



Climate Change and Indus River Basin: Implications for Pakistan

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The Indus River Basin (IRB) constitutes five major tributaries of the river Ravi, Satluj, Beas, Jhelum, Chenab, and the Indus itself. The Indus river basin covers the area of approximately 1.12 million km². The area is distributed among Pakistan, India, China and Afghanistan covering the area 47 percent, 39 percent, 8 percent and 6 percent respectively. In Pakistan, the Indus river basin covers around 520,000 km², or 65 percent of the territory, comprising the whole of the provinces of Punjab and Khyber Pakhtunkhwa and most of the territory of Sindh province and the eastern part of Balochistan. The drainage area lying in India is approximately 440,000 km², nearly 14 percent of the total area of the country, in the States of Jammu and Kashmir, Himachal Pradesh, Punjab, Rajasthan, Haryana and Chandigarh. Only about 14 percent of the total catchment area of the basin lies in China, covering just one percent of the area of the country, and Afghanistan, where it accounts for 11 percent of the country's area.¹ Pakistan receives 63 percent of the Basin's water whereas India shares 36 percent of the basin. Roughly 300 million folks are inhabitants of the Indus basin.

¹ "Indus river basin", aquastat, FAO, http://www.fao.org/nr/Water/aquastat/basins/indus/indus-CP_eng.pdf accessed 17-05-2023.

The Indus River flows in northern India and Jammu & Kashmir before it enters into Pakistan ultimately falling in Arabian Sea. India has a number of river basins ranging from Indus River basin, Ganges, Brahmaputra, Godavari, Krishna, Mahandi and Cauvery etc. The Indus River basin is the essential resource of water for Pakistan to meet its requirements of human consumption, agriculture and industry and hydropower production.²

Pakistan is a developing country with major dependence on agriculture which acts as the backbone of the state's economy. The country is facing massive budget deficit, challenge of poverty and governance, poor infrastructure and corrupt system on the one hand and acute climate challenge on the other due to the global warming.³ The situation is further intensified due to the aggressive behaviour of neighbour state India always willing to cut water supply of Pakistan bearing the status of upper riparian state that holds the control of Pakistan's main rivers which contribute as the life line of its economy and human security. In case of disrupted water supply, Pakistan will have to face adverse effects as 90 percent of the entire agrarian production is done on area irrigated by Indus Basin Irrigation System. Besides, the river is further significant being the crucial source of meeting domestic, industrial as well as energy production needs.

Climate change as a result of global warming is characterized by rise in the temperature of the earth that alters the weather conditions and ecosystem. The issue is being seriously considered in sphere of international relations where the states cannot avoid from its impact individually and its communal impact is making the situation further complex in its governance. Climate change has raised apprehension not only across the world but also in the Indus River basin particularly in Pakistan. Changing weather patterns in the

² Shafqat Kakakhel, "The Indus River Basin and Climate Change", Vol. 10 No. 3, 2015. <http://www.criterion-quarterly.com/the-indus-river-basin-and-climate-change/> accessed 10-05-2023

³ Zahoor Khan, "Climate Change: Redefining Pakistan's Security", J-SAPS Volume 02, Number 02. https://www.academia.edu/11781996/Climate_Change_Redefining_Pakistans_Security?auto=download accessed 17-05-2023

country have caused variations in temperature and precipitation, intense tropical storms and rainfalls, glacial melt, lake and cloud outbursts, floods, rise in the surface of the sea, affected biodiversity, droughts and desertification. The country who is emitting less than 1 percent carbon but bore a damage of PKR 3.2 trillion in the recent floods of 2022.⁴ Besides, it is among the most water strained countries in the world. Glaciers melt in Himalayas due to the rise in the temperature is alarming for the flow of Pakistani rivers which is affecting the lives of millions of Pakistanis. This coupled with Indian hostility to violate Indus water treaty is further raising apprehensions in Pakistan where it has to meet the challenge of the growing need of water to the constantly raising population along with food and energy supply.

Rapid increase in population and the trend of urbanization will most likely bring a continuous decline in per capita access to surface and groundwater sources.⁵ The study aims to analyze the impact of Indian hostility in the form of water blocked violating the Indus water treaty coupled with climate change on Pakistan and that how this treaty can address the challenge of climate change. Besides, it will suggest some policy options for decision makers to address the issue. The study is based on qualitative research which makes use of the data that collected through primary and secondary sources which include existing documents i.e., books, journals, newspapers and online resources.

Theoretical Debate

The hydro-hegemony theory was conceptualized by Zeitoun and Warner as an analysis tool for trans-boundary water conflicts. It combines the concepts of hegemony, power

⁴ "PAKISTAN FLOODS 2022: Post-Disaster Needs Assessment", Ministry of Planning Development & Special Initiatives, 2022. <https://www.pc.gov.pk/uploads/downloads/PDNA-2022.pdf> accessed 24-05-2023

⁵ "The Vulnerability of Pakistan's Water Sector to the Impacts of Climate Change: Identification of gaps and recommendations for action" <http://www.pk.undp.org/content/dam/pakistan/docs/Environment%20&%20Climate%20Change/Report.pdf> accessed 10-05-2023

and intensity of conflict into one framework. Water security is most important element in any basin or basin state. The rapid increase in the world population is posing a serious challenge to the available water resources of the world. The situation becomes further complicated where the states have shared basins where the conflict is most likely to erupt on water allocation and its distribution to all states of the basin. Along with traditional disputes among states on the rights of water sharing, another challenge of climate change has emerged in the contemporary world. Therefore, the cooperation and conflict management is essential in such circumstances.

The growing dearth of water across the world needs a thoughtful approach towards trans-boundary water disputes. Traditional study inclines to restrain the role that asymmetrical powers have more water management issues that can lead to war in an unbalanced framework. The theoretical agenda of Hydro-Hegemony given here tries to give two characteristics - power and changing intensity of the dispute and their respective standing in the perpetual and deeply political question: who gets how much water, how and why?

The strategies like detention of the sources, their integration and containment to control water resources are developed at river basin level to achieve the goal of hydro hegemony. The execution of these strategies is made by using different tactical means like exploitation of asymmetrical existing power in the context of weak international institutions. Basin wise hydro political relations are shaped outside the water resources through political process in order to be benefitted from the cooperation under hegemonic leadership. Thus, the result of the competition regarding resources control is analysed by the form of hydro-hegemony established, usually in favour of the supreme influential actor.⁶

⁶ Mark Zeitouna and Jeroen Warnerb, "Hydro-hegemony - a framework for analysis of trans-boundary water conflicts", *Water Policy* 8 (2006).

Indian hegemonic designs in South Asian region have severe implications for Pakistan which requires serious consideration by the policy makers and government of Pakistan. Pakistan needs to project its case in a forceful manner to counter the Indian hegemonic aspirations particularly hydro hegemony. Pakistan is lower riparian state in Indus River Basin and is water strained simultaneously. With rapidly declining per capita fresh water resources, Pakistan who has been water surplus state has become water strained state raising serious concerns about the future of state which is politically weak, heavily populated nuclear state with water distress if the only lifeline of the state Indus water is cut down or deplete at the current pace. The river flow is highly affected by mismanaged irrigation by Pakistan, glacier melt as a result of climate change and also due to the diversions of rivers by India who is upper riparian in Indus River Basin. It is widely perceived in Pakistan that Indian control on the western rivers by violating IWT can misuse Pakistani waters leading to devastating economy. The perception is due to Indian hegemonic designs to control the regional waters. Such scenario may worsen already stressed situation between two traditional nuclear rival states India and Pakistan.⁷

Literature Review

United Nations Development Program report (UNDP) “The Vulnerability of Pakistan’s Water Sector to the Impacts of Climate Change: Identification of gaps and recommendations for action” states that global warming has started affecting Pakistan with a deep concern of climate change on already scarce water resources of Pakistan particularly in IRB. Rise in temperature due to climate change increased water evaporation, rise in the sea level increased salt in the coastal areas of the state and melting glaciers are causing floods due to the increased flow in the rivers along with heavy rainfalls and change in the weather and monsoon patterns. This has serious impact on the agriculture, health and water supply and energy. Despite of the awareness programs

⁷ Paula Hanasz, “Power Flows: Hydro-hegemony and Water Conflicts in South Asia” Security Challenges, Vol. 10, No. 3 2014.

about climate change, the results are quite uncertain. Pakistan's National Climate Change Policy (NCCP) acknowledges that Pakistan lacks a comprehensive evaluation of the possible effects of climate change on the scarce water resources of the state and its possible solution.⁸

Zahoor Khan wrote in "Climate Change: Redefining Pakistan's Security" that Pakistan lacks a strong will of government machinery to address environmental degradation. An irresponsible approach in using the natural resources of the state has made the ecological system more vulnerable. Pakistan is prone to climate deviation in Monsoon patterns, bringing in adverse effects like mass flooding, drought and rise in the sea level. Besides, global warming may also cause water shortage in Pakistan and mass flooding as the country has witnessed during 2010 most likely as a result of climate change, less agricultural production seriously affecting the livestock and biodiversity of the state, causing health problems and huge population shift. It will further enhance the glacier melt to 1/5 of the current glaciers by 2030 and may convert regional rivers into merely seasonal rivers.⁹

Shafqat Kakakhel in his article "The Indus River Basin and Climate Change" stated that the rapid increase in the population of Indus River Basin has severely affected the water resources of the region mainly due to mismanagement, unregulated urbanization, hindering construction of dams, misuse of water at industrial as well as domestic level and climate change and lack of awareness about it.¹⁰

⁸"The Vulnerability of Pakistan's Water Sector to the Impacts of Climate Change: Identification of gaps and recommendations for action"
<http://www.pk.undp.org/content/dam/pakistan/docs/Environment%20&%20Climate%20Change/Report.pdf> accessed 10-05-2023

⁹ Zahoor Khan, "Climate Change: Redefining Pakistan's Security", J-SAPS Volume 02, Number 02.
https://www.academia.edu/11781996/Climate_Change_Redefining_Pakistans_Security?auto=download accessed 17-03-2023

¹⁰Shafqat Kakakhel, "The Indus River Basin and Climate Change", Vol. 10 No. 3, 2015.
<http://www.criterion-quarterly.com/the-indus-river-basin-and-climate-change/> accessed 10-03-2023

David Michel and Russell Sticklor write in their study “Connecting the Drops: an Indus Basin Roadmap for Cross-Border Water Research and Policy Coordination” that the annual water withdrawal in Pakistan has increased to 153.4 km³ to 183.5 km³ in the years 1975 to 2008 respectively whereas, per capita renewable water resources have decreased significantly from 3,385 m³ to 1,396 m³ in the year 1977 to 2011 respectively. On the other hand, annual water withdrawal in India has doubled during the same period mounting from 380 km³ to 761 km³ in the years 1975 to 2010 respectively whereas, per capita renewable water resources have increased significantly from 2,930 m³ to 1,539 m³ in the years 1977 to 2011. Keeping in view these numbers, the natural threshold is 1700m³ annually to meet the needs of each person for households, industry, environment and energy according to hydrologists which is considered as water stressed and if it falls to 1000m³ then it is water scarcity. As calculated by UNEP, 1,329 m³ per capita are available for Indus River Basin as a whole.¹¹

Aneel Salman states in “Navigating the Climate Change Landscape in Pakistan and India” that there is a diversion in the precipitation patterns of plain and coastal areas of Pakistan where it decreased significantly since 1960 but on the contrary it increased in the northern areas of Pakistan over the same period.¹²

Indus River Basin will bear severe effects of the climate change. The basin which is vital for Pakistan and is marked as the life line of its agricultural economy counting environmental security, food and energy. This will further affect economic development of the state, forestation and crop cultivation due to its poor management.

Imran Aziz Tunio in his article “Climate change and the Indus” said that glaciers hold vital position in the Indus basin as they constitute 70-80 percent of the river flow but these

¹¹ David Michel, Russell Sticklor, “Connecting The Drops An Indus Basin Roadmap for Cross-Border Water Research and Policy Coordination”, Stimson, SDPI, 2013

¹²Aneel Salman, “Navigating the Climate Change Landscape in Pakistan and India”, Heinrich Böll Stiftung Pakistan, 2015. https://pk.boell.org/sites/default/files/aneel_e-version.pdf accessed on 17-05-2023.

are also vulnerable due to the shift in climate patterns. Rapid melt of glaciers will cause serious impact on the water resources on the one hand and causing mass flooding leading to water scarcity on the other.¹³

Dr. Shaheen Akhter in her article “Quest for Re-Interpreting the Indus Waters Treaty: Pakistan’s Dilemma” states that melt of glacier due to climate change would have a serious impact on Indus River basin as 90 percent of its waters are dependent on this flow. Pakistan is facing problem that how it can reinterpret Indus water treaty which might not undermine its own water rights and also ensure the security of its waters in future.¹⁴ Further, she states that The IWT does not address the upcoming challenge of climate change, ecological problems and management of water resources and water quality.

Natalie A. Nax in the thesis “Looking to the Future: The Indus Waters Treaty and Climate Change” describes that the events like precipitation pattern and run off the river are severely affected by the climate change making the relevant regions more vulnerable. The variation in the winter precipitation in the form of snow determines the water flow in the rivers. Therefore, the mitigation about climate change is the dire need of hour because it possesses the ability to change water flow and water quality causing water scarcity. It can further affect environment of the world on the one hand and social and economic system of the states on the other. Such affects may aggravate the conflicts in states having historic political and social disputes.

Though IWT is a classic example of arbitration between two states but it has certain flaws as well. The rapidly changing weather patterns have the potential to challenge the affectivity of the IWT as there was no such issue like climate change when the treaty was concluded hence demanding an up gradation in its content to address the climatic issues.

¹³Imran Aziz Tunio, “Climate change and the Indus”, The Nation, 27 December, 2016.

¹⁴Shaheen Akhter, “Quest for Re-Interpreting the Indus Waters Treaty: Pakistan's Dilemma”, Margalla Papers, 2011.

According to her, the treaty has lost its credibility being unable to meet the changing climate challenges along with the changing conditions of the rivers.¹⁵

Impact of Climate Change on the Availability of Water Resources in the IRB

93 percent of the extracted water is being used by 95 percent of irrigation in Pakistan's Indus plains presently. Glacial melt is the fundamental element in the river flow to irrigate the catchment area. But water resources of the state are under direct influence of the climate change posing a serious challenge to Pakistan's water security. It is further making complex the water management of the state in IRB.¹⁶

Climate change is leaving adverse impacts on Pakistan in the form of variation in the annual rainfall patterns which has severely affected Pakistan in 1961, 1976 and 1994 by heavy rainfall and it was devastating in 2010 causing mass flooding in the country and also most recently in 2022. Besides flooding, water scarcity is converting the land into barren and also causing droughts in the state.

Moreover, it has altered the summer and winter behaviour changing the monsoon patterns and also disturbing the winter precipitation. Heat waves have much increased in the state which are the by-product of climate change becoming more intense and frequent affecting not only to humans but also to plants and other biodiversity of the state leaving irreversible damages.

Besides, climate change is raising sea surface temperature along with a rise in the sea level due to heavy rainfalls and glacier melt. Himalaya-Karakorum-Hindukush together

¹⁵Natalie A. Nax, "Looking to the Future: The Indus Waters Treaty and Climate Change", 2016. <https://transboundarywaters.science.oregonstate.edu/sites/transboundarywaters.science.oregonstate.edu/files/Publications/Nax%20-%202016%20-%20Indus%20Treaty%20and%20Climate%20Change%20-%20Thesis.pdf> accessed on 17-05-2023

¹⁶ Dr. Amjad Nabi, "Climate Change Impact Assessment of Water Resources of Indus Water System", http://ww3.comsats.edu.pk/faculty/CampusFiles/Islamabad/08_11_2016_16_36_39_4244521.pdf accessed on 23-05-2023

constitutes the largest mountain chain on the earth and are holds third largest ice reserves after the Polar Regions. The rapid increase in temperature is causing retreat of glacial extent by thinning the ice at alarming pace. Sea water intrusion is another problem emerging with climate change claiming more land area. Increased storms in the sea intensified the tides causing coastal erosion.

Food security is another challenge being posed by climate change with more demand of water for crop cultivation and constantly decreasing water supply may leave the state into severe famines and health related issues.¹⁷

Indus Water Treaty and its Challenges

Indus Water Treaty concluded in 1960 after a decade long discussion dividing the water resources of the basin gave three eastern rivers (Ravi, Satluj & Beas) to India and three western rivers (Chenab, Jehlum & Indus) to Pakistan. The treaty has generated a heat debate on its credibility and efficacy in the contemporary era where the world is facing the challenge of climate change due to global warming and because of the aggressive behaviour of upper riparian India towards lower riparian Pakistan. Indus water treaty which has been largely a conflicting interest between India and Pakistan has been rejected by India many times violating it to interfere in the water flow to Pakistan, less examples of rejection may also be found in Pakistan.

The prevailing water shortage has heightened the tension between India and Pakistan. India lacks adequate water storage capacity and keeps an eye on the western rivers allotted to Pakistan under IWT and always try to control these rivers by utilizing the weak areas of the treaty and excusing Pakistan for mismanaging the water resources. Being upper riparian, India holds the capability to control Pakistan's rivers and uses it as a political tool to control it. It has technical supremacy as well in the form of river head works at Ferozpur and Madhupur to cause floods or droughts in Pakistan by releasing

¹⁷ Dr. Ghulam Rasul, "Climate Change in Pakistan", Pakistan Metrological department, Islamabad, 2012.

extra water or stopping it leaving Pakistan in acute problem of water scarcity which is deadlock for the agriculture of Pakistan. The situation is further worsened by the impact of climate change in the region contributing in the hostility of two neighbouring nuclear states.

The treaty leaves room for cooperation in article XII as it can be modified according to the need of hour and none of the state can unilaterally pull out of the treaty. Thus, there is no need to re-negotiate the treaty as a whole because it already provides space to discuss the forth coming problems like climate change.

Moreover, IWT also provides dispute resolution mechanism in article IX in the form of permanent Indus Water Commission of both states, governments of India and Pakistan and neutral experts and Court of Arbitration.¹⁸

The cross-border water conflict may easily be solved under already signed IWT according to the prevailing global scenario of climate change. It needs a serious consideration and cooperation to tackle the issue which lacks boundaries.

Policy Options

Inadequate expertise is available in Pakistan to meet the challenge of climate change. Pakistan needs to prepare itself for the biggest challenge of the century by developing institutional set up in the state. Lack of awareness and poorly trained human resource and meagre investment in the field of climate change is another challenge to the state. Pakistan lacks trained scientists and technological experts to participate deal with international negotiations.¹⁹ Furthermore, there is absence of reliable organizations and

¹⁸ Dr. Shaheen Akhtar, "Emerging Challenges To Indus Waters Treaty Issues Of Compliance & Transboundary Impacts Of Indian Hydroprojects On The Western Rivers" <http://www.irs.org.pk/f310.pdf> accessed 24-05-2023.

¹⁹ "National Climate Change Policy", Government Of Pakistan Ministry Of Climate Change Islamabad, Pakistan September 2012. http://www.gcisc.org.pk/National_Climate_Change_Policy_2012.pdf accessed 14-05-2023.

institutions to manage adaptation, mitigation and policy issues. The government should focus on capacity building and strengthening the institutions on priority basis. Nevertheless, to address the paucities in climate change, human resources and institutional set up Govt. of Pakistan should take the following steps:

A climate change cell and commissions should communicate and coordinate with other states to address the challenges. There should be a proper mechanism to monitor change in the climate and to meet the challenge. Government functionaries needs to be pro-active in taking key decisions to project Pakistan's stance on policy issues relating to climate change and role of upper riparian state in further worsening the issue for Pakistan.

Moreover, Pakistan needs to enhance capacity building by developing professionals and encouraging youth to develop expertise in the field of climate change at higher education level. Already existed institutions should be strengthened. General awareness programs should be launched regarding climate change and its impact on the public by involving different stakeholders in climate change related issues.

Policy studies must involve the users of the information and establishment that is supposed to implement the decisions. The issue of climate change needs to be addressed on priority basis as in case of delay it will be more costly for the population as well as development.²⁰ This can only be done by developing a technical analysis based on socio-economic research. Furthermore, a comprehensive mechanism is required to solve the conflicts between states on water management resources.

Pakistan should develop a strategy based on the institutional parameters to build a comprehensive narrative to propagate its agenda in the global world. Besides, its short-term agenda should be focused on the correct representation of Indus River Basin Profile, careful assessment of climate change and its impact on Pakistan coupled with findings

²⁰ Pervaiz Amir and Zaigham Habib, "ACT Report: Estimating the impacts of climate change on sectoral water demand in Pakistan", Action on Climate Today, 2015 https://cyphynets.lums.edu.pk/images/Readings_concluding.pdf accessed on 23-05-2023

and anti-coercive tactics to contain India's hydro hegemonic designs not only for Pakistan but also for region.

Besides, Pakistan needs to manage its population, its water resources, water management and storages along with a proper mechanism to control floods. Government of Pakistan can play a vital role by using simple formula of reduce, recycle and reuse, ground water management and by establishing dams.

Conclusion

India, the upper riparian state, holds aggressive behaviour towards lower riparian Pakistan. Not only towards Pakistan but also towards regional states where it possesses cross boundary water sharing, India acts more coercively. It is playing the role of negative hegemon in the region taking the advantage of its growing size in terms of economy and security in the region.

Hydro hegemony has four controlling tools i.e., strategy as a consolidated tool, capturing the resources and integration along with containment. It is not necessary for a hydro hegemon to exercise physical power but these strategies can also be used to achieve the required objectives. India in south Asia in general and with Pakistan in particular is exercising hydro hegemony to make Pakistan water starved.

Such practices can leave severe implications for Pakistan like water shortage, water scarcity in terms of less river flow, water pollution in ground with increasing floods due to monsoon etc. Besides, India has the policy of secrecy in which it avoids to be transparent in sharing data regarding water usage and storage which further complicates the already tensed situation. On the other hand, India is projecting Pakistan as a poor manager of water resources internationally further weakening Pakistan's position in the global arena.

