INDO-PAK HYDRO-CONUNDRUM UNDER THE RED DRAGON'S SHADOW

ANURAG JYOTI AND RAJ KAMAL KAPUR

In broad terms, water security is about ensuring that every person has reliable access to enough safe water at an affordable price to lead a healthy, dignified and productive life, while maintaining the ecological systems that provide water and also depend on water. When these conditions are not met, or when access to water is disrupted, people face acute human security risks transmitted through poor health and the disruption of livelihoods.

Beyond Scarcity: Power, Poverty and the Global Water Crisis,
Human Development Report (UNDP), 2006.

INTRODUCTION

South Asia is home to a variety of river basins, all diverse in their characteristics. This diversity is matched by the countries which form

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this region. Different profiles, political formulations, varied geopolitical and geostrategic outlooks and inter-country relations are, in many cases, marred by years of animosity and adversarial standpoints even as they try to navigate the complex yet intertwined futures. The exploding populations and rapidly growing economies mean tremendous competition for finite and shared resources, especially water. It follows that willingly or unwillingly, countries have to come together for the larger good of the people who inhabit this region. The hydro-politics is also made complex since a large portion of the water resource flows out of the Tibetan plateau, an area controlled by China, a country which has steadfastly refused to bind itself into any water sharing arrangement. It has brazenly been applying the theory of absolute territorial sovereignty to a shared resource like water, a concept which is more applicable to what is confined within the borders of a nation like land and underground resources, and those too with the exception of shared underground aquifers. The world has moved ahead and there is a broad consensus to treat trans-boundary surface waters and underground aquifers as a shared resource for the common good of humanity.

The Chinese imprint on the hydro-politics of South Asia is rather stark but the narrative has unfortunately been limited to the South Asian co-riparians in the Indus, Ganges and Brahmaputra basins. China has explicitly kept itself aloof, with its refusal to share hydrological data freely and its continually expanding control over the water flows downstream into these basins though it should be a party to any cooperative basin-wise management agreement. It has been left to the middle and

lower riparians, with clashing interests and contrasting demands on the waters, to try and come to some understanding—something which has been eluding the region even where formal agreements have been reached. And while the lower co-riparians bicker and negotiate year after year, China sits atop as a hegemon, holding most, if not all, of the proverbial hydro-cards.

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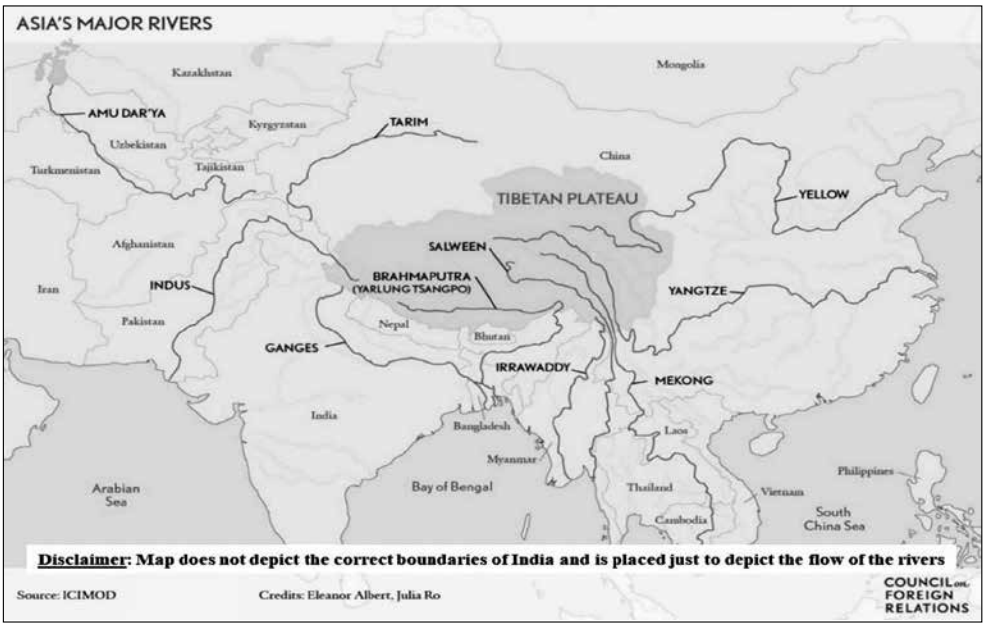
CHINESE HYDRO-HEGEMONY IN SOUTH ASIA

China not only sits on the world's largest fresh water resource in Tibet but also its total internal renewable water resource is 2,813 km^3 per year, and external renewable water resource just a fraction of it at 27.32 km^3, giving it a yearly external dependency ratio of less than one percent.[1] Eighty percent of China's water is in the south, whereas half of its population and two-thirds of its farmlands are in the north. China also controls the source of 10 major Asian river systems flowing into South and Southeast Asia, as given in Fig 1. So much of control over this vast resource provides China with massive leverage with the lower riparians.

1. AQUASTAT - FAO's Global Information System on Water and Agriculture: Country Profile China, Food and Agricultural Organisation of the United Nations. Retrieved from http://www.fao.org/aquastat/en/countries-and-basins/country-profiles/country/CHN

Fig 1



In addition, China firmly believes in Harmon's Doctrine[2] in considering multi-nation river waters as part of its territorial sovereignty without

2. **Harmon's Doctrine**. The Doctrine of Absolute Territorial Sovereignty over trans-boundary waters was born out of the international law about territorial sovereignty. It gained prominence during the dispute over the utilisation of the waters of the River Rio Grande between the US and Mexico towards the end of the 19th century. The river originates in the San Juan mountain in Colorado, US, and flows for about 1,000 km inside US territory. Thereafter, it forms the border between US and Mexico for the next 2,000 km, before emptying into the Gulf of Mexico. Towards the end of the 19th century, Mexico raised an objection with the US about the latter's unilateral decision to divert large quantities of waters for its domestic use which was jeopardising the very existence of some of the downstream communities of Mexico. Mexico also requested for equitable distribution of the waters pending agreement for the final settlement of the issue. The US State Department forwarded the communication received from Mexico to the then US Attorney General Judson Harmon and requested him to prepare an opinion on the legality of the Mexican claim and to examine *inter alia* whether the claims were supported by the international law prevalent then. The opinion tendered by Harmon came to be known as Harmon's Doctrine. He formulated his opinion in 1895: "The fundamental principle of international law is the absolute sovereignty of each State, as opposed to all the others, on its territory. The jurisdiction of the State in its own territory is necessarily exclusive and absolute. His only limits are those he imposes on himself" (Stephen C. McCaffrey, 2007). By this position, Mr. Judson Harmon recognised the absolute right of the USA on the Rio-Grande through this comment: "The fact that the Rio Grande lacks sufficient water to permit its use by the inhabitants of both countries does not entitle Mexico to impose restrictions on the USA which would hamper the development of the latter's territory or deprive its inhabitants

consideration of the water rights of the co-riparians. This enables it to be an uncompromising hydro-hegemon. China has not signed international treaties for most of its 40 trans-boundary rivers, except for certain bilateral agreements with Russia, Mongolia, North Korea and Kazakhstan.[3] China also treats data about water flow and hydropower operations as a state secret and as a geostrategic tool. The sense of ownership of water runs so strong in the Chinese mindset that a field survey team dispatched by the Chinese central government in 1999 to carry out a feasibility study of a water diversion project reported that 600 km^3 of a water from the Tibetan plateau was going waste annually because of lack of infrastructure to capture and use it.[4]

Tibet, which was occupied by China in 1950, is the fountainhead of most of the waters flowing into South, Southwest and Southeast Asia. Tibet is the world's largest plateau with an east–west extent of 2,400 km and north-south extent of 1,448 km, enclosing a massive 3.5 million km^2 area. Being at an average altitude of more than 4,000 m, it is also colloquially called the 'Roof of the World'. Tibet has more than 18,000 glaciers spread over approximately 42,946 km^2 of the Great Himalayas and is home to the largest fresh water repository in the world outside of the polar caps and, hence, is also sometimes referred to as the 'Third Pole'.[5]

INDIA-PAKISTAN HYDRO-CONUNDRUM

India's total water resources add up to approximately 2,400 km^3, which include both annual renewable surface water and ground water with a total external water dependency ratio of 30.52 percent which comes in mainly from Tibet, Nepal and Bhutan.[6] India also has a water stress index of 66.49

of an advantage with which nature had endowed it and which is situated entirely within its territory. "This doctrine excludes any question of cooperation between states and does not provide for any consideration by the upstream state of the damaging consequences of the use of the watercourse in the territory of the downstream state.

3. Huiping Chen, Alistair Rieu-Clarke and Patricia Wouters, "Exploring China's Transboundary Water Treaty Practice Through the Prism of the UN Watercourses Convention", Water International, 38.10.1080/02508060.2013.782134.
4. Brahma Chellaney, *Water Asia's New Battleground* (HarperCollins Publishers, 2019), p. 154.
5. Ibid.
6. FAO 2017. AQUASTAT Database. AQUASTAT Website. Accessed on May 29, 2021.

percent as against the South Asia average of 83.82 percent Though the quantity seems substantial but, as is the case with most of the countries in South and Southeast Asia, this availability is highly variable. In the case of India, more than 50 percent of the precipitation is received in the couple of months of the monsoons, and almost 90 percent of river flows occur in the four months that are taken as the wet season. The ability of the current infrastructure to buffer that variability is low, making it difficult for accessible, reliable supply to meet the projected demand. As per the Ministry of Jal Shakti, India has a total live storage capacity of 257.8 km^3. Thus, India's accessible, reliable supply of water amounts to 744 km^3, or 29 percent of its total water resource, which is very low, and needs to be augmented.

India is also the world's largest consumer of underground water per year: an estimated 231 km^3-213 km^3 for irrigation and 18 km^3 for domestic and industrial use—out of net annual ground water availability of 399 km^3—which is more than a quarter of the global extraction. India has more than 19 million unregulated water pumps and supplements water for more than 60 percent of its total irrigated area.[7]

India's external surface water receipts are 635 km^3 and the details are given in Table 1. The water dependence on China is, therefore, self-explanatory.

7. Planning Commission of India, Report of the Expert Group on Ground Water Management and Ownership (New Delhi: Planning Commission of India, 2007).
8. Dr Uttam Kumar Sinha, "India-China Riparian Relations: Of Reality and Rationality", *USI Journal*, August 29, 2019. Retrieved from https://idsa.in/idsanews/uttam-sinha-article-on-india-riparian-relations-with-china-published-in-usi-journal.

Table 1

Country	Renewable Surface Water Flowing in (cubic km)	Remarks
China	346	Indus – 181.62 km^3 Brahmaputra – 165 km^3 (78.1 km^3 Dr UK Sinha[8])
Nepal	200	-
Bhutan	77	-
Total	635	-

Source: FAO Database 2021.

Pakistan, on the other hand, is one of the world's driest countries, with an average rainfall of under 240 mm a year. The country's water resource consists largely of rivers flowing in from neighbouring countries, mainly India and Afghanistan, and ground water. The Indus river system brings in the almost complete annual influx of surface water, amounting to about 180 km^3 flowing mainly through India.[9]

Most of the research over Pakistan's water situation indicates that the country is fast moving from being water-stressed to water-scarce. The World Bank in its report (2005) observed: "Pakistan is already one of the most water-stressed countries in the world, a situation which is going to degrade into outright water scarcity." Pakistan's Strategic Country Environmental Assessment Report, 2006, places water availability per person at 1,187 m^3, which shows a drastic fall from approximately 5,000 m^3 in 1947.[10] The same report also suggests that the availability will hit below 700m^3 per capita by 2025.[11]

As per Shahid Hameed, general manager (Hydrology and Water Management) of Pakistan's Water and Power Development Authority (WAPDA), Pakistan today has the capability to store only 10 percent of its

9. "Pakistan's Water Economy: Running Dry", https://openknowledge.worldbank.org/bitstream/handle/10986/11746/464690BRI0Box31tionerNote11Pakistan.pdf?sequence=1&isAllowed=y; Accessed on March 21, 2024.
10. n.6.
11. *Pakistan: Strategic Country Environmental Assessment*, Vol I, August 21, 2006; https://openknowledge.worldbank.org/handle/10986/33928; Accessed on March 21, 2024.

Some global warming projections have estimated a decrease in the water availability in the Indus river system by a staggering 40 percent by the year 2050, which would be catastrophic for an already water starved nation.

annual river flows against the world average of 40 percent. Pakistan has been rapidly losing even the existing dam storage owing to excessive silting and lack of funding. The storage capacity has come down to 13.68 Million-Acre Feet (MAF) today from 16.26 MAF in 1976, which is equal to only 30 days' capacity. In comparison, India's capacity at present is 170 days, Egypt's is 700 days and America's is 900 days. Pakistan has to increase its storage capacity to 120 days to be able to sustain itself.[12]

As the population grows, the gap between supply and demand is also widening. In 2004, Pakistan's water shortfall was 13.2 km^3 which is likely to go up to 37.2 km^3 by 2025. By this year, Pakistan's total water availability will have barely changed from the current 236 km^3. Yet its total water demand is projected to be about 338 km^3, a significant shortfall of 100 km^3.[13] In fact, the 100 km^3 gap will be almost two-thirds of the entire Indus river system's current annual average flow. Currently, Pakistan's water requirement in the Indus water system is 167.45 km^3 while availability is 162.7 km^3, a gap of 4.75 km^3. Some global warming projections have estimated a decrease in the water availability in the Indus river system by a staggering 40 percent by the year 2050, which would be catastrophic for an already water starved nation.[14] A combination of its agrarian economy, poor choice of crops, lack of diversification, a water infrastructure which has been facing continuous neglect and lack of alternatives to draw on make Pakistan particularly vulnerable.

12. "Per Capita Water Availability Pushes Country to Alarming Level: WAPDA", February 16, 2021; https://www.brecorder.com/news/40064309/per-capita-water-availability-pushes-country-to-alarming-level-wapda. Accessed on March 24, 2024.
13. Taufiq A Siddiqi and Shirin Tahir-Kheli, "Water Needs in South Asia: Closing the Demand-Supply Gap", https://scholarspace.manoa.hawaii.edu/handle/10125/22815; Accessed on March 21, 2024.
14.. Alim Imran, "Political Economy and Post-2000 Development in Pakistan". in R. Jeitly, ed., *Pakistan in Regional and Global Politics* (New York and New Delhi: Taylor & Francis Group), pp. 235-261.

WATER STRESS AND ITS MANIFESTATION IN SOUTH ASIA

If we analyse the level of water stress[15] as given in the United Nations Food and Agriculture Organisation (UN FAO) data in Fig 2, it is evident that India, Pakistan and China show varying degrees of water stress, with China having low water stress with an indicator at 41.52 percent at the one end and Pakistan at critical stress, with an indicator at 162.07 percent at the other extreme. India is at medium stress, with an indicator at 66.49 percent. South Asia averages high stress at 83.82 percent.[16] Pakistan is at such a precarious position largely because it is an agrarian economy with more than 22 percent of Gross Domestic Product (GDP) being generated from agriculture even though the country is rain deficient and totally dependent on an extremely large network of canals which are in crying need of repair and upgradation. The ancient and archaic irrigation system and techniques, and cultivation of water guzzling crops, create an extremely critical situation of water stress in Pakistan. Herein lies a chance for India's security establishment to keep the exacerbation of the water stress of Pakistan as a part of India's arsenal of tools available with it for bringing around the belligerent neighbour.

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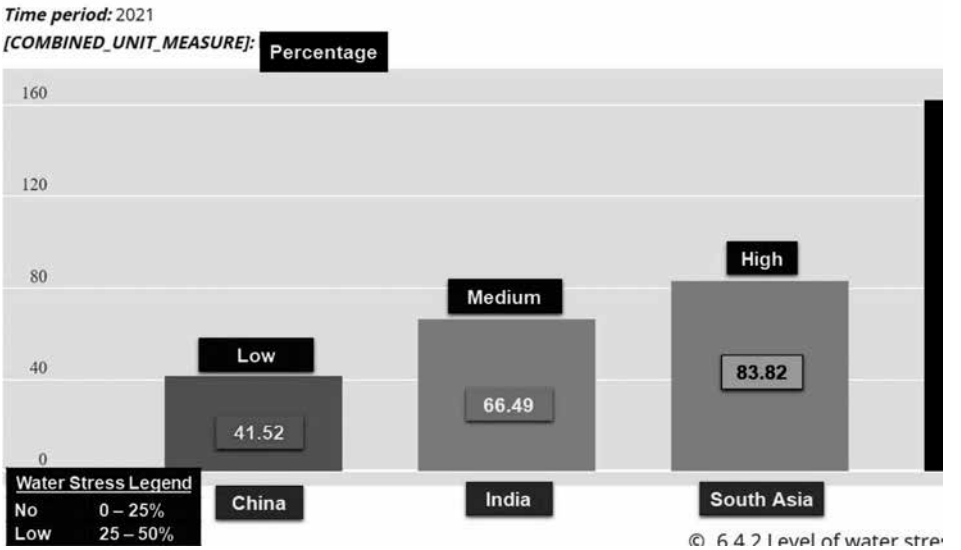
15. Indicator Metadata, https://unstats.un.org/sdgs/metadata/files/Metadata-06-04-02.pdf; Accessed on February 3, 2024.
16. UN FAO Sustainable Development Goals, http://www.fao.org/sustainable-development-goals/indicators/642/en/. Accessed on February 3, 2024.

Fig 2: Level of Water Stress (Primary Series)



A comparison table of water resources, usage and dependencies of India, Pakistan and China is as given in Table 2. It clearly brings out the extreme water stress and external dependence on water resources that Pakistan has to contend with.

Table 2

Parameter	India	Pakistan	China
Agriculture, value added (% GDP)	18.23	21.85	7.84
% of total country area cultivated	51.12	39.85	13.4
% of area equipped for irrigation by surface water	31.93	38.17	7.56
Surface water: entering the country (total) (10^9 m3/year)	635.2	265.1	17.17
Surface water: leaving the country to other countries (total) (10^9 m3/year)	1,385.00	10.72	718.80
Water resources: total external renewable (10^9 m3/year)	464.9	191.8	27.32
Total Internal Renewable Water Resources (IRWR) (10^9 m3/year)	1446	55	2812.9

Dependency ratio	30.52	77.72	01
Total renewable water resources (10^9 m^3/year)	1910.9	246.8	2840.22
Agricultural water withdrawal as % of total renewable water resources	36	69.85	12.72
Agricultural water withdrawal as % of total water withdrawal	90.41	94	62.14
SDG 6.4.1. Water use efficiency (US $/$m^3$)	2.9	1.74	25.8
SDG 6.4.2. Water stress	66.5	116.31	41.5

Source: FAO 2021. AQUASTAT Database. AQUASTAT, Website. Accessed on May 18, 2024.

As is evident, Pakistan is perilously close to, and teetering on, the brink of a hydro-disaster. With the geopolitical challenges that it is grappling with, a tottering economy wherein even feeding its population is becoming a challenge, Pakistan's ability to face a major water crisis in the short and medium terms does not seem likely. Pakistan had also joined the Chinese Belt and Road Initiative (BRI) or the China-Pakistan Economic Corridor (CPEC) in 2015 when the situation there wasn't as bad as it is now. As part of the CPEC, Pakistan had, amongst other projects, given the go-ahead to the Chinese for constructing eight major hydropower projects, four in Pakistan Occupied Kashmir (PoK) and four in Pak Punjab and the Kyber Pakhtunkhwa region, at a conservatively estimated cost of more than $ 34 billion. Pakistan is also apparently using the construction of these dams as a ploy to not only mitigate the crippling power shortage and lack of water storage, and augmenting water availability during the lean seasons, but the larger aim behind it is also to cement its claim over the territories occupied by it. Most of the dams have been in the planning for a very long time, however, lack of funding by foreign institutional and multilateral lenders because of the disputed nature of their location had made them non-starters until now. With Pakistan signing the reportedly $ 62 billion Memorandum of Understanding (MoU) for the CPEC, China has shown unusual haste in its willingness to fund the same through soft loans and grants. Pakistan was initially quite wary, having seen how the Chinese demand virtual sovereignty over project sites and over the issue of permanent ownership by Chinese entities, however, realising that it had no

other alternative, it has meekly surrendered and signed deals with a little tweaking of the provisions. For China, it is good investment strategy because it not only gets a secured land corridor to the Arabian Sea from where most of its oil transits, but also gets to station its personnel in the PoK as a counter to India with which it has unsettled borders and regular skirmishes. Details of the under construction dams are as given in Table 3.

Table 3

Name	**River / Loc**	**Type**	**Electric Output**	**Completed/ Cost**	**Remarks**
Karot Hydropower project (under construction)[17]	Jhelum / upstream of Karot Bridge and 74 km upstream of Mangla Dam in Pak Punjab	Run of the river	720 MW	June 2022 / $ 1.72 billion	Part of CPEC Three Gorges South Asia Investment Limited, part of China Three Gorges Corporation (CTGC)
Suki Kinari Hydropower Project (under construction)[18]	River Kunhar/ Jhelum Khyber Pakhtunkhwa	Run of the river	884 MW	November 2024 / $ 2 billion	Part of CPEC China Gezhouba Group Co Ltd
Kohala Hydropower Project (under construction)[19]	Jhelum / Kohala, in PoK.	Run of the river	1,124 MW	December 2025 / $ 2.4 billion	Part of CPEC China Three Gorges Corporation (CTGC)

17. CPEC Secretariat, Ministry of Planning, Development and Special Initiatives. Energy Projects under the CPEC. Retrieved from https://cpec.gov.pk/energy. Accessed on April 15, 2024.
18. Ibid.
19. Ibid.

Azad Pattan Hydropower Project (under construction)[20]	Jhelum / 7 km upstream of Azad Pattan Bridge in the Sudhanoti District of PoK	Run of the river	700 MW	2026 / $1.6 billion	Part of CPEC China Gezhouba Group Co Ltd
Bunji Hydro-power Project (proposed)[21]	Indus / Bunji, Gilgit Baltistan	Hydro-power project	7100 MW	Will take 9 years to construct/ $ 8.1 billion	In 2009, Pakistan and China signed an MoU. Three Gorges Project Corporation, China
Diamer-Bhasha Dam (under construction)[22]	Indus/ Khyber Pakhtunkhwa and Gilgit Baltistan	Hydro-electric and storage dam	4800	Under construction / $ 14 billion	Joint venture (70:30) between China Power Investment Corporation (CPI Group) and Pak Frontier Works Organisation
Dasu Dam (under construction)[23]	Indus / Dasu, Kohistan District, Khyber Pakhtunkhwa Province	Hydro-electric and water supply	4320 MW	February 2023/ $ 4.278 billion	Constructed by Gezhouba Group Company Limited, China. Work started in February 2018

20. Ibid.
21. Power Technology, "Power Plant Profile: Bunji, Pakistan". Retrieved from https://www.power-technology.com/data-insights/power-plant-profile-bunji-pakistan/. Accessed on April 15, 2024.
22. Ministry of Water Resources, Government of Pakistan, Signing Ceremony of Contract Agreement of Construction of Diamer Basha Dam Project, May 13, 2020. Retrieved from https://mowr.gov.pk/NewsDetail/NWEzNDIyYzEtZGNjMC00Yjc1LWFkN2ItZWNjY2JkMzlmMTg3. Accessed on April 15, 2024.
23. Dasu Hydropower Project. Retrieved from https://dasuhpp.com/newportal/theProjec. Accessed on April 15, 2024.

Dasu Dam (under construction)[23]	Indus / Dasu, Kohistan District, Khyber Pakhtunkhwa Province	Hydro-electric and water supply	4,320 MW	February 2023/ $ 4.278 billion	Constructed by Gezhouba Group Company Limited, China. Work started in February 2018
Kalabagh Dam (proposed)[24]	Indus / Kalabagh in the Mianwali District, Punjab, Pakistan	Hydro-electric and storage dam	3,600 MW		Proposed but environmentally not feasible
Proposed / Under Construction Dams in Pakistan part of the Indus Basin Irrigation System (IBIS)					

CHINESE INVOLVEMENT IN POK: SECURITY IMPLICATIONS FOR INDIA[24]

Reports emanating from the region say that Pakistan has given more than 300 lease licences to China in Ghanche district of Gilgit-Baltistan for mining uranium, gold, copper, marble and precious stones to China.[25] Pakistan has also given licences for more than 2,000 projects to Chinese firms, and leased land for 30 to 50 years to work on some of these projects, which include building dams, power houses, power transmission lines, roads, rail and tunnelling projects, etc. In May 2009, Pakistan's Board of Investments had approved development of nine Special Economic Zones (SEZs) in the region.[26] All these have meant heavy Chinese presence in the area. By some estimates, there are more than 10,000 to 12,000 People's Liberation Army

24. Muhammad Khan, S Jamil, Fawad Ali, Kiran Akhtar and Muhammad Javaid, "Feasibility Study of Kalabagh Dam", *Life Science Journal*, 2014, 11. 458-470. 10.7537/marslsj1109s14.93.
25. "Gilgit Baltistan: Protest Brewing Over Mining Lease for Chinese Firms", July 22, 2019, Retrieved from https://asianlite.com/2019/news/asia-diaspora-news/gilgit-baltistan-protest-brewing-over-mining-lease-for-chinese-firms/. Accessed on February 15, 2024.
26. Lieutenant General (Dr) Rakesh Sharma, "Eastern Ladakh (EL) and Siachen: The Geo-Strategic Obstruct", Vivekanada International Foundation, 2020. Retrieved from https://www.vifindia.org/article/2020/june/17/eastern-ladakh-el-and-siachen-the-geo-strategic-obstruct. Accessed on February 15, 2024.

(PLA) personnel stationed there for security duties and many more who must be working as specialists on the various projects. China is also known to get its own labour to work on its projects abroad. So, the actual presence of its military personnel towards the west of India is hard to guess and critically alters the geostrategic balance in South Asia. This encirclement of India from the north, east, and now, west, by China becomes a matter of great concern to India and needs strategic rebalancing.

With such huge investment in the hydropower projects, China has managed to become a major stakeholder in South Asian hydro-politics. It will now not only preclude any Indian move towards renegotiation of the Indus Waters Treaty (IWT) but even the construction of hydropower plants under the existing provisions will be even more vehemently opposed by Pakistan, duly backed by China, which, in all probability, would like to become a party to the dispute. This may even provide greater traction to the lower riparian rant that Pakistan has consistently been indulging in for the last more than six decades since the treaty came into being. This, in spite of the fact that even through three wars, many border skirmishes and more than the three-decades-long Pakistan supported terrorism in Jammu and Kashmir (J&K) and the rest of India, the latter has not made any negative move on the IWT. From the Chinese point of view, with Xi Jinping's pet project, the CPEC, and its $ 62 billion investment, keeping the disputed areas of PoK, through which the corridor passes before entering China, under Chinese control becomes a strategic necessity.

This enhanced financial and strategic interests in the western flank of India will also encourage China to use the collusive threat from the east, north, and now, west and, thus, present multi-front multi-dimension conflict scenarios against India. Also being the upper riparian to most of the Indian rivers, be it the Sutlej, the main tributaries of the Ganges and, of course, the Brahmaputra, will now give China greater control over the hydro-politics and, thus, it will be able to emerge as a stronger hydro-hegemon, something which India needs to guard against and take counter-measures for, at the earliest. Also, the CPEC passing through PoK and the consequent activities,

Even with India, there have been quite a few recorded events which can, directly or indirectly, be attributed to Chinese activities.

will impinge upon any future plans, kinetic or non-kinetic, that India may have to fulfil its strategic aims in the region.

PAKISTAN-CHINA COLLUSIVE DYNAMICS

Of the total 11 dams planned by China over the Yarlung Tsangpo river or Brahmaputra, as part of its 14th Five-Year Plan, it has constructed five to six dams already. It has recently also announced plans for the construction of the massive 60-Giga Watt (GW) Motuo Storage Dam over it.[27] This ultra-dam will be constructed very close to the Indian state of Arunachal Pradesh. The scale of the dam can be gauged by the fact that once completed, it will have 10 percent of the total installed hydropower generation capacity of India as on date[28] and will be more than twice the size of the current largest dam in the world, the Three Gorges Dam.[29] It will also provide China with huge leverage over control of the waters in the river and to 'weaponise' the flow if it so desires.

China's upstream activities have triggered many flash floods and droughts in the downstream areas. Some of the notable ones are the 2019 drought amongst the lower riparians on the Mekong river, even though according to all the meteorological data, the rains in the catchment areas had been normal that year. Even with India, there have been quite a few recorded events which can, directly or indirectly, be attributed to Chinese activities upstream. Whether these were deliberate or natural may be debated but it does point to the possibility of China testing capabilities to use water as a weapon. Some of the notable ones are:

27. Shan Jie and Lin Xiaoyi, "China to Build Historic Yarlung Zangbo River Hydropower Project in Tibet", *Global Times*, November 20, 2020, Retrieved from https://www.globaltimes.cn/content/1208405.shtml.
28. Government of India, Ministry of Power, "Power Sector at a Glance: All India". Retrieved from https://powermin.gov.in/en/content/power-sector-glance-all-india
29. Ibid.

- The flash floods in the Siang river in Arunachal Pradesh in June and the Pari Chu tributary of the Sutlej in Kinnaur district of Himachal Pradesh in August 2000. Both events were ostensibly due to the bursting of a man-made lake or a glacial lake burst in the upper reaches of the rivers inside the Chinese territories. Satellite imagery had shown that these lakes had disappeared post the flooding event, pointing to the temporary nature of these water bodies.[30] A heavy loss of life and infrastructure had been reported in both instances. As expected, the Chinese denied any hand in it, even though the evidence proved otherwise.

Both events were ostensibly due to the bursting of a man-made lake or a glacial lake burst in the upper reaches of the rivers inside the Chinese territories.

- Similarly in 2004, China reported an artificial lake having been formed on the Pari Chu river, again because of a massive landslide, with the temporary lake blocking up to 60 million m^3 of water.[31] The lake finally burst in 2005 and caused massive infrastructural damage in India though loss of life had been averted due to the advance warning. Here again, it was believed that it was some kind of a deliberate action by the Chinese as even though the information about the emergence of the lake was conveyed to India, China refused to allow Indian scientists to visit the site for a detailed study.[32]
- In 2017, the water in the Siang river, a tributary of the Brahmaputra, in Arunachal Pradesh, turned muddy and black, becoming unfit for human consumption. This episode severely affected the agricultural production

30. Shishir Gupta, "Floods Ravage Himachal and Arunachal Pradesh, Satellite Pictures Suggest China's Hand", *India Today Magazine*. October 19, 2012. Retrieved from https://www.indiatoday.in/magazine/neighbours/story/20010625-floods-ravage-himachal-and-arunachal-pradesh-satellite-pictures-suggest-china-hand-774997-2001-06-25.
31. K. Jayaraman, "Crisis Foments as Unstable Lake Builds in the Himalayas", *Nature, 2004* pp. 430, 818 (2004). https://doi.org/10.1038/430818a.
32. Ramesh Vinayak, "Sutlej in Himachal Swells as Pareechu Lake Bursts in Tibet", *India Today Magazine,* 2012. Retrieved from https://www.indiatoday.in/magazine/indiascope/story/20050711-sutlej-river-in-himachal-pradesh-swelled-up-after-pareechu-lake-burst-in-tibet-787274-2005-07-11.

and fisheries. Even as China attributed the cause to an earthquake in November 2017, the experts opined that the incident had preceded the reported earthquake and could have been because of the Chinese dam building activities upstream.[33]

- After the 73-day Doklam standoff between India and China in 2017, China had withheld hydrological data for the Brahmaputra and Sutlej rivers – in contravention of the agreement – resulting in India not being able to get an advance warning of the impending floods in Assam and Uttar Pradesh.[34]

It could be argued that the activities mentioned above could actually have been natural phenomena as is claimed by China, but the scientific evidence, and the reluctance of the Chinese to allow independent researchers to visit these sites, point towards a probable Chinese bid to try out the impact of 'weaponising of water'. The control that can be exercised by China by virtue of the unprecedented number of storage dams planned or constructed over trans-boundary rivers, and its reluctance to share hydrological data, points to capacity-building of the use of water as such. With China having an increasing stake in Pakistan because of its close to US$ 62 billion investment, and the Chinese need to upstage India as a strategic competitor in its supposed backyard, these capabilities could definitely be used by China to come to the aid of Pakistan, amongst other measures that it could take. In the event of a conflict situation between India and Pakistan or any supposed coercive move over the IWT by India, Chinese collusion with Pakistan is a given and use of water as a weapon could be one of the responses.

33. Brahma Chellaney, "Water Shortages Could Trigger Asia Conflicts", *Stagecraft and Statecraft*. December 31, 2017. Retrieved from https://chellaney.net/2017/12/31/water-shortages-could-trigger-asia-conflicts/.
34. Ameya Pratap Singh and Urvi Tembey, "India-China Relations and the Geopolitics of Water", *The Interpreter*, July 23, 2020. Retrieved from https://www.lowyinstitute.org/the-interpreter/india-china-relations-and-geopolitics-water.

THE WAY FORWARD

India is faced with two openly hostile neighbours towards its north and west i.e., China and Pakistan. The geography, geostrategic environment and the hydro-politics of India and Pakistan can be openly interfered with by China. Also, the convergence of the strategic interests of China and Pakistan means that India will always have to remain guarded about, and mindful of, a collusive threat. With construction related to the CPEC going full steam ahead, and Chinese companies building multiple dams in PoK, both as part of the CPEC and otherwise, there are grave security implications for India.

The best option is to create deterrence/leverages to counter and dissuade the belligerent and or take effective steps to either remove the threat altogether or mitigate it.

CREATING LEVERAGES AGAINST PAKISTAN

India and Pakistan have a long standing water sharing agreement in the form of the Indus Waters Treaty (IWT) of 1960, however, even after more than six decades of its inception, the former has not been able to optimally utilise all the leeway available under the clauses agreed upon on it. India is permitted to use the waters of the western rivers allocated to Pakistan for hydropower exploitation, controlled usage for agricultural and domestic purposes and even construction of limited storage. The estimated hydropower potential over the western rivers is 16,475 Mega Watt (MW) and of this, only 3,263 MW has been harnessed till now.[35] Annexure C of the IWT, 1960, allows India to use of 1.3 MAF for irrigation. As per experts, this amount of water can irrigate 1.34 million acres, while India is utilising only 0.792 million acres worth[36] at present. This is again a provision which India needs to tap urgently, especially when large tracts of agricultural land in the Union Territory of J&K are desperately in need of assured irrigation facility. India

35. "J-K Exploits Just 16% of Hydro-Power Potential Despite Growing Demand: Survey", https://www.business-standard.com/article/pti-stories/j-k-exploits-just-16-of-hydro-power-potential-despite-growing-demand-survey-118022500370_1.html; Accessed on May 23, 2024.
36. Ibid.

India has not been able to harness this large quantum of water due to the lack of adequate storage and carrying capacity of its barrages and canals over the eastern rivers.

is also allowed to construct total storage of 3.6 MAF over the western rivers which is yet to be done.[37]

Apart from the leeway available over the western rivers, India has to also ensure that the entire quantum of water allocated to it from the eastern rivers is harnessed within India and not allowed to flow into Pakistan unutilised. As per many researchers, approximately 11 km^3 of India's share of waters from the eastern rivers flows into Pakistan yearly.[38] India has not been able to harness this large quantum of water due to the lack of adequate storage and carrying capacity of its barrages and canals over the eastern rivers. This issue needs to be addressed on a war-footing because stopping this flow into Pakistan will put immense pressure on the highly water stressed irrigation system in the southern part of Pak Punjab, which has been utilising this free largesse for more than six decades now. India has taken partial action on this and has initiated projects for impounding about 2.5 km^3 of this water by constructing the Shahpurkandi Dam, Ujh Multipurpose Project and the Second Ravi Beas Link below the Ujh river, over the river Ravi. Similar projects involving widening of canals and enhancement of storage facilities on the Sutlej and Beas rivers also need to be undertaken urgently to harness the balance share of our waters.

At the beginning of 2023, it was also widely reported in the media that India had issued a notice to Pakistan for starting discussions on modification to the Indus Waters Treaty. The notice was apparently sent on January 25, 2023, through India's permanent Indus waters commissioner. The proposal to initiate the process of looking at the treaty anew is a step in the right direction for keeping the extremely water stressed Pakistan on its toes.[39]

37. n. 23, pp. 227-229.
38. FAO. 2011. AQUASTAT Transboundary River Basins – Indus River Basin. Food and Agriculture Organization of the United Nations (FAO), Rome, Italy, p. 4.
39. "Explained: Why has India Issued Notice to Pakistan on Indus". Retrieved from http://timesofindia.indiatimes.com/articleshow/97379292.cms?from=mdr&utm_

India can also look to exploit the tenacious hydro-relations, coupled with the long simmering boundary dispute between Pakistan and Afghanistan as part of this effort.

CREATING LEVERAGES AGAINST CHINESE HYDRO-HEGEMONY

India receives almost 48 percent of the total renewable surface water flowing out of Tibet.[40] There being no water sharing agreement with China in any of the three basins viz the Indus, Ganges and Brahmaputra, China, as the upper riparian, can easily act as a hydro-hegemon. Added to it is the extensive Chinese involvement in hydropower development, construction of infrastructure, mining, etc in PoK which creates a strategic headache for India. So, what options does India have to counter the Chinese impact over the Indo-Pak security conundrum in general and hydro-politics in particular. There aren't very many leverages available to India for countering China hydrologically because of the intransigence of the latter, not only with respect to India but with all of its co-riparians. The options will, thus, mainly revolve around hydro-cooperation with the other co-riparians to minimise the influence of China, and put our own house in order.

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Integrated Action Plan for Regional Water Security: By its very nature, any international river lends itself to basin-wise integrated and cooperative development for the larger good of all the inhabitants and dependents. India has to take a lead in the regional water diplomacy and create a consensus

source=contentofinterest&utm_medium=text&utm_campaign=cppst. Accessed on March 6, 2024.

40. "Surface Water: Leaving the Country to Other Countries (total) (10^9 m3/year)". FAO 2021. AQUASTAT Database. AQUASTAT Website. Accessed on May 18, 2024.

using the regional fora like the Association of Southeast Asian Nations (ASEAN), South Asian Association for Regional Cooperation (SAARC) and Bangladesh, Bhutan, India, Nepal Initiative (BBIN) in order to address the socio-economic, environmental and equitable water sharing concerns of the co-riparians. There will also be a need to develop a regional action plan for shared water security with all the co-riparians of the three basins where China can exercise control, and also to establish networked international hydrologic data collection centres for sharing data, flood forecasting, etc. Such an exercise would make the participating co-riparians stakeholders in continued hydro-cooperation for the larger good of their people. However, for China to agree to be an actively participating member would require deft diplomatic manoeuvring—its involvement in the Mekong River Commission (MRC) does not bode too well for such an organisation in any or all the three shared basins.

Additionally, India needs to take a lead in creating joint research institutions to combat climate change, pollution, Research and Development (R&D) for technology for efficient use of the water resource, dam-building, water storage and transportation, development of inland waterways and research on computational forecast modelling across South and Southeast Asia and to formulate comprehensive water sharing and management policies. Such an initiative could be formed with all the co-riparians, with or without Chinese participation.

India is one of the global leaders in space and remote sensing technology. It needs to leverage this capability and create space-based assets which can partially, if not fully, replace its dependence on China for hydrologic data, an aspect that China had used as a geostrategic coercive tool during the Doklam standoff of 2017, and which it will definitely not hesitate to leverage in the future as well.

United Nations Sustainable Development Goals (SDGs): Also known as the Global Goals, these were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. Goal No 6 relates to clean

water and sanitation, and addresses all aspects related to water.[41] India needs to build consensus within the international community in general and co-riparians in South Asia in particular to force China towards regional hydro-cooperation.

There are many other confrontational and accommodative steps like taking a relook at our adherence to the One China Policy, our stand over Tibet, allowing more visibility to the Dalai Lama and the Tibetan Government-in-Exile, our ability to influence shipping trade through Strait of Malacca, activities in the South China Sea, defence exports to the ASEAN countries, building kinetic and non-kinetic capability and capacity, border issues and reducing our burgeoning trade dependence and deficit, etc, that India could take diplomatically and economically but these are not being discussed here, being beyond the purview of this article. However, these too will play a very important role in defining the trajectory of the relations between the two Asian giants as also the hydro-relations.

DOMESTIC STEPS TO MITIGATE CHINESE HYDRO-HEGEMONY

As is evident from the preceding paragraphs, India has a limited ability to create any worthwhile hydro-leverages, and towards that end, the nation will have to look inwards and beyond supply side solutions to negate the Chinese ability to exploit water as a geostrategic tool as well as weaponise it in collusion with Pakistan. The Government of India's Central Water Commission Annual Report 2022–23, has identified the undermentioned thrust/priority areas for water resources development. However, these fall way short if India wants to truly mitigate the Chinese ability to dominate India hydrologically.

- Improving the overall water use efficiency in the irrigation and drinking water supply systems.
- Adoption of the piped distribution system in place of the open canal system to reduce water loss.

41. United Nations Development Programme, "Sustainable Development Goals, Goal 6 Clean Water and Sanitation". Retrieved https://www.undp.org/sustainable-development-goals/clean-water-and-sanitation. Accessed on May 27, 2024.

India needs to develop hydropower and water storage infrastructure on all the trans-boundary rivers emanating from China, especially the Sutlej, Karnali/ Ghaghara and Brahmaputra.

- Flood management and erosion control using new tools and techniques.
- Dam safety, dam rehabilitation and performance improvement.
- Repair, renovation and restoration of existing water bodies used for irrigation, drinking water supply, cultural activities, etc.
- Increasing ground water availability by various ground water recharge techniques.
- Inter-basin transfer of river water by interlinking of rivers.

Doctrine of Prior Appropriation: India needs to develop hydropower and water storage infrastructure on all the trans-boundary rivers emanating from China, especially the Sutlej, Karnali/ Ghaghara and Brahmaputra. This will not only help produce clean power, help tide over seasonal flow variations and help in flood control but will also help India assert its water rights under the Doctrine of Prior Appropriation[42] despite being a lower riparian to China.

Agricultural Reforms and Cropping Pattern: India has traditionally been growing water intensive crops in regions which have been water deficient for a very long time. Combined with subsidies on electricity and irrigation facilities, this it has resulted in highly inefficient use of water, including unbridled use of ground water. This has caused widespread decline in the water table, which has led to water extraction from even deeper aquifers, making India one of the largest extractors of ground water[43] at 230 km^3.

42. **Prior Appropriation Doctrine**. In dealing with water rights, the prior appropriation doctrine states that water rights are determined by priority of beneficial use. This means that the first person/state to use water or divert water for a beneficial use or purpose can acquire individual rights to the water.
43. The World Bank, "India Groundwater: A Valuable but Diminishing Resource", March 6, 2012. Retrieved from https://www.worldbank.org/en/news/feature/2012/03/06/india-groundwater-critical-diminishing#:~:text=Key%20Issues-,India%20is%20the%20largest%20

India also fares poorly in water use efficiency at about 38 percent compared to the developed countries with 50 to 60 percent.[44] This clearly shows that we have to increase water use efficiency by changing cropping patterns, using innovative irrigation techniques and introducing new technology for reducing water losses during transportation.

For India to be able to counter China politically, economically, militarily or strategically remains work in progress. Till the time it happens, we have to search for solutions within and the way forward to counter the Chinese hydro-hegemony and the collusive threat would be to take up the construction of hydropower projects and storages at a scale not seen before and with a missionary zeal.

Export of Virtual Water. India is the world's largest rice exporter (since 2012), with its exports reaching 22.1 million tonnes in 2022, a figure which constitutes 42 percent of global exports of this water guzzler. India's rice exports touched $ 10.5 billion in 2023-24.[45] In effect, India has been exporting more than 32 Billion Cubic Metres (BCM) of virtual water annually which is about 1.6 percent of total available water.[46] There is a serious need to have a relook at our cropping patterns and export policies to reduce this virtual water export.

CONCLUSION

India's $ 3.42 trillion economy is still dwarfed by the $ 17.96 trillion economy of the Chinese behemoth.[47] For India to be able to counter China politically,

user%20of%20groundwater%20in%20the%20world,supplies%20are%20dependent%20on%20groundwater. Accessed on May 28, 2024.

44. CV Dharma Rao, Government of India, Ministry of Water Resources, RD & GR. "Water Use Efficiency". Retrieved from https://nwm.gov.in/sites/default/files/1.%20National-water-mission-%20%20%20water-use-efficiency.pdf. Accessed on May 28, 2024
45. Department of Commerce, Export Import Data Bank, Rice Commodity. Ministry of Commerce and Industry, Government of India. Retrieved from https://tradestat.commerce.gov.in/eidb/ecom.asp. Accessed on May 24, 2024
46. Shiv Narayan Nishad and Naresh Kumar (2021), "Virtual Water Trade and its Implications on Water Sustainability", Water Supply. 22. 10.2166/ws.2021.322.
47. The World Bank, Data. GDP (current US$) - India, China. Retrieved from https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=IN-CN. Accessed on May 15, 2024.

economically, militarily or strategically remains work in progress. Till the time it happens, we have to search for solutions within and the way forward to counter the Chinese hydro-hegemony and the collusive threat would be to take up the construction of hydropower projects and storages at a scale not seen before and with a missionary zeal. It would also involve entering into water sharing agreements with the other co-riparians to mitigate the Chinese impact. Indian policy-makers need to work on the counter-measures that India may be required to undertake to avoid such a situation being exploited by our western and northern neighbours.