Water Storage Challenge of Pakistan: Reviving Kalabagh Dam Project

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POLICY BRIEF

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Executive Summary

The Supreme Court of Pakistan urged the nation to forge unanimity on the construction of Kalabagh dam in its 24-page ruling dated July 04, 2018.[1] Federal Minister for Water Resources Faisal Vawda also hinted at reviving the Kalabagh dam project (KBD) on July 31, 2019.[2] KBD is among the proposed dams in Pakistan since 1987 and approved by the Council of Common Interest (CCI) in its decision on September16, 1991 and May 9, 1998. Many consultants worked on the feasibility studies of KBD and have provided merits and demerits of the dam. One main objection by KPK province is that KBD will flood Nowshehra. Another objection by Sindh province is that KBD will convert Sindh into desert because of the blockage of water. In this context, the paper argues that Pakistan should revive Kalabagh dam together with constructing other potential dams in order to take first step towards making Pakistan a water secure country. The paper addresses above-mentioned concerns and recommends:

- Pakistan should start building consensus on the construction of Kalabagh dam while the construction on uphill dams (Bhasha and Munda) is going on.

Issue to be Analyzed

Impending water crisis in Pakistan is not solely because of climate change, extensive usage of water in agricultural sector and Indian dam building spree. Population growth and insufficient water storage capacity are the main culprits in reducing per capita water availability in Pakistan. There is a need to analyze the requirement of water storage reservoirs especially the Kalabagh dam.

Overview of the Pakistan's Water Problem

Low Storage Capacity

Soon after independence, water conflict between India and Pakistan started in 1948[3] as all major Pakistani rivers pass through India. For amicable water sharing, Pakistan, India and World Bank agreed on Indus Waters Treaty (IWT) in 1960.[4] With Western rivers in its share, Pakistan gets an average of 137 to 145 MAF water annually: Indus (including river Kabul) provides 89.58 MAF, Jhelum 22.69 MAF, Chenab 25.45 MAF.[5] Pakistan uses 95 MAF water for irrigation and presently stores 13.86 MAF in Tarbela, Mangla and Chashma.[6] It has increased the storage of Mangla by 39 per cent but storage capacities of Tarbela and Chashma have decreased by 36 per cent and 61 per cent respectively.[7] Pakistan has 50 MAF

[1] Barrister Zafar Ullah Khan v. Federation of Pakistan, "Const.P.57/2016," Supreme Court of Pakistan, July 04, 2018, https://www.supremecourt.gov.pk/downloads_judgements/Const.P._57_2016.pdf, (accessed on February 26, 2021).
[2] Khaleeq Kiani, "Minister hints at reviving Kalabagh dam project," *Dawn*, August 1, 2019.
[3] Pankaj Kumar Sharma, "Conflict over Water between India and Pakistan: Fear and Hopes?" *The Indian Journal of Political Science* 73, no. 1 (Jan-Mar, 2012): 133-140.
[4] "Fact Sheet: The Indus Waters Treaty 1960 and the Role of the World Bank," World Bank, June 11, 2018, https://www.worldbank.org/en/region/sar/brief/fact-sheet-the-indus-waters-treaty-1960-and-the-world-bank, (accessed on February 25, 2021).
[5] Ali Raza Kalair et al., "Water, energy and food nexus of Indus Water Treaty: Water governance," *Water-Energy Nexus* 2, no. 1 (June 2019): 10-24.
[6] Ibid.
[7] Ali Raza Kalair et al., "Water, energy and food nexus of Indus Water Treaty: Water governance."

groundwater out of which 40 per cent is not useful for irrigation.[8] Hence, Pakistan is highly dependent on natural river flows that are now either dammed or diverted by India.

Pakistan's net water storage capacity has reduced from 16.26 MAF to 13.68 MAF which equals to 30 days carry-over capacity. Pakistan only stores 10 per cent of its river flows against the global average of 40 per cent. Moreover, per capita water availability in Pakistan had come down from 5,650 cubic meter (in 1951) to an alarming level of 908 cubic meter per annum.[9] Pakistan has lost about one-fourth storage of dams. India, on the contrary, has carryover capacity of 120 days, 750 MAF water potential and 278 MAF storage capacity. Pakistan has 145 MAF water potential and 12.68 MAF storage capacity. Pakistan's water storage capacity, as of now, is 7 per cent which should be at least 20 per cent.[10]

Diminishing Ground Water

Groundwater level is fast depleting because of its excessive extraction and reckless usage. For instance, underground water level has fallen down more than 90 per cent in major cities of Punjab.[11] Moreover, Islamabad, Karachi and Quetta are also facing water crisis. In Lahore and Islamabad, water level has dropped to 130 feet and 250 feet, respectively.[12] In Balochistan, water level has fallen down from 30-40 feet in 1951 to 1000-1200 feet in 2018.[13] Mastung district's 350 karaizes have gone dry. Similarly, freshwater sources are diminishing in Vehari, Multan and Lahore districts as well. One of the main factors of decreasing subsurface water level is excessive pumping through tube wells for agriculture and other purposes. In this context, proponents of dams argue that dams' water supply in canals will eventually reduce farmers' reliance on subsurface water.

Water Scarcity Myth

Per capita surface water availability in Pakistan is likely to drop to about 860 cubic meters by 2025.[14] However, decreasing per capita water availability is not because of physical scarcity of water in the country but increasing population growth and decreasing storage capacity. In fact, Indus Basin has enough water to sustain the lives of 210 million people. The problem is Pakistan's irresponsible use of water because of inefficient pricing mechanism and allocation of 95 per cent of water sources to its agriculture sector. Pakistan produces two most water-intensive crops: cotton and sugarcane that use 22,500 liters and 1,500-3,000 liters of water for 1 kilogram of each crop respectively.[15] That is why, it is often suggested that Pakistan should at least has a vision of moving away from water-intensive agricultural crops.

Pakistan's Water Management Challenges

Climate change will aggravate Pakistan's water crisis because of decline in Indus River's water flow. Around 50 to 80 per cent of Indus River average flow comes from snow and ice-melt.[16] The decline in water flow will be due to the melting of the glaciers of the Hindu

[8] Hafeez Akhtar Randhawa, "Water development for irrigated agriculture in Pakistan: past trends, returns and future requirements," Food and Agriculture Organization, Pakistan, http://www.fao.org/3/ac623e/ac623e0i.htm, (accessed on February 28, 2021).
[9] "PAF Air War College Delegation Briefed Water, Hydropower Sectors," Pakistan Water & Power Development Authority, February 15, 2021, http://www.wapda.gov.pk/index.php/newsmedia/news-views/562-paf-air-war-college-delegation-briefed-water-hydropower-sectors, (accessed on February 27, 2021).
[10] Hafeez Akhtar Randhawa, "Water development for irrigated agriculture in Pakistan: past trends, returns and future requirements."
[11] Ali Raza Kalair et al., "Water, energy and food nexus of Indus Water Treaty: Water governance," p. 20.
[12] Ali Raza Kalair et al., "Water, energy and food nexus of Indus Water Treaty: Water governance."
[13] Ibid.
[14] Dianxi Zhang et al., "Water Scarcity and Sustainability in an Emerging Economy: A Management Perspective for Future," *Sustainability* 13 (2021): 144.
[15] "5 Most Water Intensive Crops," CLARO, https://claroenergy.in/5-most-water-intensive-crops/, (accessed on March 5, 2021).
[16] Winston Yu et al., *The Indus Basin of Pakistan: The Impacts of Climate Risks on Water and Agriculture* (Washington, D.C: The World Bank, 2013), 5.

Kush-Karakorum-Himalaya mountains and changes in hydrological patterns in the Indus River basin. According to Muhammad Khalid Rana, spokesperson for the Indus Rivers System Authority (IRSA), "water levels in Tarbela and Mangla dams have also continued to decline due to no snow melting and almost no rainfall in the catchment areas in the ongoing and previous months" [of 2021].[17] However, the river flow is going to remain stable at least until 2050.[18] The main impact of climate change on Pakistan's water resources is going to be an increase in water demand especially in country's agriculture and energy sector due to rising temperature, as shown in the Annex-A. Therefore, there is need to manage water demand and supply in Pakistan. In this regard, one way to manage Pakistan's increasing water demand is the construction of new dams.

Case of Kalabagh Dam

Dams are essential for water storage and management. In Pakistan, Mangla and Tarbela were not the only potential big dam sites for water storage. Kalabagh had also been considered as a strategic location where Indus River becomes a natural dam. After shutdown of rivers by India in 1948, Kalabagh was conceived as a potential natural dam for Indus River in 1953. Keeping in view ecology of Kotri in Sindh and Nowshera Valley flooding in Khyber Pakhtunkhwa (KPK), Dr Ding Lianzhen of China reviewed the Kalabagh Dam (KBD) project in 1987. Later on, Dr John F Kennedy, Dr Rodney White and Dr. Khalid Mehmood from United States of America did the final review.[19] The World Bank also approved the feasibility report of KBD.[20] Overall, the project was carried out by WAPDA, Government of Pakistan and World Bank. Only KBD can distribute and irrigate areas which were previously fed by eastern rivers. KBD costs only US$ 6.12 billion compared to US$ 15.66 billion Basha dam projects.[21]

Objections on KBD

KPK objects to the construction of KBD on multiple ground including: (1) Nowshehra will get flooded; (2) Mardan, Swabi and Pibi SCARP will be water logged; and (3) a large amount of KPK population will be displaced. The main objections of Sindh on KBD include: Sindh's desertification because of non-availability of water and fear of Punjab taking away Sindh's water share.

Addressing KPK and Sindh Concerns

There is a need to allay fears of flooding and sea intrusion that have built resistance in KPK and Sindh against the dam.

Nowshera Flooding Problem

According to a study titled 'Feasibility Study of Kalabagh Dam Pakistan', there is no connection between the flooding risk to Nowshera and construction of KBD. In Nowshehra:[22]

[17] Khalid Hasnain, "Serious water shortage imminent as dry season continues," *Dawn*, March 5, 2021.
[18] Jo-Ellen Parry et al., "Making Every Drop Count: Pakistan's growing water scarcity challenge," International Institute for Sustainable Development, September 29, 2016, https://www.iisd.org/articles/making-every-drop-count-pakistans-growing-water-scarcity-challenge, (accessed on February 22, 2021).
[19] Ali Raza Kalair et al., "Water, energy and food nexus of Indus Water Treaty: Water governance."
[20] Engineer Shams ul Mulk, Ex Chief Minister of the NWFP and Former Chairman WAPDA, In Personal Discussion with the Author.
[21] Muhammad Israr Khan et al., "Feasibility Study of Kalabagh Dam Project," *Life Science Journal* 11 (2014): 460.
[22] Ibid.

> 935 ft. is the elevation of lowest point while KBD reservoir peak water level is designed to be kept at 915 feet above mean sea level. It means clearly that the water level in the reservoir will be 20 ft. lower than the lowest point in Nowshehra region… In KBD reservoir, the sedimentation will be controlled for 50 days by the sediment sluicing every year at the minimum operation level. It will guarantee that in Nowshehra region, there will be no flooding.

Moreover, KBD peak reservoir level is also lower than lowest elevation points at Mardan, Pabbi and Charsadda. It is also important to mention here that KBD will store water at its highest level only for 3 to 4 weeks during the month of September and October that will be released for Rabi crops. After release of water, the KBD level will remain 825 ft till June.

Sea Intrusion and Water Availability Problem of Sindh

During the flood seasons from July and October, KBD will store the excess water and will discharge it down during October to July. It means that during the deficiency of water, Sindh (Kotri) will get more water. In summer months, additional quantity of water will be available for Sindh which will ensure cultivation of hundreds of acres of barren land as well as provision of water for the crops. Hence, the main beneficiary of water from KBD will be Sindh. KBD will help out in converting the unproductive land of Sindh into cultivable green land.

Pakistan has also started constructing Bhasha and Munda dams to lessen the risks of flash floods before constructing KBD. These dams will also decelerate the flow of waters from Hindu Kush, Karakoram and Himalayan Mountains, mitigating KPK's fears of flash flood. Pakistan lets 35 MAF rain water fall into sea every year.[23] If monsoon waters are stored and diverted to Thar, it can easily be cultivated. In this regard, the concerns of KPK (flash flood fears) and Sindh (barren lands and sea intrusions) will be addressed, once the uphill dams like Munda and Bhasha are successfully built. Another concern regarding Punjab taking away Sindh's water through KBD can be addressed by giving control of the project to all four provinces.

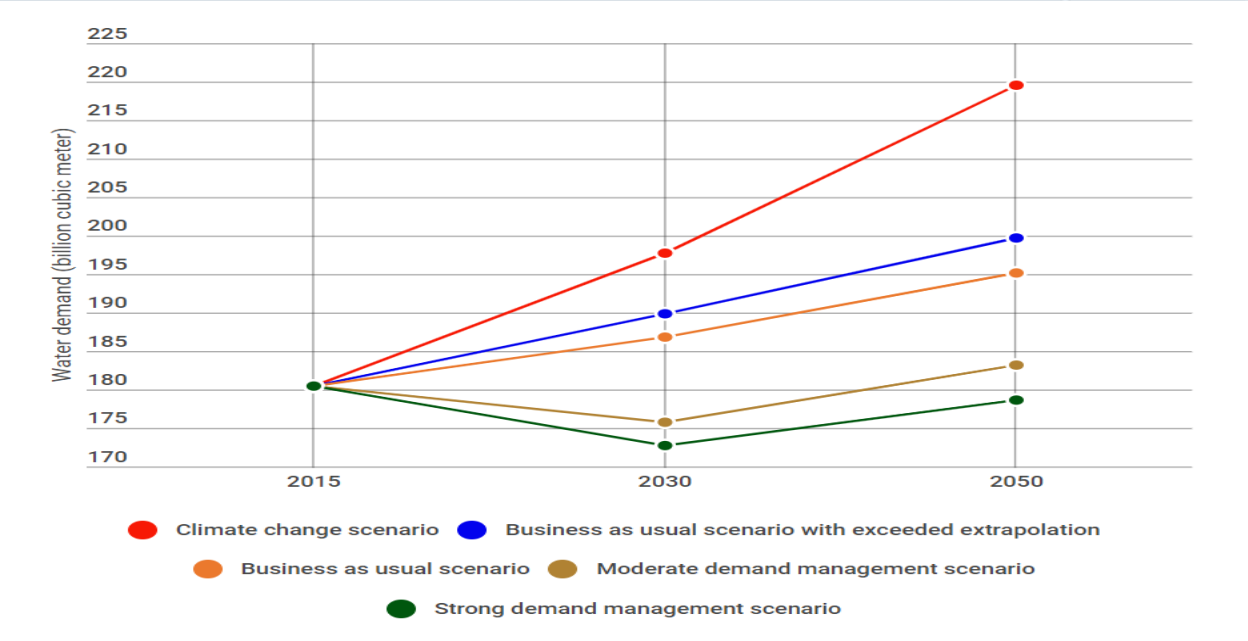
Recommendations

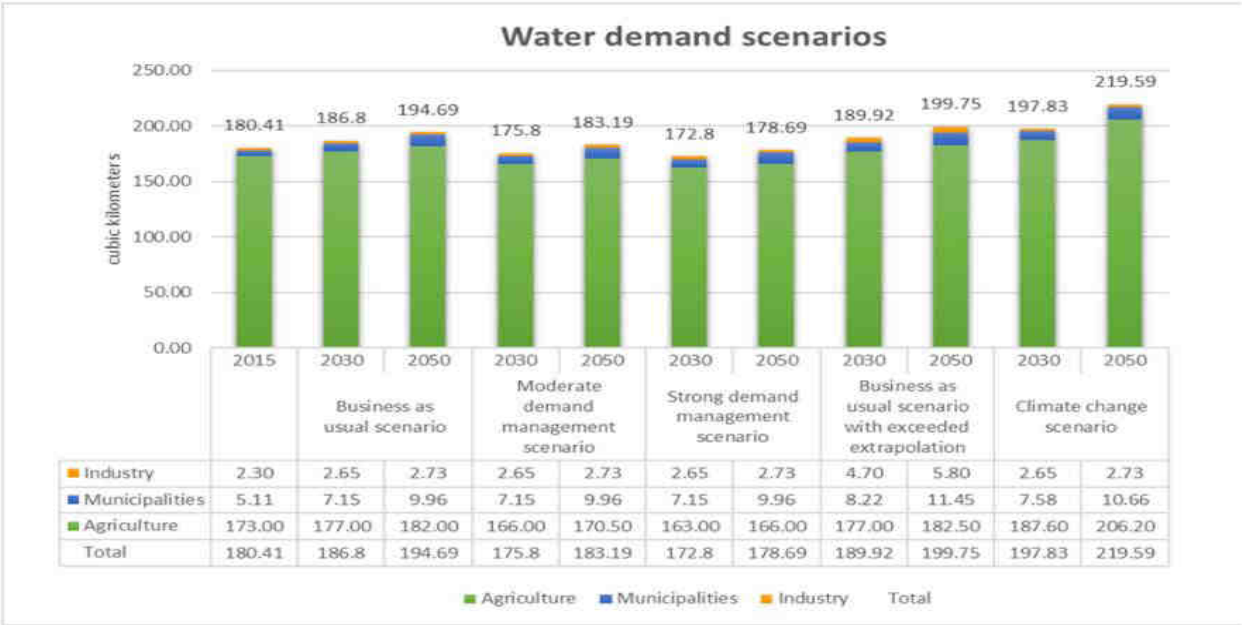
- Pakistan needs to start building consensus on the construction of the KBD. To build consensus and address KPK and Sindh's concerns, a parliamentary committee comprising representatives from all four provinces and technical experts may be constituted. Given the controversies surrounding the project, an implementable agreement may also be signed among the provinces for agreed water distribution from Kalabagh Dam. If consensus is built successfully, a Kalabagh Dam Management Authority (KBDMA) may be established to manage the project.
- Pakistan should start working on KBD, even if consensus among provinces on the project is not built.[24] Not only should Pakistan resist opposition on the KBD but also carry out a full study of Indus River System to determine Pakistan's water storage potential and point out feasible dam sites for future.

[23] Ali Raza Kalair et al., "Water, energy and food nexus of Indus Water Treaty: Water governance," p. 18.
[24] Engineer Shams ul Mulk, Ex Chief Minister of the NWFP and Former Chairman WAPDA, In Personal Discussion with the Author.

Annex-A

Water Demand Scenario of Pakistan[25]





	2015	2030 Business as usual scenario	2050 Business as usual scenario	2030 Moderate demand management scenario	2050 Moderate demand management scenario	2030 Strong demand management scenario	2050 Strong demand management scenario	2030 Business as usual scenario with exceeded extrapolation	2050 Business as usual scenario with exceeded extrapolation	2030 Climate change scenario	2050 Climate change scenario
Industry	2.30	2.65	2.73	2.65	2.73	2.65	2.73	4.70	5.80	2.65	2.73
Municipalities	5.11	7.15	9.96	7.15	9.96	7.15	9.96	8.22	11.45	7.58	10.66
Agriculture	173.00	177.00	182.00	166.00	170.50	163.00	166.00	177.00	182.50	187.60	206.20
Total	180.41	186.8	194.69	175.8	183.19	172.8	178.69	189.92	199.75	197.83	219.59

Agriculture Municipalities Industry Total

[25] Jo-Ellen Parry et al., "Making Every Drop Count: Pakistan's growing water scarcity challenge."