'absolute water scarcity'[90]—increased water demands 'will exacerbate water insecurity and present Pakistan with significant economic, social and political challenges'.[91] These stark indications suggest that, similar to India, water quantity and quality issues are likely to increase overall water insecurity for Pakistan. Given that India and Pakistan are interlinked by a water system that is transboundary in nature—the Indus—and that both countries face serious water scarcity issues, increased competition for access to more safe water is to be expected, which could exacerbate existing tensions.

India and Pakistan compete for the control of the Indus' shared water resources to satisfy their demands. The Indus river system is of geostrategic importance to both these major riparian countries since it sustains most of their surface water requirements. This is particularly true of Pakistan, with the Indus being the main water artery supporting the country. Additionally, of the Indus' five main tributaries, two are of particular concern *vis-à-vis* India-Pakistan relations since they flow through the sensitive region of Kashmir: the Jhelum (the largest), which originates from the Valley of Kashmir, and the Chenab, which flows through the Jammu and Kashmir state before reaching India.[92]

Given the serious water problems faced by both India and Pakistan, shared access to Indus water resources is not only paramount to their socio-economic development but elevates the issue as an

important transnational issue. In short, control of Kashmir means power to control the 'main Indo-Pakistani water valve'. Associated 'upstream' water management frictions have been a source of increased tension between India and Pakistan that persist to this day.

India's upstream use of water aggravates existing tensions with Pakistan. This is best exemplified by Pakistan's objections to India's initiation of hydropower construction projects along the Indus river basin (Jelhum and Chenab) in answer to its expanding energy requirements. India has also been diverting western rivers' waters through canals and tunnels from Jehlum to Chenab and onward to the Ganges to meet its increased regional water supply requirements. In the process, it is starving lower riparian Pakistan, which argues such action as a flagrant violation of the Indus Water Treaty.[93]

As a result, the prevalent Pakistani view is that India, by virtue of its upstream geography and regulated access to the Indus basin's river network, denies water supply to Pakistan which impacts on equitable water distribution and, in turn, Pakistan's socio-economic development.[94] In addition, there is also a Pakistani perception of 'theft' of water by India, which has fuelled threats by anti-Indian militant groups such as Lashkar-e-Taiba, one of the more than 60 active terror groups in India.[95] These allegations and intimidations, rooted in water insecurity, have the effects of intensifying the mutual sentiment of distrust and of fuelling political acrimony, which exacerbates existing tensions and raises the issue as a serious transnational security matter.[96]

The effectiveness of current Indo-Pakistani bilateral water management mechanisms is critical for the future security of the two nations, yet it is challenged. The longstanding Indus Waters Treaty and the Permanent Indus Commission should serve as the basis for the maintenance of peace and the fostering of bilateral cooperation. After all, the international water treaty was signed by two rivals, and lasted through the Indo-Pakistani wars and into the nuclear era.

Additionally, a recent extensive study of 148 countries concluded that active 'water cooperation between countries sharing transboundary water resources is directly correlated with the security of the nations involved in such cooperation and peace in the continent or subcontinent they belong to'.[97] Nonetheless, 'the existence of a [river bordering organisation]—like the existence of a treaty—does not mean the existence of cooperation.[98] Indeed, India and Pakistan are still coming to terms with the Indus Waters Treaty and, to date, 'the dissection and diversion of a single and geographically integrated river system under the treaty has intensified divisive politics in the region and [reinforced] the distrust between the two parties'.[99] Hence, the Indus Water Treaty holds no guarantee of peace between the two water rivals. As all indications are that Pakistan will reach a status of absolute water scarcity by 2025, the potential for aggravation of already existing tensions between India and Pakistan caused by this additional irritant will remain.

This examination suggests that issues over transboundary waters act as a compounding factor to the predisposing causes of Indo-Pakistani tensions by adding a layer of complexity to the Kashmir question, inciting more divergence, and creating another opportunity for both countries to undermine their respective national agendas. Moreover, these circumstances are shaped under an umbrella of nuclear deterrence and by the looming threat of numerous unpredictable irregular actors such as Lashkar-e-Taiba.

Furthermore, given the impact that any solution to India's water security problems is likely to have on neighbouring Pakistan, it can be concluded that the matter is one of not only national but also transnational concern. India's water transnational problem requires a transnational solution. Unless bilateral mechanisms such as the waning Indus Water Treaty are revitalised, India's water security challenges will most likely remain a cause of further divide and mistrust, which will aggravate existing tensions between India and Pakistan and, in turn, will continue to test Indo-Pakistan relationships in the decades ahead.

Having examined India's water security in relation to its neighbour Pakistan, the next section will move beyond the Indian subcontinent to consider an increasingly predominant contestant for Indian water resources in the emerging 'giant' of China.

India-China relations

India and China, two of the oldest living civilisations and rich in history, were once the pillars of global trade, prosperity and progress. The roots of Sino-Indian co-existence date back to at least two centuries BC,[100] at which point both countries were dominant powers, holding collectively more than half the world's economy.[101] Linked by trade since times immemorial through the so-called land and maritime 'Silk Routes' that enabled a two-way flow of material commodities, technology, people, ideas, culture and spirituality, India and China peacefully co-existed and, to some extent, influenced each other's evolution for two millennia.[102]

However, 'for over [the last] fifty years relations between the two countries have been at best distant and suspicious, at worst antagonistic, even conflictual'.[103] Indeed, long-drawn-out border disputes dominate contemporary Sino-Indian relations, with three major conflicts having been fought in recent decades: the Sino-Indian War over Aksai Chin (1962), the Chola incident in Sikkim (1967) and the Sino-Indian skirmish in the Sumdorong Chu Valley, surrounding the Indian statehood of Arunachal Pradesh (1987).[104]

Despite recent diplomatic and economic rapprochements and tight alignment on certain key international issues, such as world trade and climate change policy, strategic discord and military rivalry continue to divide the two nuclear-armed neighbours.[105] The as-yet unresolved question of Tibet and a recent military face-off between opposing Chinese and Indian troops in Ladakh (Jammu and Kashmir), at the Sino-Indian border near Demchok-Chumar in September 2014, most notably demonstrate these tensions.[106]

Martin Jacques argues that two main reasons underpin the profound antipathy between India and China. First, India remains suspicious of China's widening ambitions in the region. In essence, China's expanding bilateral relations with India's nuclear-armed rival Pakistan and its befriending of Bangladesh, Nepal and Myanmar, are seen as a deliberate attempt to 'contain' or control India by proxy, hence counterbalancing its predominance in the regional balance of power.

In the wider Indo-Pacific context, there is also similar wariness on the part of India towards China's increasing sphere of influence in the Indian Ocean, echoed by China's reciprocal apprehensions about Indian military and economic activities in the disputed South China Sea. Increasing Indo-Chinese rivalry over access to resources and influence has also been observed in Africa.[107] Ostensibly, the two emerging powers are on a path of strategic competition on a global scale.

Second, India and China have yet to resolve their longstanding border disputes.[108] Figure 3 illustrates the 4000 kilometre-long Indo-Chinese border with areas of contention shown in red. The first contested area is the remote Aksai Chin plateau in the western sector, which is administered by China but claimed by India. The central sector hosts the second area of contention, Sikkim, which is administered by India but deemed by China as an independent country. Finally, the eastern state of Arunachal Pradesh is the third area of contention, administered by India but claimed as 'South Tibet' by China.[109]

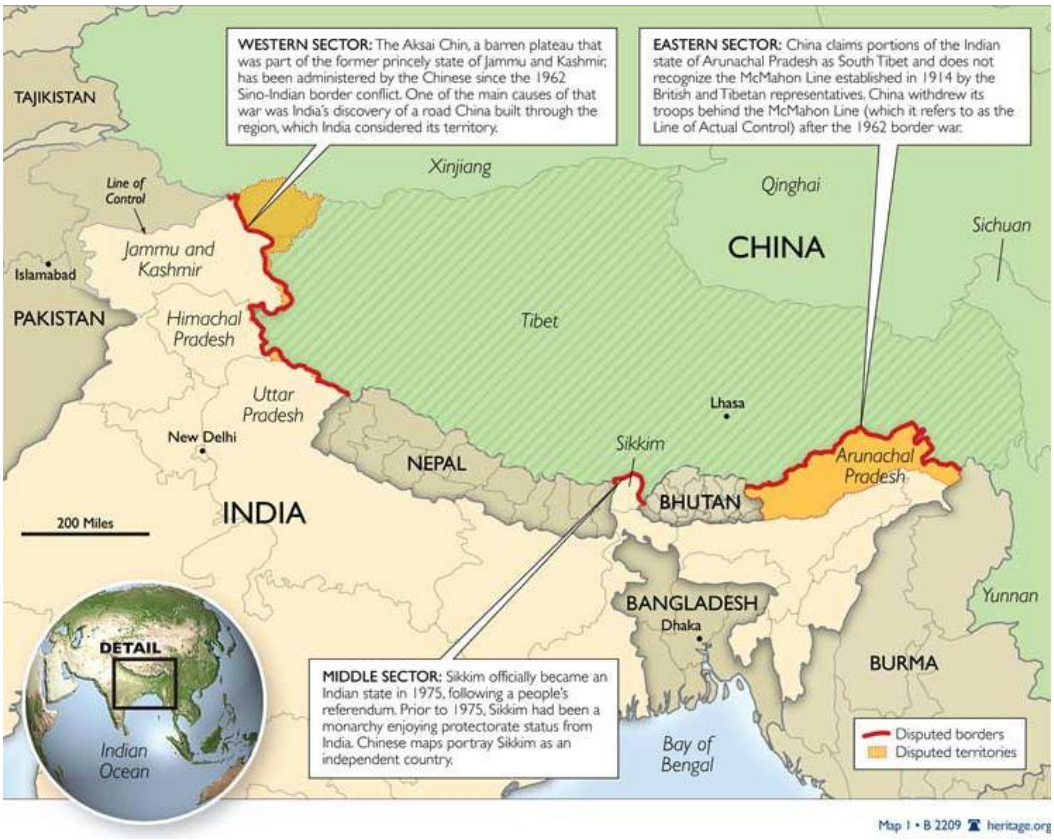

Figure 3: India-China disputed borders[110]

These three disputed areas are manifestly of strategic value and interest for both countries. For instance, the Indian state of Sikkim has long been an important element of modern Chinese foreign policy relative to the Tibet Autonomous Region—conceptualised by the Chinese leader Mao ZeDong as a 'palm consisting of five fingers policy, namely, Ladakh, Nepal, Sikkim, Bhutan and Arunachal Pradesh'.[111] Sikkim hosts a significant Tibetan population and 'by enhancing connectivity and getting an overarching influence over the [region], China gets a better hold over Tibet, thus weakening any potential cards which India would want to play at a later stage'.[112] Nevertheless, this area is but one of the many bones of contention likely to exacerbate Sino-Indian boundary tensions in the Tibetan plateau.

Indeed, even though Aksai Chin might at first appear to be an inhospitable, resource-scarce and barren plateau of marginal value, it is a vital logistical route that links Chinese west Tibet and the province of Xingjiang. Militarily, the plateau also offers a natural strategic mobility corridor that could potentially enable China's reach through to the heart of India, its capital city and critical infrastructures, as well as economic centres. The plateau also represents 20 per cent of the whole Kashmir region.[113] As noted by B.R. Deepak, this is a central and sensitive issue for rivals India and Pakistan because it is 'closer to the disputed area between India and Pakistan [from where] China could effectively support Pakistan'; therefore, 'Aksai Chin is like a Damocles sword hanging over India's head', making it geostrategically important for China and of vital interest for India.[114]

As a result, other pressures such as those created by impeding water security challenges are likely to intensify strategic competition between India and China and therefore aggravate their already strained interstate relationship. The aforementioned Sikkim and Aksai Chin disputes, as well as the central issue of Tibet, reflect the antagonistic dynamics and the distance, suspicion and distrust that divide the two rising powers, in essence, a 'diplomatic-security stalemate' of sorts. Conversely, disputes over Arunachal

Pradesh have also been a key component of Indo-Chinese relations since the demarcation of the interstate border (the 'McMahon Line') in 1914. According to an assessment by the US strategic intelligence firm STRATFOR:

> [T]heir scope, frequency and significance may be increasingly correlated with the water conflicts over the [Brahmaputra] River.... Chinese territorial claims to 'South Tibet' – [including] the entirety of Arunachal Pradesh – have become more frequent and assertive as Beijing moves to consolidate its boundaries.... New Delhi is concerned not only about China bolstering its military presence along the border with Arunachal Pradesh, but it also fears that China's dam construction will cause a sudden drop in water levels in the disputed territory, giving Beijing the upper hand.[115]

Indeed, as for India, water is a vital commodity for China, indispensable to sustain its ambitious socio-economic development program and the needs of a growing (and ageing) population. Despite significant improvements to its water resources development and management in recent decades—in areas such as irrigation and hydro-power development, the region coverage of freshwater supply systems, and drought prevention—China's 'peaceful rise', hinged on sustained socio-economic development, remains critically contingent on the resolution of a number of serious water security challenges.[116]

With 21 per cent of the world's population but only a meagre six per cent of its available freshwater resources, China is in the throes of a serious water scarcity crisis.[117] Indeed, as stated by China's Ministry of Water Resources, water resources use has 'already surpassed what [Chinese] natural resources can bear'.[118] Overall, China's annual per capita renewable freshwater reserves sit at around 2072m^3—compared to water-stressed India's 1155m^3—well over the UN's categorisation of 'water scarcity' as 1000m^3 but still only about a third of the world's average, and trending down.[119]

As the Chinese central government is in the midst of preparing its 13th Five Year Plan (2016-20), a look at China's ambitious water security goals provides valuable indications in relation to the magnitude of its looming water scarcity problem. While more than 600 million urban residents in 2010 had access to public water supply and over 400 million rural Chinese residents enjoyed clean drinking water, 298 million others still lacked safe drinking water.[120] In addition, 80 per cent of Chinese cities are considered severely water stressed. These indicators combined make China one of the 'water-poorest' countries worldwide.[121]

With a population predicted to continue to grow from 1.37 to 1.42 billion by 2025, China's need for safe water will increase, placing additional pressures on water access and worsening its problem of water scarcity in the coming decade.[122] Moreover, the quality of the water supplied is in question: approximately 60 per cent of China's aquifers are deemed polluted and most of the drinking water in rural areas is considered unsuitable for human consumption because of agricultural and industrial activity.[123] Furthermore, 16 of the world's 20 most polluted cities are in China.[124]

In another regard, as it is in the case for its neighbours India and Pakistan, the distribution of water in China is extremely variable across space and over time. Certain regions are naturally well supplied, while others are naturally arid or simply water scarce. Northern China is host to 47 per cent of the Chinese population and 60 per cent of the country's farmlands but contains only 20 per cent of the country's water resources. In comparison, in southern China major river systems such as the Yangtze (the largest) provide nearly 80 per cent of water resources to 53 per cent of the Chinese population.[125]

In addition, Tina Butzbach asserts that 'the pattern of chronic [seasonal] flooding and ... drought is becoming increasingly familiar in China ... [and responsible for] the shortage of water supply in rural and urban areas ... [and] a heavy burden on industrial production and the agricultural sector'.[126] Official figures show that severe drought in March 2010 temporarily denied water to approximately 51 million people in southwest China, causing about US$3.5 billion in damages due to severed agricultural production and hydro-electric power generation.[127]

More recently, China's Ministry of Civil Affairs stated that natural disasters—primarily floods and drought—affected more than 20 million people in May 2015, leaving 123 Chinese dead, 15 missing and 518,000 others displaced, while destroying or damaging some 320,000 residences.[128] In sum, China's growing water problems are a serious challenge that threaten people's safety, hamper the country's rapid

development, and set the conditions for future competition over transboundary water resources, with the potential to aggravate existing tensions with its riparian neighbours, particularly India.

In response to its alarming water security challenges, China has undertaken an ambitious program of dam and canal construction (see Figure 4).[129] With a view to increasing supply and levelling the regional distribution of water resources across the country, China has plans to divert water to the drier northwest provinces.[130] In parallel, in an attempt to favour renewable (and less polluting) energy sources over coal and oil, China has also initiated an impressive number of hydro-electric damming projects, notably on the upstream portion of the Brahmaputra.

Figure 4: China's plans to dam or divert rivers of the Tibetan Plateau[131]

These initiatives fuel much anger and angst within South Asian countries in this region—India and Bangladesh in particular—about the sustainment of their own future water supplies. In that regard, the disputed Arunachal Pradesh is of particular relevance in relation to India's water security challenges and its potential to exacerbate existing regional tensions with China, as it has become the theatre of a complex 'interstate water stalemate'. There, water security is achieved through one of the most vital water arteries that flow through the heart of the Himalayan water-common: the Yarlung-Tsangpo (in China) or Brahmaputra River (in India).

Figure 5 depicts the transboundary nature of the massive river network that waters the region. The Brahmaputra River, with the world's third greatest average discharge, extends over a 2900km course from its source in the Himalayas to its confluence with the Ganges in Bangladesh, passing through the Chinese Tibet Autonomous Region and the Indian states of Arunachal Pradesh and Assam, before releasing into the Bay of Bengal. The river is networked with numerous tributaries, virtually acting as a jugular vein for the region and its communities, and confirming that water is certainly 'without borders' in that region.[132]

Figure 5: South Asian borders and hydrology[133]

This regional inter-connectedness through water highlights three important geostrategic features that characterise regional transboundary relationships. According to Gopal Siwakoti 'Chintan':

> [The first feature] is the hydrological dependence of all [these communities] on China. The headwaters of all these rivers, except the main Gang[es] river, rise within a few hundred kilometers of each other, in the south-western region of the Tibetan plateau….This has important consequences, given that China is the largest and technologically the most advanced country among these co-riparian countries. [Second,] India and China are in a phase of rapid economic expansion, resulting in increased use of water and hydropower. Both India and China have plans to step up inter-basin water transfers to meet their water demands and have accelerated their hydropower dam construction programmes. [Third,] [b]oth countries also economically and politically overshadow their smaller neighbours and countries downstream of these long and large river systems.[134]

The threat of water diversion by China in the upstream Brahmaputra is a particularly sensitive issue for India. The north-eastern state of Arunachal Pradesh is fenced by international boundaries, linked to mainland India through the Siliguri corridor and, most importantly, is traversed by many other interstate tributaries. Border tensions in this region already carry a lot of geopolitical weight that India's water security challenges further exacerbate.[135] Given the serious water problems that both India and China face, shared access to the Brahmaputra's water resources and its many tributaries extends the issue beyond the national realm into a serious transboundary, regional matter.

Finally, the absence of a formal, comprehensive water sharing agreement between India and China over the Brahmaputra—particularly in light of China's ambitious dam construction program intended to divert waters to supply its increasing water requirements—is raising concern. Given its unprecedented growth

and increasingly-assertive trajectory, global reach and momentum—as seen in the South China Sea and Africa, for example—it is highly unlikely that China will compromise its water security requirements, simply because India is in desperate need of more safe water. For now, agreements between India and China are limited to water-related information sharing during the monsoon months.

However the truly divisive issue of planned Chinese diversion of the Brahmaputra remains unaddressed. To date, India has been unable to convince China to enter into a bilateral cooperation agreement over the Brahmaputra issue.[136] This suggests that China is acting unilaterally and, arguably, this lack of consultation through adequate bilateral coordination mechanisms has the potential to create 'another serious impediment to relations between the two Asian heavyweights', thereby worsening the core issues that underpin existing tensions.[137]

China's perceived lack of transparency and willingness to cooperate over transboundary water matters is likely to intensify India's suspicion of Chinese ambitions in the region. It is also possible that China's unilateral approach will reinforce India's perception of a deliberate, regional containment strategy. Moreover, because they have been unable to resolve their longstanding border disputes, it seems likely that antipathy and strategic competition between India and China will prevail, further exacerbated by water competition, leaving both rivals head-to-head in a potential 'interstate water stalemate'.

Summary

When considering India's water security in relation to its neighbours Pakistan and China, it appears evident that water availability is a strategic issue for all of them. Given their serious water security problems, shared access to the water resources of the Indus and Brahmaputra, and their numerous tributaries, is essential to sustaining the livelihoods, well-being and socio-economic development of all three countries.

Furthermore, the present analysis suggests that issues over transboundary waters have the potential to worsen core issues that underpin existing Indo-Pakistani and Indo-Chinese tensions by adding a layer of complexity to the already sensitive Kashmir and Tibet questions, as well as inciting more suspicion, antipathy and divergence, thereby potentially crystallising their antagonistic relationships.

Therefore, water acts a potential tension-multiplier between India and its nuclear-armed rivals Pakistan and China. Given the impacts any solution to India's water security problems are likely to have on Pakistan, and in the absence of truly effective cooperation over water sharing concerns with an increasingly thirsty China, it can be concluded that the matter is both one of transnational and national concern.

Possible consequences for regional security: competition, cooperation or confrontation?

Having determined that water challenges act as an interstate tension-multiplier between India and Pakistan, as well as with China, the issue of water security is clearly a regional concern. The paper will now highlight the possible consequences for regional security in the decade to come by outlining the essential characteristics of the *status quo* before exploring possible outcomes and future implications.

The status quo

From a national stand point, the *status quo* in relation to water security is unsustainable for India and Pakistan and, to a lesser extent, for China. Indeed, water stress today has unfortunately become a common denominator for India and Pakistan, which both strive to secure adequate water supplies to satisfy their domestic demands. Their mediocre National Water Security Index classifications indicate that their current situation is simply hazardous and that much improvement remains ahead before they can reach satisfactory levels of water security. Notwithstanding their engagement, while China is also wrestling with serious water woes, its investments and domestic water management mechanisms are also insufficient to reach a satisfactory level of water security.

As observed in the analysis above, the well-being—and in extreme cases the very survival—of millions of Indians, Pakistanis and Chinese is being jeopardised by poor water security arrangements. So are agricultural and industrial outputs, as billions of dollars evaporate in pure water loss and inefficiencies—amounts that could potentially be invested in resolving the very water issues at hand. In essence, the risks associated with sustained water scarcity under a *status quo* scenario—that is, the high probability of potentially severe repercussions of inadequate household (including sanitation), urban and environmental water security, as well as resilience to water-related disasters—are just too high for any responsible government to leave unaddressed.

When examined from a wider regional stand point, the *status quo* proves to be even more unsustainable for the members of the Himalayan water-common. As highlighted previously, water scarcity is perhaps the single most important factor that impairs interstate relations among riparian countries of the 'commons'. As water scarcity increases, transboundary tensions play a more predominant role in shaping interstate political relations. India, due to its regional leadership and geostrategic location relative to other upper and lower riparians, has become a 'water-hegemon' of sorts within the Indian sub-continent. With the exception of Bhutan, India's diplomatic relations with other neighbours all deteriorate into disputes over cross-border water issues and, as Paula Hanasz notes, 'the water issues India has with Pakistan … could become the catalyst for conflict'.[138]

While the Indus Waters Treaty represents a form of bilateral cooperation between India and Pakistan, India's 'upstream' use of transboundary waters continues nonetheless to aggravate existing tensions with Pakistan, since the treaty has proven ineffective to deal with the full range of contemporary water stresses at hand. In the wider Asian context, to complicate Indian water issues even more, there is no comprehensive cooperation mechanism in place between India and China to regiment their transboundary matters.

Hence China appears to be in a position of absolute control over the Brahmaputra's headwaters and India in a position of vulnerability. As China exercises a perceived hegemonic use of water and diverts more towards its drier northern provinces, India's current water scarcity problem risks being amplified, and does Pakistan's also. As Indo-Pakistani water supplies have dwindled because of increasing domestic, agricultural and industrial demands, as well as other aggravating non-traditional pressures such as climate change and pollution, the present water scarcity crisis is proving to be simply unsustainable for India and Pakistan. Therefore, the current *status quo* has already failed and must be addressed.

Possible outcomes

Commentators have identified a wide spectrum of possible outcomes for a region's water problems.[139] At one end of this spectrum, 'fatalists' promote a 'water war' rhetoric, proposing that water scarcity invariably leads to conflict. For instance, in 1995, Ismael Seragelding, then Vice President of the World Bank, coined that 'if the wars of this century were fought over oil, the wars of the next century will be fought over water'.[140]

In addition, the UN has highlighted that 'an estimated 40 per cent of intrastate conflicts over the past 60 years are associated with natural resources, and since 1990 at least 18 violent conflicts have been fuelled by the exploitation of natural resources and other environmental factors'.[141] Additionally, UN Secretary-General Ban Ki-moon has contended that water scarcity 'could help transform peaceful competition into violence',[142] and that '[t]he consequences [of water scarcity] for humanity are grave … [and that] … it is a potent fuel for wars and conflict'.[143]

By contrast, optimists refute the 'water wars' narrative. They often argue that water conflicts are mere chimerical fabrications or fallacies, worthy of far-fetched 'Hollywood-like' scenarios.[144] Professor Kader Asmal, winner of the prestigious Stockholm Water Prize and once chair of the World Commission on Dams, has 'challenged the assumption … that decreasing supplies of fresh water will inevitably lead to water wars', saying that 'water is a catalyst for peace, and will not be the cause of wars [as] there is not a shred of evidence to back up the rhetoric of water wars'.[145]

According to Wendy Barnaby, the 'water wars myth' should be dismissed, as the reality is that nations 'do not go to war over water, they solve their water shortages through trade and international

agreements'.[146] As well, Jeremy Allouche reports that 'some water experts have argued that scarcity drives the process of co-operation among riparians'.[147] David Michel similarly argues that:

> [On] closer inspection of global hydropolitics … the warnings of looming water wars are overblown. From local streams to international rivers, riparians seem more often to find opportunities for a cooperative modus vivendi than the seeds of a casus belli in shared water resources. No modern state has ever declared war on another solely over water.[148]

In turn, the middle spectrum offers a range of alternative perspectives on possible outcomes and their root causes. For example, the risk assessment firm Verisk Maplecroft asserts that while 'water security has the potential to compound the already fragile state of societal affairs in some countries…. [it is also] related to food security, which leads to cost of living protests … in less democratic societies'.[149] As well, Peter Gleick notes that:

> Mal-distribution of fresh water together with current trends in population and development suggest that water is going to be an increasingly salient element of interstate politics, including violent conflict…. Not all water resources disputes will lead to violent conflict; indeed most lead to negotiations … and non violent resolutions. But in certain regions of the world … water is a scarce resource that has become increasingly important for economic and agricultural development. In these regions, water is evolving into an issue of 'high politics' and the probability of water-violence is increasing.[150]

Zhang Hongzhou offers yet another perspective, suggesting that the 'water wars' narrative appears to be premature, unhelpful and has rather become a 'self-fulfilling prophecy … [that] erodes the mutual trust that is desperately needed to improve Sino-Indian relations, and encourages overreaction from both sides'.[151]

Notwithstanding these diverging views, it still appears that the lack and uneven distribution of safe water has indeed launched India, Pakistan and China on a possible trajectory of transboundary water competition to secure access to this depleting strategic commodity. This prospect prompts a fundamental question for the future of regional security: will water prove to be a nexus for peace and cooperation, or rather a catalyst of increased competition and, ultimately, conflict between India, Pakistan and China?

Future implications

The lack and uneven distribution of water resources within the Himalayan commons have created an unfair competitive environment that has the potential to act as an interstate tension-multiplier in the future. Furthermore, the *status quo* has proven to be unsustainable. Looking forward a decade, unless immediate corrective actions are taken, all indications are that India and Pakistan's water situations will continue to deteriorate significantly. Indeed, as highlighted in the analysis above, by 2025 India will be in a position of 'severe water deficit' and Pakistan will have reached a state of 'absolute water scarcity'.

Meanwhile, adequate regulation and coordination mechanisms must be achieved elsewhere, otherwise China will most likely continue to leverage its geographical (and hydrological) advantage of unrestricted control of the Brahmaputra's headwaters and, consequently, continue to starve India and Pakistan. For that reason, cooperation needs to be initiated, further developed and ideally institutionalised or else conflict or political, economic, social and humanitarian crises are likely consequences that will continue to test regional relations over the next ten years. Clearly, neither India, Pakistan nor China would be served by the issue deteriorating into conflict. As noted by Aaron Wolf, '[w]ar over water seems neither strategically rational, hydrographically effective, nor economically viable. Shared interests along a waterway seem to consistently outweigh water's conflict-inducing characteristics'.[152]

Nonetheless, 'improving transboundary water relations in the absence of domestic water security will be challenging, particularly given that the current approach treats water as a zero-sum resource'.[153] Indeed, on the one hand, India's lack of trust towards its co-riparians might present another limitation; for instance, India is 'insisting on installing monitors at a new Chinese dam that will affect Indian waterways'.[154] On the other hand, however, scholar M. Taylor Fravel found that 'China offered many concessions [in its disputes] despite clear incentives that its simultaneous involvement in multiple conflicts created to signal toughness and resolve, not conciliation'.[155] Zhang also points out that:

> [D]espite 'China's [current limited] engagement with the global water governance regime … [and] [a]lthough it is true that China needs to cooperate more with neighbouring countries on the transboundary river issues, it is unfair to label China as the uncooperative water hegemon…. [W]hat should be noted is that these areas are gradually opening up. China has become more willing and open to share hydrological data with neighbouring countries including India.[156]

This indicates that despite China's apparent assertiveness and unilateral approach, there are signs of openness and potential for future engagements and cooperation.

Nonetheless, India's transnational water problems require transnational solutions and there are several ways in which this could play out in coming years. First, India, Pakistan and China might reassure the international community of their goodwill and resolve over shared water security challenges by reconsidering their positions and ratifying the UN Convention on the Law of the Non-Navigational Uses of International Watercourses. Indeed, while this Convention—which came into force in August 2014 after decades of work on the sensitive issue—is the first global and comprehensive legal framework for interstate cooperation over transboundary water resources, neither India, China or Pakistan are yet legally bound to its terms since they have failed to ratify the agreement.[157]

However, the Convention might prove beneficial to India, Pakistan and China. Should these nations decide to leverage the formal mechanisms offered by the Convention, it could:

> [A]ssist … by filling gaps where no basin agreement exists, where a basin agreement only partially covers aspects covered by the global Convention, and where not all states within a particular basin are parties to a basin agreement. The Convention therefore has great potential in addressing the existing legal architecture for international watercourses, which is often described as fragmented.[158]

Second, India and Pakistan might expand cooperation and seize the opportunity to revitalise the waning Indus Water Treaty. This could be achieved either under the current Indus Permanent Commission or the sponsorship of another authoritative international body such as the UN. Furthermore, in an effort to foster greater cooperation and transparency, and hence prevent 'the securitization of water and the deeply entrenched fear that water will be used as a weapon of proxy war between … opposing state[s] … [which] have led to a regime of secrecy around transboundary water issues', the respective governments of India and Pakistan might want to consider desecuritising and declassifying transboundary data and information.[159]

Third, India and China might at least initiate tangible bilateral cooperation for the sharing of the Brahmaputra's waters. This could be based on the UN Watercourses Convention that establishes a solid framework for the development, conservation and management of international watercourses. Ideally, given the extent of the water security challenges shared by countries served by the Himalayan water-common, multilateral cooperation through an authoritative international body would be the ideal outcome. In that regard, the Mekong region offers an interesting benchmark. Indeed, as the World Water Council has noted:

> [D]espite the political context, the Mekong region in the 1950s offered one of the first spaces for regional environmental negotiations. Through the constitution of several organizations (Mekong River Commission, ASEAN), a regional approach is now evolving towards a nexus approach. The session showed how the issues discussed among the Mekong riparian countries reflect an international situation where environmental, social and economic trade-offs are to be made in order to guarantee a sustainable future.[160]

Finally, the sharing of technological innovations, including promising solutions such as more affordable desalination systems, may alleviate some of the risks induced by water stress and scarcity and set conditions for further rapprochements.[161]

Summary

From both a national and regional stand point, the *status quo* on water security is unsustainable for India, Pakistan and China. The risks associated with sustained water scarcity under such a scenario are simply too severe for any responsible government to leave unaddressed, particularly since India, Pakistan and China are seemingly embarked on a trajectory of transboundary water competition. Looking forward a

decade, it has been argued that the best case scenario for India is a path of cooperation with its neighbours over better management and conservation of their water supplies. Otherwise, further competition and confrontation seems inevitable.

Conclusion

Water is a vital yet extremely limited commodity of strategic value for India. The magnitude of India's internal water scarcity and mismanagement problems pose serious and worsening security challenges of national concern for the rising power. Indeed, India's water resources shortage and management deficiencies have the unintended consequence of fostering domestic frictions over water availability and between water resource consumers.

When viewed in the wider context of India's external relations with Pakistan and China—which both have equally serious and worsening water issues—it is evident that water availability is a strategic issue for all three. It is also apparent that India's increasing water security requirements have the potential to intensify transboundary competition for access to more safe water, thereby increasing the odds of exacerbating existing Indo-Pakistani and Indo-Chinese tensions. Given the impact that any solution to India's water problems is likely to have on Pakistan, and in the absence of proper water-sharing mechanisms with thirsty China, India's water security is a matter of regional as well as national concern.

While the *status quo* is unsustainable, an assessment of how the current regional water security circumstances might play out in the coming decade suggests there is a wide spectrum of possible outcomes to India's water security challenges, ranging from an incentive to regional peace and cooperation, to a catalyst of increased competition and, ultimately, conflict between India, Pakistan and China. While it has been argued that the best case scenario for India is a path of cooperation with its neighbours over better conservation and management of their water supplies, competition and confrontation remain probable outcomes should regional cooperation not be initiated, expanded and institutionalised. Therefore, it is evident that unless more effective mechanisms are put in place, India will continue to struggle to adapt and overcome the many domestic and transnational challenges associated with its increased water security requirements, which will continue to test regional relations over the next decade.

Looking to the future, several alternative scenarios might become plausible in a ten-year time frame. First, current and new technologies might be able to address India's water security problem if the Indian Government were to give this a high priority. For instance, current technologies such as thermal or membrane desalinisation processes are being used successfully by Israel and Singapore to solve their own and other water crises. Other new and emerging technologies are also expected to become increasingly more accessible and affordable.[162] However, this scenario could well represent a two-edged sword for India, possibly leading to either enhanced cooperation or, conversely, to further confrontation with China and Pakistan. Indeed, India, Pakistan and China could certainly opt to pool resources and cooperate in the research and development of new technologies. Yet such developments could also result in more competition, in that if the upstream state developed new technologies, it could preserve all it saved and not necessarily assist those downstream, hence causing increased tension.

Second, India and Pakistan might find their interests converging if China acts unilaterally to develop its water resources to their detriment. However, this scenario appears unlikely. Indeed, maintaining a strong relationship with Pakistan is of geostrategic importance for China. A case in point is the recent announcement of the China-Pakistan Economic Corridor or 'silk road' mega-project that would link coastal Gwadar in Pakistan to Kashgar in the Chinese region of Xinjian.[163] It comes as no surprise that the corridor initiative, which is planned to run through Gilgit Baltistan—a highly-sensitive area claimed by India as part of the contested area of Jammu and Kashmir—has so far been fiercely opposed by India, with Prime Minister Modi declaring the proposal 'unacceptable'.[164]

In a third plausible scenario, China could develop policies amenable to India in order to wean it away from developing a closer strategic relationship with the US. The recent announcement that India and Pakistan are set to join the Shanghai Cooperation Organization as full members by 2016 is an indication that China is open to building closer ties with both, but in part also to counter-balance India's increasingly closer relationship with the US. As well, a key element to note is that the Organization has played a

positive role in the past in preventing friction among Central Asian states by prioritising the joint use of water resources.[165]

A fourth and very plausible scenario might see India experience severe domestic unrest as a result of water scarcity. In fact, numerous instances of civil protest, unrest, escalation of violence and legal battles have been observed in India as a result of water challenges. The Narmada Dam water disputes opposing the Indian states of Madhya Pradesh, Maharashtra, Gujarat and Rajasthan; the ongoing Sardar Sarovar Dam conflict; and the resurgence of the longstanding conflict over water from the Cauvery River between the states of Karnataka and Tamil Nadu due to dryer climate condition—all leading to a form of protest or violence—suggest that severe domestic unrest remains a highly probable scenario for India in the context of future increased water scarcity.[166]

Overall, India would greatly benefit from more conservation and adaptation, through a holistic and smarter way of managing water. Ideally, with the view of mitigating water insecurity as a potential source of increased transnational tension and a cause of regional instability in the coming decade, India might find benefit in addressing its critical lack of a coherent national water management strategy while engaging in genuine and open active cross-border collaboration. For example, India and Pakistan might opt for increased cooperative work, under the auspices of the Permanent Indus Commission, to revisit and revitalise the current water-sharing arrangements.

Conversely, India and China might find value in initiating tangible bilateral cooperation for the sharing of the Brahmaputra's waters. As well, India, Pakistan and China might consider increasing cooperation through the adoption of a more basin-oriented approach and the institutionalisation of international agreements between co-riparians, as it is not good for any one of these states to be more efficient water users if the others are still in trouble. For instance, the UN Convention on the Law of the Non-Navigational Uses of International Watercourses offers a formal mechanism to address the current fragmented and inefficient regional water-sharing scheme. In addition, more transparent interstate water data and information sharing may help reduce current regional tensions. As well, sharing of technological innovations might offer another useful path to greater, mutually beneficial cooperation.

As the future unfolds, the analysis in this paper would suggest that a key issue will be whether India can secure its water requirements without further aggravating tensions with China and Pakistan. It has been argued that it clearly is in the interests of all parties that India—and indeed the other affected states—strive to resolve the issue cooperatively on a region-wide basis, ideally under the auspices of broader, multilateral forums. Otherwise, increased competition and the potential for confrontation seem longer-term possibilities, posing significant risk for India's continued socio-economic rise, as well as the security and stability of the broader region.

Notes

1 This is an edited version of a paper, with the same title, submitted by the author while attending the Defence and Strategic Studies Course at the Centre for Defence and Strategic Studies at the Australian Defence College in 2015.

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