

Introduction:

Pakistan, predominantly an arid and semi-arid country, is heavily dependent on the Indus River system, which originates from the glaciers of the Himalaya, Karakoram, and Hindu Kush ranges. This system, stretching 2,880 km and recognized as the world's largest contiguous irrigation network, sustains over 90% of Pakistan's agriculture.

According to WAPDA, Pakistan receives an average of 191 Billion Cubic Metres (BCM) of surface water annually, of which 129 BCM is used for irrigation while 59 BCM is extracted for ground water. Despite this

Date _____

natural endowment, Pakistan has moved from water abundance to acute scarcity: per capita availability has fallen from $5,260 \text{ m}^3$ in 1951 to 877 m^3 in 2020 (World Bank, 2020). This pushing the country below the threshold of water stress. By 2025, availability is projected to decline further to 800 m^3 per person.

This decline is not merely a matter of demography. Internally, poor water governance, inefficient irrigation, population growth, and climate change are exacerbating the crises. Externally, Pakistan faces mounting challenges due to India's upstream dam construction on western rivers under the Indus Water Treaty, also suspension of IWT, raising fears of water manipulation and hydro-hegemony. Furthermore, the absence of a water-sharing arrangement with Afghanistan over the Kabul River poses a looming threat.

Internal dimensions of Water Crises:

(a) Unsustainable Cropping Patterns

Agriculture, the backbone of Pakistan's economy, employs 39% of the labour force and sustain 62% of population. However, the sector is highly water-intensive, consuming nearly 75%.

Date _____

of national water resources. Pakistan prioritizes water-intensive ones: Wheat (23% of water use), rice (21%), sugarcane (19%), and cotton (14%). Sugarcane alone expanded from 0.2 million ha in 1960 to 1.1 million ha by 2020-21.

This shift has displaced drought-resilient crops (barley, bajra, jowar), strained provincial allocations, and intensified scarcity.

Thus, unsustainable cropping patterns — driven by export orientation and policy neglect, have become a major internal driver of Pakistan's water crises.

(b) Rainfall Patterns in Pakistan

Pakistan's rainfall patterns reveal significant internal challenges contributing to its water crises. Historically, annual rainfall declined during the early 20th century. However, this national average conceals stark regional disparities:

Punjab: Receives an average of 360mm annually (1901-2021), which is ~~high~~ 25% higher than national average record of 288mm.

Sindh: Records only 168mm annually, which is 42% lower than national average, with a declining long-term trend.

(c) Ground-Water Extraction

Groundwater has emerged as Pakistan's dependable buffer against surface water shortages, particularly in agriculture. Pakistan is the 4th-largest groundwater user globally.

- **scale of extraction:** About 52 BCM of groundwater is extracted annually through 1.35 million private tube wells, with 1.02 million located in Punjab. These wells irrigate nearly 61% of cultivated land.

- **Conflict driver:** over-exploitation deepens Punjab-Sindh disputes over Indus River water allocation, linking groundwater stress directly to inter-provincial tensions.

(d) Limited Storage Capacity

Pakistan's water storage capacity is critically insufficient, making it vulnerable to seasonal and climate shocks.

- **current capacity:** only 15 MAF (~18.5 BCM), equal to 13% of annual river flows, compared to the global average of 35-40%.

- **major dams:**

- Tarbela — 11.9 BCM
- Mangla — 10.5 BCM
- Chasma — 0.87 BCM.

- **Comparative vulnerability:** Pakistan's storage covers < 30 days of needs, far below the recommended 1,000 days of semi-arid countries.

Weak storage infrastructure thus compounds Pakistan's hydrological insecurity, amplifying risks of droughts, food shortages, and inter-provincial disputes.

(e) Political Economy of Water

The distribution of water in Pakistan is heavily shaped by politics, power, and inequality, deepening inter-provincial and intra-farmer disputes.

- **Out-dating irrigation system:** Pakistan's canal network (colonial-era) operates at only 35% - 40% efficiency, with 40-50% water lost to seepage, breaches, and spillage.

- **Salinity threat:** In Sindh, 70-80% of soils are moderately to severely salinized due to poor irrigation and water logging.

- **Farmer inequality:** Large-scale, politically powerful farmers often divert ^{water} directly from canals, leaving smallholders deprived. Nearly 59% of irrigation water is misappropriated before reaching intended fields.

Hence, the political economy of water transfers scarcity from a technical issue into a governance and equity challenge, intensifying the crises internally.

External dimensions of Pakistan's Water Crises:

(a) Climate change and Glacial Retreat:

- Dependence on Indus Basin: >80% of Pakistan's water comes from Himalayan glaciers.
- Glacial Retreat: Himalayan glaciers receding at 30-50 m/year - Flow may decline by 30-40% by late 21st century.
- Short term vs. long term trend:
 - Short term: 40% surge in flows due to glacial melt.
 - Long-term: 60% reduction in Indus flows.
- Temperature Rise: Since 1950, a clear upward trend; sharp rise post-1991, increasing evapotranspiration and crop water demand.

(b) Pakistan - Afghanistan water issue:

- Shared rivers: 9 rivers, especially the Kabul river Basin (KRB)
- Kabul River dependence: Provides 85% irrigation in Charsadda, 80% in Peshawar, 47.5% in Nowshera; also key drinking water source -

However, Afghanistan has been developing dams on the Kabul River with significant Indian financial and technical backing. The Shahoot dam is a key example, which could reduce water flows into Pakistan by 16-17%, threatening both agriculture and domestic supply. Despite the severity of these risks, Pakistan and Afghanistan lack a formal water-sharing treaty. Six failed attempts since 2003 (Kabul River Treaty proposal, WB mediation, KRB Commission).

(c) Pakistan - India Water Security Concerns:

Pakistan's water security concerns with India are rooted in the Indus Water Treaty (1960), which gave India control of three eastern rivers (Ravi, Beas, Sutlej) and Pakistan control of the western (Indus, Jhelum, Chenab).

In April 2025, due to terrorist attack in Kashmir which India attributed to Pakistani involvement, New Delhi suspended the IWT. As part of this suspension, India ceased sharing vital hydrological data, on river flows, snowmelt, reservoir release with Pakistan, thereby disrupting Pakistan's capacity to manage its water for agriculture and hydropower. The Indus ~~Water~~ River System

Date: _____

Authority (IRSA) warned that this could result in a 21% water shortfall during the early Kharif season, directly impacting crops like rice and cotton. While India has limited infrastructure to drastically reduce flows immediately, it has already fast-tracked hydropower and reservoir expansion projects in Jammu & Kashmir, moves that leverage the IWT suspension to potentially increase control over shared waters.

Policy Responses (way forward) :-

To address the looming water crises, Pakistan must adopt a two-pronged strategy. Domestically, it should accelerate dam projects like Diamer-Basha and Mohmand, modernize irrigation through drip systems and crop-rotation. Externally, Pakistan should strengthen the IWT by using World Bank mediation. At the regional level, cooperation through SAARC and SCO on climate and water management is vital. Above all, water must be treated as a national security priority to ensure long-term sustainability.