PAKISTAN INSTITUTE FOR PARLIAMENTARY SERVICES

DEDICATED TO PARLIAMENTARY EXCELLENCE

PIPS INFORGRAPHICS: 03 **September, 2024**

WATER SCARCITY AND WASTAGE IN PAKISTAN

Compiled By

PIPS SDGs Desk

For more information or feedback contact us at research@pips.gov.pk

A) Water wastage

1) Agriculture Sector

Pakistan boasts one of the largest contiguous irrigation systems globally, spanning approximately 17 million hectares. Despite this, the system is highly inefficient, with over 60% of water lost during both conveyance through channels and application in the fields. The majority of these irrigation water losses occur at the water course level (30%) due to leakage and seepage, and at the field level (29%) due to inadequate irrigation practices. [1]

Location	Delivery at Head (MAF)	Losses (MAF)	Losses (%)
Canals	106	16	15
Distributary & minors	90	6	7
Watercourses	84	26	31
Fields	58	17	29
Crop use	41		
Total		65	61

Source: Qureshi, R. H., & Ashraf, M. (2019).

2) Present status of the selected water management parameters in Pakistan

As regards waste water treatment, above 63% of the worldwide produced water is collected. Out of this collected water, 52% is treated and 48% is released untreated, and only 11% is reused. Among the world countries, Pakistan ranks lowest in waste water treatment ratio, treating just 1% of the collected water.

Parameters	Existing situation
Capacity to store volume of water received from rain and snow*	Less than 10%
Proportion of water Pakistan receives from rain during the three months of monsoon season	80%
Wastage of water stored in dams	50%
Proportion of total water needs used for agriculture	90%
Wastage of water supplied for agriculture during distribution	Almost 50%

Source: Khan, K. and Khan, A.A. (2022)

*Guidelines of international organizations tell that a country must have the capability to stock up to 40% of the whole amount of water received from rain & snow.

[1] Qureshi, R. H., & Ashraf, M. (2019). Water Security Issues of Agriculture in Pakistan (p. i). Pakistan Academy of Sciences. https://www.paspk.org/wp-content/uploads/2019/06/PAS-Water-Security-Issues.pdf

B) Water scarcity

Water scarcity (WS) refers to the lack of adequate accessible water resources to meet the needs of a region. Due to factors such as population growth and climate change, the issue of WS is escalating rapidly in many areas around the globe. Pakistan is particularly vulnerable to water scarcity, with limited capacity to address water crises effectively. This shortage significantly hampers socio-economic development and threatens livelihoods in the country. To evaluate the water scarcity situation in Pakistan, several well-established indices are, including Falkenmark's indicator, the Water Resources Vulnerability Index (WRVI), IWMI's Water Stress Indicator, and the Water Poverty Index (WPI) (Appendix A).[2]

1) **WS situation in Pakistan:** According to different tolls developed by Falkenmark indicator, WRVI, IWMI's indicator, and WPI, Pakistan fall in water scarce countries. PCRWR has already warned that if the government did not take serious steps, the country will run out of water by 2025. IMF has also ranked Pakistan third among the water scarce countries.

Indicator	Present situation	Remarks/results
Pakistan's share in global Population	2.85%	Contain big population
Pakistan's share of global fresh water resources	0.5%	Limited water resources
Population having access to safe drinking water	36%	Indication of WS
Waste water treatment Ratio	01%	Lowest in the world
Average annual increase in temperature during past century	Almost 0.57°C	Indication of climate change & high water demands
Future predicted temperature rise	Above world average	High vulnerability to climate change
Pakistan's ranking by global climate risk index	5th position	Highly vulnerable to climate change
Population suffering from WS	80% (High proportion)	Indication of WS
Predicted water shortage by 2025	31%	Indication of WS
Falkenmark's indicator (FI)	Below 1,117 m^3/capita/year	At the verge of WS
WTAR/WRVI	82%	Indication of WS

[2] Khan, K. and Khan, A.A. (2022) 'Understanding Water Scarcity Risks Of Pakistan: A Spatio-Temporal View', Pakistan Geographical Review, 77(2), pp. 234–260.

World ranking by WTAR	160th position	Poor water resources
IWMI'S indicator	Facing water shortage	Indication of WS
WPI	Less than 1,700 m3/person/year	Indication of WS
IMF's ranking of Pakistan among water scarce countries	3rd position	Indication of WS

Source: Khan, K. and Khan, A.A. (2022)

2) Pakistan's water storage capacity

Pakistan is wasting 10 trillion gallons of water yearly due to the deficiency of water reservoirs. Per head storage of water in the country is much lower compared to other countries.[3]

Country	Water Storage Capacity (m3/capita/year)
Australia	Over 5,000
USA	Over 5,000
Egypt	23,00
China	22,00
Turkey	14,02
Iran	492
Pakistan	159

Source: Ashraf, 2020

3) Formulation of water policy and capacity to store water

Pakistan has the ability to store water for only 30 days needs which is far behind the rest of the world. When compared to other countries, India can store water for 190 days.[4]

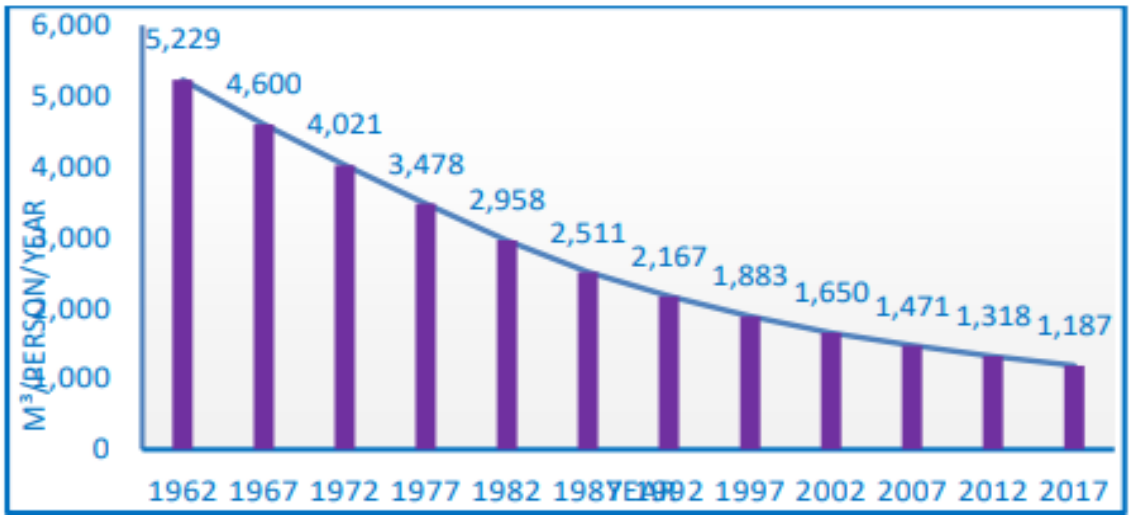
Country	Formulation of 1st water policy	Capacity to store water for
Pakistan	2018 (40 years after India)	30 days
India	1978	190 days
USA	1948 amended in 1972	900 days
Egypt	1975	1,000 days
China	1988	Several years

Source: Khan, K. and Khan, A.A. (2022)

[3] Khan, K. and Khan, A.A. (2022) 'Understanding Water Scarcity Risks Of Pakistan: A Spatio-Temporal View', Pakistan Geographical Review, 77(2), pp. 234–260.
[4] Ibid.

3) Changing per capita water availability trends in Pakistan (1962-2017)

According to IWMI's physical and economic water scarcity indicator, the countries that would not be capable to fulfill their projected water demands by 2025 are grouped as physically water scarce. According to this index, Pakistan is already facing WS. It has suffered from 11% water shortage in 2004 which is predicted to reach 31% in 2025, pushing the country further to physical and economic WS (Ashraf, 2018). Current per head water availability is also much lower than the global water poverty index (WPI) of 1,700 m3/person/year.[5]



*Changing per capita water availability trends in Pakistan (1962-2017)

Some selected indices commonly used for water scarcity assessment

WS indices	Developed by	Definition
Falkenmark Indicator (FI)	Falkenmark, 1986 & 1989	Measures water availability in m³ per person per annum within the region (FI = Available Water/Population).
Basic Human Need Index (BHNI	Gleick, 1996	Measures the water consumed to fulfil the basic needs of people like drinking, cooking and washing
Water Resources Vulnerability Index (WRVI)	Raskin et al., 1997	Estimates WS as a ratio of total per year water consumption to total water resources available in the region or country. If use is between 20 & 40%, the country is classed as water scarce. When use surpasses 40%, the country is called as sternly water scarce.
International Water Management Institute (IWMI)	Seckler, et al., 1998	Considers the portion of renewable water resources available for human needs, guaranteed by present water infrastructure, with respect to

[5] Ibid.

Indicator		main water supply. This indicator estimates physical and economic WS.
Social Water Stress Index (SWSI)	Ohlsson, 2000	Estimates the capability of people to adjust to water stress situations using technological, economic or other methods.
Environmental Performance Index (EPI)	World Economic Forum (WEF), 2002	This index deals WS as a function of water availability and water uses, and tells water overuse in a region. It is computed by 'subtracting the recommended use fraction (0.4) from the ratio of total fresh water withdrawals (including both renewable and fossil ground water) to total renewable water resources' (EPI, 2022).
Water Poverty Index (WPI)	Sullivan,2002; Sullivan, et al., 2003	This index assesses weather people are water secure at domestic and community level or not. It measures physical water availability for people and environmental needs, water quality, percentage of people having access to clean water and time taken by the persons to collect water, issues of water management, and economic & social dimensions of poverty.
Water Stress Indicator (WSI)	Smakhtin et al., 2005	Tells water stress level using WSI=Water withdrawals/Mean annual runoff (MAR)-Environmental water needs (EWN). Environment needs certain amount of water for maintenance (EWN), and not all water (measured as MAR) can be treated available for human use. Index value ranges from 0 to 1 that moving towards 1 indicates high water stress and vice versa.
Watershed Sustainability Index (WSI)	Chaves & Alipaz, 2007	Index is watershed specific and used to estimate water sustainability within a maximum area of 2500 km². Bigger areas are divided into smaller units to gage WSI. It considers hydrology, environment, life, and policy. Each factor has equal weightage with fixed scores of 0.25, 0.50, 0.75, and 1.0.
Agricultural Water Poverty Index (AWPI)	Forouzani & Karami, 2011	It evaluates the agricultural water concerns by combining various elements of agricultural water system. Index considers five key components and several sub-components.

Water Self-Sufficiency (WSS)	Aldaya et al., 2010	It measures WS in terms of water demand for the production of goods and services. Ability of a country to supply for the requirements of its regular activities is estimated. The ratio of internal water footprint to the total water footprint is calculated and stated in percentage. Value towards 100% indicates that demanded water is available within the region and towards zero indicates heavy reliance on imported water.

Source: Khan, K. and Khan, A.A. (2022)

Falkenmark water stress index

Sr. No.	Index (m^3/capita/year)	Category
1.	>1,700	No Stress
2.	1,000-1,700	Stress
3.	500-1,000	Scarcity
4.	<500	Absolute scarcity

Source: Khan, K. and Khan, A.A. (2022)