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Pakistan's Water Crisis and Indus River System: Revisiting National Security

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Abstract

Pakistan has become water scarce and is ranked 8th most vulnerable country to the effects of Climate Change. Pakistan is water based economy, where about 91.6% of water is consumed in agricultural sector. The entire reliance is on Indus River System which is fed by rainfalls and glacial melt. There are constant disagreements among provinces on availability of water. Water entitlements to provinces are higher than actual availability based on the assumption that by then more dams would be built. Serious tensions on water flows into Eastern Rivers have evolved between Pakistan and India despite of Indus Water Treaty. This treaty fails to address division of shortages in dry season and cumulative impact of storages on Chenab into Pakistan. For almost six decades Pakistan and India have smoothly sailed through the tough times but now with growing tensions and other conflicts water is foremost in bilateral relations. India is using water as a toll against Pakistan exploiting its upper riparian status. Water assumes the status of national Security concern requiring immediate attention and resolution as Pakistan faces both inter-state and intra-state water crises.

Keywords: Water Crisis, National Security, Integrated Water Management, Pakistan-India Conflict

Introduction

Water is life. Water is the most important component of life. A country like Pakistan which is primarily fed by a river, The Indus, is certainly at crossroads. The Indus System is the source of life for Pakistan's agrarian economy. The mighty Indus originates in the north of Kailash Range in the foothill of Mount Everest in Tibet in Himalayas. It is one of the longest rivers in the world. It is also known as great trans-Himalayan river of South Asia. After flowing about 1,000 miles in between the ranges of Himalayas, Hindukush and Karakoram, it drains about 1,000 miles of plain area in Punjab and Sindh. After flowing for about 2,000 miles it drops into Arabian Sea from Eastern Karachi (Encyclopedia Britannica, 2017)

The Indus Basin is shared by Afghanistan, China, India and Pakistan. Pakistan receives maximum water flow and occupies maximum catchment area. Its semiarid plains of Punjab and Sindh depend on Indus System (Indus River and its tributaries) and 90% of its agriculture is based on irrigation system of Indus, which is one of the largest integrated irrigation systems of the world. Indus has five main Eastern tributaries; Indus, Jhelum, Chenab, Ravi and Sutlej. Main Western tributary is Kabul River and various small tributaries; Kabul, Swat, Haro, Kunhar, Chitral, Tochi, Shah Alam, Naguman, Adezai, Soan etc. Small lakes and nullahs along with these rivers feed the irrigation system in Pakistan. These rivers are fed by snow melt and monsoon

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system of rainfall. The catchment area is so unique that it contains about seven of the highest peaks in the world (National Disaster Management Authority, 2017).

Pakistan inherited river and irrigation system which was divided among provinces before partition and was managed by Government of India. At time of partition, provinces and princely states sharing the Indus River System had various disputes of water sharing, and on projects. Government of India had been resolving these issues through commissions and committees as under Government of India Act, 1935, water management was provincial subject. At the time of partition the division of the Punjab province ignoring the irrigational realities of Sutlej and Ravi Rivers and dispute of Kashmir intensified the water distribution for Pakistan. Since partition Pakistan faces two fold crises internal and external. The external water dispute with India has its links with territorial integrity of Pakistan as it is rooted in partition plan.

After partition, Pakistan's focus had been settling water dispute with India more and less on water management within. Lack of proper planning and management of water resources has led to water scarcity which is rapidly transforming to make Pakistan water stressed nation as per capita water availability is reducing to below 1,000 cubic meter. Politicization of water resources had been biggest obstacle in framing an integrated water management in Pakistan. The issue is not just of water supplies. Water infrastructure has depleted and upgradation is not up to the mark. Since the economy is agrarian depending on irrigation through perennial canals, water shortage in dry seasons and water abundance in form of floods both are sources of economic disaster. Having one of the best irrigation systems in the world, canal system is integral to agriculture. Water supplies in canals vary from 76.2 MAF to 111.1 MAF. There is still lack of comprehensive framework to tackle the issue of water shortages in dry season and adequate storage facilities for flooded seasons. Despite the investment of about USD 300 billion in water related infrastructural development, Pakistan's storage capacity stands at only 30 days and only 11% of total hydro-potential has been exploited yet. There is only one approved water policy in country in Baluchistan, Integrated Water Resources Management Policy, which is victim to institutional hiccups.

Rapid depletion of ground water resources without planned usage, clean water availability and urban water management are further complicating the water scarcity issue.

This study is aimed at addressing few fundamental issues of water management in Pakistan;

- Why did water distribution dispute between Pakistan and India become a security issue?

- Why is water sharing among provinces a major governance issue in Pakistan transforming it into a prominent political question?
- How is Pakistan's water crisis a National Security issue?

Theoretical Framework

The realist and liberal schools dominated the development of international political connotations for major part of twentieth century. The inter-war period gave way to the idealist perceptions which was based on hope and cooperation after the horrors of World War I. The outbreak of World War II doomed the cooperative and collective security paradigm. The period of cold war was the transitional development era for these theoretical paradigms too which reoriented the propositions according to the bipolar global order and state focused security scenario. But Richard Ullman and Lester Brown had raised the concerns about environmental and human security aspects right at the height of cold war period.

After the disintegration of Soviet Union new challenges came forward to the global security. The Copenhagen school rooted in constructivist approach focused on human as the fundamental level of security assessment. Barry Buzan establishes that individual security has separate meaning from state security. National security could not be achieved if individuals are at disadvantaged position and it cannot be just assessed at the national level (Buzan, 1983: pp 18-30). This school recognizes the anarchy at international level (Level 3), which it subscribes to be mitigated through international cooperation. The internal disputes of nations elevate from the individual level of disharmony which becomes security issue at national level (Level 2) and eventually at international level (Buzan, 1983: pp 214-242).

Buzan further clarified this in 1991, when he explained that contours of national security are determined by the societal aspects of human security. Weaver defines that the state of security is freedom from the threat both objectively and subjectively. And the threat is established through the 'speech acts' of the political elite in particular. Security is the state where there is recognition of the problem and solution while insecurity is the level where there is problem but no solution. The continuous recognition of the state elite of a particular issue elevates it to the level of securitization (Weaver, 2007: pp 66-73).

Copenhagen school gives its securitization model which is socially constructed. This model establishes its base that referent object can be five different things not just the state as strictly as in Realism. The multi-sectoral approach of this model establishes that referent object can be state, national sovereignty, ideology, national economies, collective identities, species or habitats. The process of securitization is gradual as it is first taken to the sphere of politicization through the speech acts of political elite and brought into public sphere of defeat. Then in the next stage it is framed into

securitization question by depicting it as an existential threat to the referent object (Emmers, 2007: pp 110-112). Buzan, Weaver and Wilde term themselves as wideners as they have transformed the traditionalist approach in defining the security. According to them dynamics of environment and economy have deep implications for determining security (Buzan et.al, 1998 pp 1-7).

Buzan developed his security complex theory in particular in South Asia and Middle East. Buzan states, "a security complex is a set of states whose major security perceptions and concerns are so interlinked that their national security problems cannot reasonably be analyzed or resolved apart from one another" (Buzan et.al, 1998: p 13). Buzan's theory of regional security complex came forward in 1986 when he analyzed the security dynamics of this region evolved through the geopolitical realities. As the region's security complex is based on security relationship of Pakistan and India. The further complexity is added by proximity with Middle Eastern complex, Sino-Russian complex and South East Asian complex (Buzan, 1986: pp 1-15).

The process of securitization does not just involve the elevation of an issue to the level of high debate. When the issue is moved from politicized domain to the securitized domain the main rhetoric is not confined to the political elite rather it also involves military elite, civil society, government officials and also individuals. The referent object may be the state itself, or any group, national sovereignty, ideology and economy. Buzan and ilk define it as "exact definition and criteria of securitization is constituted by the intersubjective establishment of an existential threat with a saliency sufficient to have substantial political effects" (Buzan, et.al, 1998: p 25).

National security is the manifestation of the national interest. Before the Cold War the national defense was considered to be the national security. After the Cold War this debate started that national security cannot be termed in narrow terms of military security. This debate evolved by taking into account the politics, economics, societies and national resources (Ali & Patman, 2019: pp 2-5). National security encapsulates the value system of society. Wolfers described the pursuit of national security as the struggle to secure the core values of the society. The pursuit of one nation becomes the threat for other nation generating 'security dilemma' (Wolfers, 1952: pp 481-490). This idea was further developed by Baldwin who criticized the still narrow approach of national security on basis of military security. In 1977, Lester Brown further targeted the strict approach of national security broadening its base to include the issue of economies and threat to natural resources (Brown, 1977: pp 1-46).

Ullman built upon this connotation by describing his conception that threat to national security is actually the narrowing down of options of the state limiting its security. He criticized that states tend to define the national security in military terms because states and societies take this matter more seriously (Ullman, 1983: pp 129-

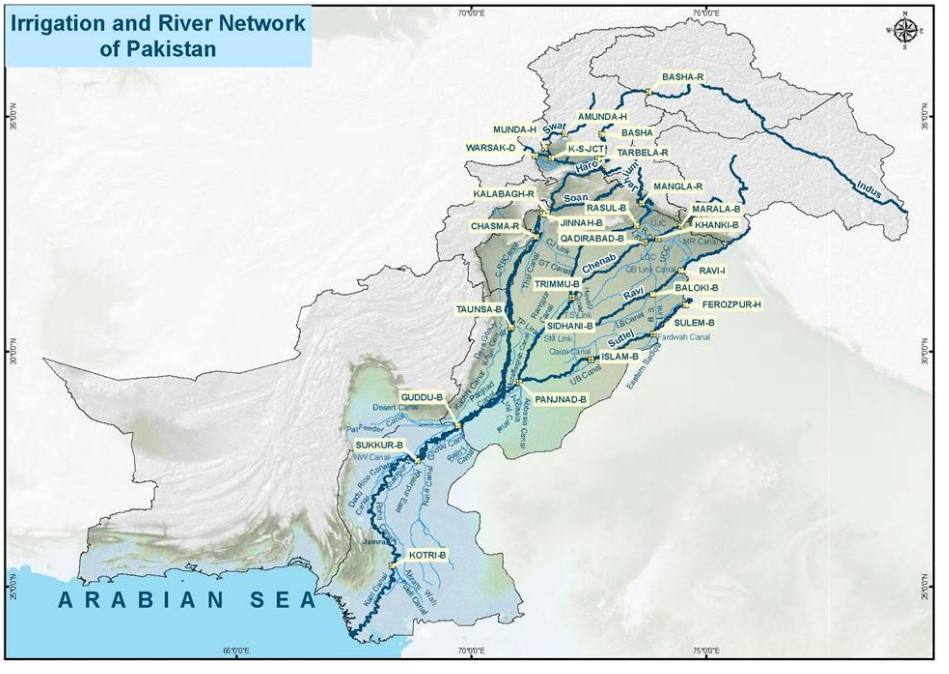
132). Kenneth Waltz adjusted the realism to structural realism establishing that international order will remain anarchic and states' behavior will be adjusted by the broader structural changes (Waltz, 2000: p 5). Katzenstein puts the national security in social terms. He believes that states caught in security dilemma are more prone to cooperation (Katzenstein, 2011: p 19).

After the demise of Soviet Union the bipolar global order collapsed into unipolar world opening ways to new security challenges. Amid this more concentration was shifted to non-traditional security threats. Brahma Challaney gave his thesis of 'Water Wars' in 2013 that now the global concern is primarily the water crisis which is assuming a serious security form after oil. He projected that in near future inter-state water wars are likely and also intra-state water conflicts (Challaney, 2013: p 16). He maintains that maximum conflicts are in the world revolve directly or indirectly around the water. Asia inhabiting about 60% of global population also is the house to major water sharing disputes clubbed with all other kinds of conflicts (Challanaey, 2013: p 8). Homer-Dixon established strong link between environmental scarcities and conflicts. He was more convinced that environmental scarcities along with unequal distribution of resources and population growth would lead more towards sub-national, civil or international conflicts. "Ecological Marginalization" is the bedrock of his thesis (Homer-Dixon, 1994: p 5-15).

Indus River System-Source of Pakistan's Water:

Indus is one of the ten largest rivers of Asia. Originating in Tibet it cuts through Himalayas, Hindukush and Karakoram. For about 1,000 Km it flows within mountain ranges and enters into Plains. The Indus River Basin is shared by China, Afghanistan, India and Pakistan. However, Pakistan occupies maximum if the basin; about 47%. Pakistan is drained by mighty Indus and its tributaries. Pakistan's complete reliance is on this river system. About 90% of Pakistan's agriculture is dependent on this river. By 2014, about 43% of employment in Pakistan was related to water sector. The crisis of water is complicating in Pakistan majorly due to mismanagement. Pakistanis use 10% more water than global water average. Despite of such grave water challenges there is absence of water market. Water availability in Pakistan has declined from 2,172 cubic meters per inhabitant to 1,306 cubic meters in 2015. Still 27.2 million Pakistanis don't have access to safe water (UNDP, 2017: p 6).

Irrigation and River Network of Pakistan



Source: http://www.pakirsa.gov.pk/

At time of partition per capita water availability was more than 5,000 cubic meters which started reducing rapidly. In 1990, per capita water availability was 2,172 cubic meters per inhabitant which declined to 1,362 cubic meters per inhabitant in 2015. Annually, Pakistan extracts 74.3% of its fresh water. Still 27.2 million Pakistanis do not have access to safe water resources (UNDP, 2016: p 1). Water storage facilities are integral to the water security of any nation. Pakistan here too stands at poor ranking only above Ethiopia with only designed live storage capacity of 121 cubic meters per person. USA has largest live storage capacity of 6,000 cubic meters per person. Pakistan has only 30 days' storage capacity. In Indus Basin Irrigation System, groundwater resources are estimated at about 810 MAF (Million Acre Feet), equivalent to six times of mean annual river flow. In 1979, WAPDA based survey showed that 42% area of water table covering IBIS was three meter below and was declared waterlogged. Due to droughts and increased extractions water this area reduced from 42% to 32%. In last 40 years ground water abstraction has increased from 25.6 MAF to 50.2 MAF (UNDP, 2016: p 3), contributing to about 47% of total of surface water to farmlands.

Rainfalls, glacial and snow melt are main sources of water In Indus and its tributaries. Pakistan has largest ice bodies after Polar areas. Flow rate from glaciers and snow melt varies from 100 meters to 1,000 meters per year. About 90% of Pakistan is arid or semi-arid. About 50% of the total area is arid and 40% is semi-arid. Only 10% area falls in humid category. Monsoon and Western Depressions are main source of water into the rivers. Annual average of rainfall is;

April-September	158mm
Oct-Mar	80mm
July-September	118mm
Total annual average	238mm (Bhatti & Farooq, 2016: p 16).

Indus System and its tributaries bring on an average 154 MAF of water annually. Three western rivers contain 144.91 MAF and eastern tributaries bring 9.14 MAF. About 104.73 MAF is used for irrigation, 39.4 MAF flows to sea and 9.9 MAF of water is lost to seepage, evaporation and spills during floods. Indus Basin Irrigation system is one of the best and largest integrated having 16 barrages, 3 major reservoirs, 2 headworks, 2 siphon across major rivers, 44 canal systems (23 in Punjab, 14 in Sindh, 5 in KPK and 2 in Baluchistan), 12 inter river link canals and more than 107,000 water courses. Dam construction started in 1955 and warsak was built on Kabul river.In 1960s after Indus Water Treaty, Mangla and Tarbela were built with storage capacity of about 5.88 MAF and 11.62 MAF respectively. By year 2010, Mangla and Tarbela were estimated to have lost 33% of storage capacity. Due to siltation capacity of Tarbela, Mangla and Chashma had reduced by 11.47 MAF in 2010. It is estimated that in these reservoirs storage would further reduce for 10.70 MAF by 2020 (PILDAT, 2011: p 20). Groundwater aquifers are also within Indus River Basin and are estimated to contribute 48% of available water (Ahmad et.al, 2007 p 997). At time of partition there were only three dams in Pakistan; Khushdil Khan dam 1890, Spin Karazai dam 1945 in Baluchistan and Mianwali District in 1913 in Punjab.

Partition of Punjab-Genesis of Pakistan's Water Crisis:

The British started developing the canal system in India after 1819 along Jumna and Sutlej Rivers. The Agra famine of 1837-38 compelled them to further develop the canals on western Jumna (Hussain, 2017: pp 24-25). With annexation of Sindh in 1843 and Punjab in 1849, the most fertile lands of India had come into direct control of the British so they started developing the canal colonies as Montgomery and Lyallpur (Dharmadhikaray, 2005: pp 8-9). The same pattern of river development continued with greater magnitude when Sukkur Barrage was constructed in 1932.

These developments produced a class of influential land owners which strengthened British rule in India (Haines, 2017 p 37).

British had never developed the irrigation system in Indus River Basin as integrated River basin rather it was always an arrangement as to what was required where. Pakistan-India water distribution dispute is rooted in the partition of Punjab province through Radcliffe Award in 1947. The 3rd June formula had established the partition on the basis of Muslim and Hindu majority districts and areas. Concomitant to this Radcliffe Boundary Commission was set up by the Viceroy of India for boundary demarcation. Two Muslim Judges and two Hindu Judges were the members. It was earlier decided that if judges could not reach any consensus Sir Cyril Radcliffe's award would be final. The Boundary Commission announced its decision on 17th August, 1947, when partition had taken place during the night of 14th and 15th August, 1947.

The Boundary Commission was set to decide the division on basis of majority population and 'other factors'. Before the announcement of the award it was clear that Gurdaspur, Ferozepur and Zira would be included in Pakistan. However, the award granted these areas to East Punjab to the utmost amaze of Muslims and Muslim League leadership. The award does not carry the justification of Gurdaspur and Ferozepur to East Punjab but later Radcliffe tried to justify the decision on basis of 'other factors'. He averred that he included Ferozepur in East Punjab due to communication and Railways network rather he decided inclusion of Gurdaspur on basis of Madhopur headworks which supplied water to Amritsar (Hussain, 2017: p 41).

The district of Gurdaspur had total Muslim majority. If it was analyzed on basis of tehsils, three tehsils of Gurdaspur district; Batala, Gurdaspur and Shakkargarh were Muslim majority while only Pathankot was Hindu majority. But on the basis of overall district population Gurdaspur should have been in Pakistan with 51% Muslim majority. It had Madhopur Headworks which joined Upper Bari Doab Canal with Ravi River and it was the only land route India could have to Kashmir. Ferozepur, Zira and Fazilka had 55.2%, 65.2% and 75.12% Muslim population (Hussain, 2017: p 39). Ferozepur had the headworks on Sutlej River and an arsenal. The water which flowed from Ferozepur and Madhopur headworks supplied major portion of water to lands in Pakistan. These waters supplied 8.5 MAF in India while 64.4 MAF to Pakistan (Mehta, 1988: p 71).

East Punjab signed a standstill agreement to let the water flow into West Punjab in June 1947. That agreement ended on 31st March, 1948. That was the very same date when Arbitration Tribunal formed by British Government also ceased to exist. On 1st April, 1948 India stopped water in Upper Bari Doab Canal and Diplapur Canal from these headworks. This water was finally released through an agreement on 4th May,

1948 which is known as Delhi agreement or Inter-Dominion Agreement. Pakistan was released with the water after paying 10% seignorage charges which India claimed it had right as Pakistan was using the water from the headworks India was maintaining (Haines, 2017: pp 42-44).

However, the dispute with India was intense from day one on water as it was further linked to the Kashmir issue. In 1951, Prime Minister Nehru invited David E.Lilienthal. Lilienthal visited both Pakistan and India and met Nehru and Liaquat Ali Khan. Lilienthal was the head to Tennessee Valley Authority and was pioneer in integrated basin management in Tennessee. After returning to US he wrote an article "Kashmir: Another Korea in Making?" in Collier Magazine. He was of the opinion that Kashmir was the flashpoint of South Asia which needed immediate attention of international community. In order to resolve Kashmir dispute, its surrounding matters should have been resolved and leading among those was water dispute between India and Pakistan. He proposed integrated management of Indus River Basin (Lilienthal, 1951).

The World Bank head Eugene Black took special notice of this article and proposed World Bank's role in negotiation on water between Pakistan and India. But there remained deadlock in talks. Then in 1954, World Bank gave its Bank Plan which proposed the division between Pakistan and India. Three western rivers; Indus, Jhelum and Chenab to be given to Pakistan and three eastern rivers; Ravi, Sutlej and Beas be given to India. Pakistan initially rejected this proposal as on basis of technical advice it deemed it was detrimental to its needs. In 1956, World Bank too sought technical advice which maintained that flow was not enough to meet needs of both parties (Haines, 2017: pp 124-127, 133). In 1958, Pakistan gave London Plan which proposed Tarbela Dam on Indus, Mangla on Jhelum and three more dams with various link canals with a financial estimate of $728 million. India gave its financial estimate of $666 million and countered this plan with another which proposed of using various sites on Chenab in Jammu and Kashmir and diverting 5 MAF from eastern rivers. Pakistan totally rejected this plan (Haines, 2017: p 138). Finally the deadlock broke with personal efforts of Eugene Black and agreement was signed in Karachi on 19th September, 1960. On the same day US government created Indus Basin Development fund of $893.5 million with donor countries (Mahmood, 2018: p 9).

Table 1

Indus Basin Settlement Works

Link Canals (9)	Barrages (6)	Storage (3)
Trimmu-Sidhnai	Sidhnai on Ravi	Mangla
Sidhnai-Mailsi	Mailsi Siphon on Sutlej	Chashma
Mailsi-Bahawal	Qadirabad on Chenab	Tarbela
Rasul-Qadirabad	Chashma on Indus	
Qadirabad-Balloki	Marala on Chenab	
L. C. C Feeder		
Balloki-Sulemanki-II		
Chashma-Jhelum		
Taunsa-Panjnad		

Source: Mahmood, 2018: p 9.

Indus water Treaty:

The treaty clearly divides the rivers of Indus system into eastern and western rivers. Indus Jhelum and Chenab were given to Pakistan with exclusive rights and Ravi, Sutlej and Beas' exclusive rights were given to India. Under paragraphs 3 and 4 of Article XII, the treaty is binding on both Pakistan and India. Any country cannot unilaterally alter or back out. The treaty allows modification through duly ratified treaty concluded by both countries. This treaty took whole Indus system, its tributaries and all parts of rivers (Mahmood, 2018: p 16). Under Article Xi of the Treaty, it deals with only surface water and not ground water. The parties are not entitled to invoke any other claims on basis of settling territorial claims. It is mandatory for India to share information in advance of the beginning of construction within a prescribed time and Pakistan is entitled to raise objections. If Pakistan does share objections within prescribed time then India is entitled to continue the construction. Exchange of data establishes mutual trust under the treaty. The determination of matters of dispute or question by the Neutral Expert or Court of Arbitration, stand final.

There are few exceptions to the principles of "Let Flow" and "Non-Interference". Under Article III and Annexures B, C, D & E provide for these exceptions. The Treaty allows domestic uses and non-consumptive uses (such as navigation, floating of timber or other property, flood protection or flood control, fishing or fish culture, wild life or other like beneficial purposes). Pakistan has right to use from eastern rivers on these grounds and India has right to use from western rivers. In addition, India is allowed to use waters of western rivers for limited use as for general purposes, power generation and floods. Also India is allowed from western rivers for power generation in form of run-of-river plants and some limited storage capacity. Under Annexure E, India is allowed for construction of new storages up to 3.6 MAF

comprising general storage of up to 1.25 MAF, power storage 1.6 MAF and flood storage of 0.75 MAF (Mahmood, 2018: pp 21-22).

In case of storage India started Wullar Barrage which was stopped in 1987 after controversy between Pakistan and India. Second such project is Pakaldul recently proposed by India on which Pakistan has raised its objection. In case of run-of-river projects, Pakistan did not raise objections in early phase of Salal Dam. Howeer, the issues on Salal Dam were later resolved bilaterally. The serious concerns were raised on Baglihar Dam project when Pakistan pressed for adjustments to the design and the matter was taken to Neutral Expert under recourse to the mechanism for "Settlement of Differences and Disputes". This was invoked for first time after 58 years of signing of the treaty. The same mechanism was again invoked by Pakistan in case of Kishanganga Hydroelectric Plant and the matter was taken to Court of Arbitration. Pakistan made another request to Court of Arbitration in case of Kishanganga and Ratle in mid-2016. India after some resistance has agreed to the Neutral Expert on which World Bank is pondering under Indus Water Treaty (Mahmood, 2018: pp 17-18).

India's Hostility on Water:

Amid all these issues when Pakistan is pursuing the differences and objections on Kishanganga and Ratle on legal course under the Treaty, Indian leadership is hawkish in threatening to exploit its upper riparian status. In 2016, in response to a terrorist attack Prime Minister Modi by threatening to revoke Indus Water Treaty. Prime Minister Modi held meeting to respond through water and that meeting also had National Security Advisor, Ajit Doval. During the meeting it was also considered to fully utilize the potential of western rivers which is 135 MAF (India Today, 2016). Since then, India is continuously releasing the statements at highest level to threaten the stoppage of water to Pakistan. Various such statements are politically motivated but certainly they have impact on bilateral relationship.

Before the general elections in India, Indian leadership at all levels threatened to stop the residual flowing waters into eastern rivers too. Indian transport and Water Resources Minister Nitin Gandkari averred on February 21st, amid the high tensions post Pulwama that India had decoded to stop all the water which was residual flow of eastern rivers (Al Jazeera, 2019). Pakistan already supplies water to eastern rivers through link canals from western rivers. India categorically threatened to punish Pakistan for the terrorist attack in Pulwama, where it was yet to be determined if Pakistan had any involvement. A threat on stopping the water amid a high military tensions and clouds of war insinuate the scenario of water wars (Gettleman, 2019, p 1).

However, after few months India responded in hostility by releasing water in Rai and Sutlej without prior information sharing which Pakistan termed "Fifth Generation Warfare". This development took place after India revoked the special status of Kashmir under Article 370 of its constitution. Resultantly there was high level of tensions between Pakistan and India in which India released water from dam which could cause flooding across the border in Pakistan. India's response was that sharing such information was a goodwill gesture during such releases after monsoon season was routine, and India did not have any such plan to continue such good will gestures (Gulf News, 2019).

Issues of Water Sharing in Pakistan:

Pakistan's major water sharing challenge is sharing of river waters among provinces. The Indus and its major tributaries, Jhelum, Chenab, Ravi and Sutlej drain majorly Punjab. After Mithankot mighty River Indus drains Sindh and flows into Arabian Sea. Major western tributary of River Indus, Kabul River, drains to KPK. Ground water is also in same basin which is a problem. About 0.8 million water pumps provide water to 50% of crop water requirement. Ground water development resulted in salination of 4.5 million hectares of land, half of which affects Basin's irrigated lands. Another 1 million hectares of total 16 million hectares are affected by Indus Basin irrigated land. Problem of salinity is acutest in downstream Sindh when 70-80% land is saline. This becomes another point of conflict between Punjab and Sindh (Mustafa, 2010: p 8).

Inter-provincial conflict on water is the most impelling feature of water challenges in Pakistan. The state inherited this conflict with partition of the Sub-Continent which augmented with poor governance of water. The dispute erupted immediately after development of projects started in Indus River Basin in early twentieth century. The primary dispute was on allocation of waters between Punjab, Sindh and surrounding princely states or those which were within access of the proposed projects.

First substantial treaty dates back to 1945 between Punjab and downstream Sindh allocating 75% of water of main stem Indus River to Sindh and 25% to Punjab, further allocating 94% from eastern tributaries to Punjab and 6% to Sindh. Punjab and Sindh have water sharing disputes due to the upper riparian status of Punjab and lower riparian of Sindh. After World War I, river basin development was started in Indus River Basin. With planning of projects like Haveli, Bhakra Dam and Sutlej valley canals in Punjab and Sukkur barrage were proposed in Sindh. Before partition water was provincial subject and Government of India acted as neutral third party among provinces. Under Government of India Act, 1935, water was delegated to provinces. Situation got serious when canals were started to divert waters to irrigate lands as this diversion. When Upper Bari Doab Canal started operations in 1858 to irrigate about 1 million acres of land between Ravi and Bias rivers serious issues erupted. Waters were divided according to tribal tradition so that first farmer on the stream had full

right on water to use it to full. Disagreements arose when groups had differences in socio-economic status. One party claimed more share on basis of greater contribution and other claimed on basis of greater need (Khalid & Begum, 2013: pp 7-23).

Table 2

Pre-Partition Water Settlement[i]

Agreement/ Committee/ Commission	Year	Parties	Rivers	Particulars	Settlement
Tripartite Agreement	1921	Punjab, Bahawalpur, Bikaner	Sutlej, Beas	Bahawalpur objected allocation of water to non-riparian Bikaner ignoring needs of Punjab and Bahawalpur	Government of India persuaded for Tripartite Agreement. Water rights principles drawn were; a) Priority of existing use b) Recognition of claims of riparian c) equitable apportionment regardless of history
Indus Discharge Committee	1921	Punjab, Sindh	Indus System	Sindh (at that time being part of Bombay Presidency) objected various projects. Bahawalpur and Bikaner also objected. Different claims to Secretary of state, India were filed. On appeals from Punjab and Sindh Indus Discharge Committee was formed.	Secretary of State had sanctioned construction of Sindh Valley Project and SSukkur Barrage with seven canals. Committee discharged at various sites. Sindh and Punjab signed agreement to observe daily discharge. Committee proposed Haveli Canal and provided future projects proposed by Punjab

					by taking into consideration after effects on Sindh. Nicholson Trench Committee was appointed to study Bhakra Dam which it cleared in 1930.
SVP Inquiry Committee	1932	Punjab, Sindh,	Sutlej	Actual operations of Sindh Valley Project revealed storage of supplies	Recommended exclusion of some areas in Bahawalpur state and construction of new feeder canals and adjustment in command areas of certain canals.
Anderson Committee	1935	Punjab, Sindh, Bahawalpur, Khairpur	Sutlej	11 SVP canals with four barrages and Sukkur Barrage Project were completed. Number of Problems arose; a) Bahawalpur and Khairpur sought additional supplies b) Punjab asked for more water from Haveli Canals "Committee of Central Board of Irrigation on Distribution of Water of Indus and Tributaries", Anderson Committee formed with eight experts and representatives from NWFP, Bikaner, Khairpur, and Government of India	Submission of report in 1937. Increased supplies for Haveli and Thal projects. Bhakra Dam-Agreement had been reached between Bombay and Punjab in 1934. Report cleared Haveli Project 1934-1939. Kalabagh Barrage and Thal started in 1939 but completed in 1947.

Rao Commission	1941	Sindh, Punjab	Indus River System	Sindh complained against Punjab for increased flows from rivers passing through its territory. Submitted its report in 1942.	Priority for allocation of water from Paharpur canal. Confirmed allocation of waters into That and Sukkur Barrage according to Anderson Committee. Increased flow upstream had negative effects for inundation canals downstream. Proposed construction of Guddu and Kotri barrages. Compensation to be given to Punjab for withdrawal of waters from canals.

Post Partition Water Settlement Efforts:

After partition of sub-continent water sharing got complicated because of division of rivers between Pakistan and India ignoring the irrigation system. After Indus Water Treaty signed in 1960, a new wave of water resources contention initiated among provinces as three eastern tributaries were surrendered to India. Now entire dependence was on western tributaries; Indus Jhelum and Chenab. After signing this treaty Pakistan's federation remained unsuccessful in giving any mutually agreed water sharing mechanism among federating units.

Table 3

Committee/Commission	Year	Particulars
Akhtar Hussain Committee	1968	• Water allocation and rates committee constituted by Government of West Pakistan • Review Barrage water allocations • Reservoir release patterns • Drawdown levels and use of ground water in relation to service water deliveries • One Unit divided into West Pakistan as report was presented 1970, it could not get attention

Justice Fazl e Akbar Committee	1970-71	• Committee was constituted to recommend apportionment of water allocations of groundwater and its coordinate use with flow supplies and reasonable water requirements of provinces • Committee submitted its report in 1970 but any decision could not be taken on it. • Later water allocation was apportioned on ad hoc basis from Chashma Barrage and later Tarbela Reservoir. This ad hoc allocation continued till 1991.
Chief Justices' Commission	1977	• Commission was constituted to examine water allocation • Its report remained pending till Water Apportionment Agreement, 1991.
Haleem Committee	1983	• Commission conducted limited hearing of the case but within limited hearing • FederalGovernment continued water apportionment to provinces on ad hoc basis every season

Source: Generated by Author based on information , Kalid, Iram,. & Begum, Ishrat. (2013)., *Hydro politics in Pakistan: Perceptions and Misperceptions*", South Asian Studies, Vol 28 (1), 7-23, 2013, Haines, Daniel. (2017). *Indus Divided: India, Pakistan and The River basin Dispute*, 2017, 35-58.

Water Apportionment Agreement, 1991:

In 1991, Water Apportionment Agreement was signed among four provinces with federal government. There had been at length discussions for share of each province. Water was apportioned for both Kharif and Rabi seasons and over ran all previous settlements. According to this apportionment existing water uses of present canals was kept at its level and rest of water was allocated to provinces. The projects which were under execution in NWFP and Baluchistan were allocated their authorized quota. New projects on Indus River System were sanctioned. Shares of Metropolitan city were given priority. Punjab and Sindh got 37% water each, Baluchistan got 12% and NWFP was given 14%. Indus River System Authority was established to oversee water apportionment. There was no restriction on provinces to pursue new projects within their agreed shares. Water drainage to Arabian Sea was declared to be important for preservation of marine life. However, no particular figure was given. Sindh gave an estimation of 10 MAF to drain to Arabian Sea. Later few other estimates suggested higher or lower figures. There was no restriction on Baluchistan to develop projects on Indus right bank draining into its areas. Existing reservoirs

were to be managed with priority of irrigation uses (Water Apportionment Agreement, 1991: pp 2-8). Any question of implementation of Water Accord shall be settled by the Authority through vote of majority. In case of equality of votes matter will be at discretion of the Chairman. A provincial government or WAPDA in case of any disagreement may refer the case to Council of Common Interests.

This authority has however not been successful in completely placating the woes of provinces. Under para 6 of the Accord water storage facilities must be constructed on war footings which the government of Pakistan remained unable to implement. At time of water shortage and when during February-March water reaches dead level, disagreements arise among provinces. Still there is complete absence of feasible sites on Chenab, Jhelum has one large reservoir-Mangla and there are sites on Indus. The issues of federation and federating units which Pakistan is facing since partition clearly depict through water apportionment differences.

Pakistan's National Water Resource Strategy, 2002:

In 2002, Government of Pakistan conducted a study to review availability of water. This study identified water resources as availability of farm gate at 109.3 MAF and 62.3 MAF as surface water availability, 42 MAF from underground and 5 MAF from rainfall. This report calculated development potential for 2025 as 139 MAF and 75.3 MAF from surface, 55.7 MAF from underground and 8 MAF from rainfall. The requirement at farm gate is calculated as 145 MAF. Available remaining potential is 13.7 MAF from underground, 13 MAF from rivers and 3 MAF from rainfall. Same report indicates average availability for storage as;;

- Average annual flow below Kotri (1977-2001) as 35 to 38 MAF
- Requirement below Kotri as 10 MAF
- Uses on eastern and Western Rivers as 3 to 5 MAF, 20-25 MAF balance at canal heads, equivalent available at farm gate 13-15 MAF (Water Apportionment Agreement, 1991: p 9).

So it was very clear that in 2002, water availability for storage is 20-25 MAF. This matter was taken to the President of Pakistan. Technical Committee on Water Resources, consisting of 8 members and a chairman presented their calculations. This review showed complete disagreements as to the figure of storage water availability. WAPDA gave the figure of 3.95 MAF, one member gave figure of 11.60 MAF and chairman gave figure of 0.25 MAF. This report showed that even experts had not any consensus on the figures of water available for storage[1]. In absence of any national

settlement on permanent basis water apportionment is a continuous issue among provinces. In 2010, again difference emerged between Punjab and Sindh on water apportionment twice. This was again settled but there is no long term framework ensuring water settlement.

National Water Policy, 2018:

Pakistan's water crisis can easily be gauged through commitment of all stakeholders, primarily federal government, to draw down a national policy on water by taking all on board. A National Water Policy draft has been prepared and revised at various times but always remained in form of draft. It was never elevated to the status of policy. In 2005, World Bank conducted a detailed study on updated status of water resources. After this study it was advised to formulate national water policy. Once this draft was presented to federal cabinet it could never be deliberated to approve to be a policy. In 2020, once again a committee was formed to revise the report which it presented in 2012. Ministry of law and justice objected that water is provincial subject so national policy is not required. In 2015, on instructions of Prime Minister once again this was revised. In May, 2017 when the draft was presented to Council of Common Interest for deliberation and later to be approved as policy, despite of the fact it was on meeting agenda due to lack of time it was not discussed. So again it is in cold storage (Khalid, 2017: p 1) (. Most important feature of this policy draft is that it addresses Pakistan's water crisis both on national and international front. At international front it proposes shared watershed management and also integrated management on internal front[2]. Water is provincial subject in Pakistan, under the constitution. Federal Government is responsible to oversee interprovincial water issues. In 2005, only Baluchistan formulated Integrated Water Resources Management Policy but could never be implemented.

Finally in 2018, the cabinet approved first National Water Policy of Pakistan. The national Water Policy is based on Integrated Water Resources Management. The objectives of this policy are sustainable consumption, augmentation of available water resources and equitable water utilization, improving availability and urban water management, Hydropower production, promoting judicious utilization, treatment and possible reuse, improving water shed management, promoting and setting major national targets and climate change assessment (National Water Policy, 2018: p 7). The strategic priorities set under the policy are conservation and efficiency, storage, leveraging technology, renewable energy development, integrated water resources management and comprehensive regulatory framework (national Water Policy, 2018: pp 8-9). The policy puts special focus on the environmental sustainability and

afforestation (National Water Policy, 2018: p 12). Although the policy has been approved but still it is a document on basis of which serious legal formulation is required. Pakistan has not entered into the sustainable utilization phase.

The issue of dam building in Pakistan clearly delineates the gloomy picture of issues of federation crisis of governance. The first such instance is Kalabagh dam which fall victim to high politics. Sindh objected it to utmost based on its apprehensions of water availability crisis. To hinder the process it was attached to the most impelling objection of federation of Pakistan that Punjab has dominated the federation. Pakistan is multi ethnic society and any crisis of management is easily attached to the issue of unequal and inequitable sharing of power among federating units. Kalabagh dam has passed several stages of technical and financial feasibility. However, it could not be constructed due to politicization which federal government never tried to placate with effective dialogue. Three most important projects are Neelum Jhelum, Diamir Bhasha and Dasu. These projects have been victim of delays which swelled their cost manifold. There had been delays of about one decade.

Water governance pertains to political, social, economic and administrative measures to effectively manage water resources and smooth supplies to different factions of society. Water governance is about allocative and regulatory politics exercised through water management. There is increased need of water management as water resource is a finite and most integral component of human lives and national economies. Water governance is profoundly a political element which thoroughly draws the picture of political and social realities of the nations. Increased development, population growth, urban development put immense pressure on water resources. This situation requires effective management of available water resources. Democratization of water resources is very important (Batchelor, 2007: pp 2-4). In a society like Pakistan where there is much contention among federating units on division of resources and power, water has been top of the list in these disputes. In absence of water governance mechanism water resource is depleting rapidly.

Conclusion

Pakistan is rapidly advancing towards serious water crisis. Rapid population growth, increasing development, urbanization and mismanagement are key factors of brewing crisis. Pakistan inherited water crisis owing to ignoring irrigation infrastructure under partition plan. Pakistan's water crisis is two pronged. One is on international front with India on water sharing of The Indus and internally water sharing among federating units. Pakistan's provinces inherited water sharing disagreements since the initiation of water resources development in Indus Basin in early twentieth century. The partition of sub-continent in 1947 elevated the inter-provincial water distribution issues to inter-state water conflict in a very hostile environment. Indus Water Treaty is a meritorious success which survived all the following bilateral crises but the

provisions of conditional water related projects' development triggered disagreements. India's stubborn stance on hydropower projects on Rivers Chenab and Jhelum regenerate the water distribution disputes. Furthermore, During last two, three years as the hostility between Pakistan and India increased on various other issues, in particular, on terrorism and Kashmir, India has blatantly threatened Pakistan to respond through water.

The crisis is augmented by poor management of water resources and inadequate development of water resources. Pakistan's federation had been unable to devise national water policy for seventy years which was finally approved in 2018. Water reservoirs could not be developed at a pace equating water requirements. Groundwater is being exploited without any policy of management and depleting rapidly which can cause crisis in urban centers. In Karachi, Lahore and Islamabad water resource crisis is visible now. Public and private partnership investment in water resources can be an effective tool and speedy measure. But water in Pakistan is still a public good not private which makes it difficult to move towards sustainable usage. Efficient water management can lead to saving 11 MAF. But there is almost no progress on water conservation and sustainable utilization.

In the current trends of security assessments of nations, it is primarily targeted at the security of individuals. Water is integral to human life. A country like Pakistan where agriculture stills contributes 20% to GDP and about 90% of total water is used for irrigation, water is a serious issue which had been badly ignored. This issue now assumes the state of security matter as the Copenhagen School ascribes the national security to human security. Pakistan's water crisis is two-fold; internal and external which it inherited in its creation. India has used water as a tool to respond to security and hostility issues. On the other front Pakistan's internal water distribution issues and urban and irrigational water crisis is augmenting which makes it the matter of urgent solution on war footings.

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