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Pakistan, Water Scarcity

## **Watering the Population of Pakistan**

The Islamic Republic of Pakistan, casually known as just Pakistan, is a rather populous country on the north side of the Arabian sea. A country with the fifth largest population in the world, according to the world meters website, that exists on a plot of land only about the size of Texas. Neighboring India on the east, Afghanistan, and Iran on the east, and China on the north, its southern border is taken up by the Arabian sea. Although the Arabian sea is a major source of water, the country's main source of freshwater comes from the Indus River, which runs through mostly the center of the country. It is fed by glaciers from what are mostly in the Himalayan and Hindu Kush mountain ranges and empties out into the Arabian sea. The Indus river basin provides water for 90% of Pakistan's food production and plays a big part in the country's water issues. As a result of the mismanagement of this water source, Pakistan's growing population faces an acute water crisis as soon as the year 2025. (*Deutsche, 2018*)

On February 1st, 2022, the population of Pakistan is recorded as 227,669,746 people, and as of 2020 a growth rate of 2.00%. (*worldometers.info, 2022*). Of this total population, over half is considered rural, 63.84% as of 2020, to be specific, while the other 37.7% is considered urban according to the world bank. Pakistan ranks as the second-largest Muslim-majority country, where 96.5% of the population follows the Islamic faith. (*worldpopulationreview, 2022*) They are also considered a population-dense country, with 287 people per square kilometer, this is equivalent to 742 people per square mile, and the average age of this population is 22.8. (*worldometers.info, 2022*)

Agriculture plays a big role in the country with 22.77 million hectares of land currently being cultivated. (*pbs.gov.pk., 2022*) The main crops grown are rice, sugar, wheat, and cotton, while the main exports of the country are textile articles, cotton, knit and non-knit apparel, and leather goods. The climate of Pakistan is difficult to generalize, as each location varies widely between extreme temperatures. The five provinces all have their own weather patterns that differ from the next but overall the climate can be characterized as subtropical, semi-arid, or desert. In the North, snow-capped mountains and glaciers create cool temperatures and rainy days, the Indus Basin, which exists on most of the northwest, or the Punjab province, is the largest contiguous irrigation system in the world, while in the south, Karachi houses trading ports on the Arabian Sea, and endures very hot days during summer, cold nights in "winter", and wet days during the monsoon season.

It is culturally appropriate in Pakistan, for most families to live under the joint family system. This means that one home, houses the parents, their married sons along with their wife and offspring, and any unmarried or widowed daughters. This makes the average family size in Pakistan 6.7 people per home. A

typical meal for a Pakistani consists of carbs, whether that be rice or roti; a wheat-based flatbread, curried animal protein, vegetables, and yogurt. Chai tea is commonly enjoyed, which is a remnant of the times when the British colonized this region. (*togetherwomenrise.org*) Forty-five percent of the youth population of Pakistan have had five or fewer years of education (*WENR*), poverty primarily contributes to these numbers, as many families, especially in rural areas “cannot afford the costs related to education.” (*WENR*) Education becoming more widespread could be the key to propelling the modernization of Pakistan, and failure to do so could be detrimental to the future of Pakistan's water and sanitation systems, health and education services, and the job market. (*The Washington Post/ WENR*) Not only do government-run schools lack proper funding, but government healthcare facilities do as well. This results in the people being forced to use private healthcare, which is unaffordable, and about eight to ninety percent of the population pays out-of-pocket for this. (*Dr. Murad Moosa Khan*)

Currently, Pakistan is facing a severe water crisis that is only growing worse. They are on track to reach absolute water scarcity by 2040 (*IMF*). These trends are continuing to worsen, and drought-like situations, as well as dried-up reservoirs, are threats that are on the verge of becoming reality. Many are to blame for these decaying conditions, the first being the 1960 Indus Water Treaty. In this treaty, Pakistan gave up control of three of the eastern tributaries of the Indus River, their main source of water. (*dw.com*) Ineffective mismanagement of the Indus Basin is a key player in the issues, as well a lack of defined water rights laws from the Government. Climate change is also in play here a few examples include, glaciers in the Himalayas that feed the rivers are expected to diminish in the coming years, (*Chloe Stein, southasianvoices.org*), and increases in water evaporation in agricultural soil as a result of increasing temperatures is causing an increased demand for water on farms. Pakistan also has a low storage capacity for retaining freshwater. The world average is forty percent while Pakistan lies at a low ten percent. (*Aneel Salman*)

The agricultural sector of Pakistan is highly reliant on freshwater sources. This sector could suffer the most from the lack of water, however, this sector also puts a heavy burden on the available water sources. A combination of poor crop choices as well as ineffective irrigation strategies results in low water productivity for the country. This means that “Pakistan uses a lot more water to produce crops than in other countries.” (*Joshua Meribole*) If the issue continues to grow worse, crop yield will decline, and this will force rural populations to migrate to cities in search of work. Livestock from these farms will also be affected since they too need water to be raised.

This water crisis does not affect rural populations alone. People living in urban cities are also affected in many different ways. Lower crop yields, and meat shortages, would mean whatever food products can get shipped to the cities, will be expensive. This only increases the gap between the poor and the rich regarding food insecurity. Unemployment levels are rising in these cities as well, due to the influx of migrants in search of stable work. Back to the water, a shocking eighty percent of people living in twenty-four different cities, do not have access to clean water. (*Joshua Meribole*) This definition of clean water equates to water that is safe enough to drink. Lack of access to clean water is the most fatal for

children, specifically under the age of five. According to UNICEF, about “fifty-three thousand Pakistani children die annually from diarrhea due to poor water and sanitation.” Many children are also forced to drop out of school as a result of these water-borne illnesses. Since food production is being affected, malnutrition rates in children are surging as well. On the other hand, elderly people have been exposed to the same water-borne diseases and heavy metals in the water for decades now. The repercussions of this lifelong exposure to toxins in the water have resulted in a rise of chronic diseases throughout the country and a falling life expectancy.

Women are by far the most affected by these worsening conditions, since providing water for the family is one of their responsibilities. They are more likely to encounter attacks and harassment by men, on the long distances they must walk to fetch the water. Girls are also pulled out of school, and instead, the money that would be used to pay for their schooling is put towards bearing the expenses of buying clean water. The contaminated water also puts women most at risk for fatal consequences. Unclean births associated with the water account for 26% of neonatal deaths, and 11% of maternal mortality. (*Syena Sana Batool*)

The two major issues that need to be addressed regarding Pakistan’s water shortage are their lack of water storage, and how the water Pakistanis do have, is used. Although global warming and changing climate patterns contribute greatly to the water stress they face, the country would be most successful in improving their water levels by focusing on decreasing the wastage of water within the agricultural sector. The following solutions would provide long-term solutions to these problems and also increase energy and food production.

In 1998, the foundation was laid for the Diamer-Bhasha Dam, however, construction has just begun in June of 2020 due to financial setbacks. This project claims to be able to irrigate 1.23 million acres of agricultural land and a gross water storage capacity of 8.1 million acre-feet. (*Amit Ranjan*) This dam is being financed by China and is being built in a highly controversial territory, on the border of Pakistan and India. Positive impacts of this solution that has already been put in place by the government of Pakistan, include a new hydropower source for the country that also struggles with energy problems, and newly added storage capacity, which is a key proponent to the water scarcity. A dam would also control the intense flooding that occurs during Pakistan’s monsoon season, storing water during this wet season which could then be put to use during the dry season. Nonetheless, these pros would all be irrelevant to helping the water crisis get any better if they continue to be mismanaged by the government. This project misplaces a large population of people and is also located in a high seismic zone. Scientists are concerned that this would lead to environmental disasters such as landslides and floods.

The second proposal, to help improve water availability in Pakistan is to discourage the cultivation of what the World Wildlife Fund classifies as “thirsty crops” in areas prone to drought. For example, rice uses 3,000 to 5,000 liters of water to produce 1 kg. Rice, along with sugar cane, cotton, and wheat are all

thirsty crops, and unfortunately, Pakistan just does not have enough water to support these crops along with their inefficient irrigation practices of flooding. When implementing flood irrigation, only 20% of the water is used by the plant itself, while the rest is lost evaporation and runoff. Flooding also decreases the crop yield, while increasing the likelihood of soil erosion. (*fdp.com.pk*) These practices are what contribute most to water wastage in Pakistan. Instead of growing crop varieties that require water that the country does not have ample supply of, farmers should look at using or incorporating more modern and efficient farming techniques. For instance, aerobic rice is considered a modern rice production system that results in a higher rice yield, while using less water. The rice is grown in “well-drained, non-puddled, and unsaturated soils,”(*knowledgebank.irri.org*) which differs from the traditional submergence of rice fields. Additionally, studies in Brazil have been shown to prove that sugar cane plants that are placed in water deficits, during a specific period in their growth, can improve their “biomass production, regardless of the water conditions.”(*Fernanda C. C. Marcos et al.*) They strongly believe these results could bring a new perspective on the management of sugar cane and claim that this strategy creates a “higher resilience of photosynthesis after facing water shortage.” Pakistan’s agricultural sector would strongly benefit from the implementation of these modernized practices. Both of these solutions result in higher and more consistent crop yields while using fewer water resources. These projects would be expensive in the sense that first, farmers would have to be educated on these practices, to begin using them. Equipment and farmland would have to be alternated as well to fit the needs of the new design for crop production. The Asian Development Bank would fund these improvements since they previously contributed to solving these issues in Pakistan. Organizations such as the World Wildlife Fund and the International Fund for Agricultural Development (*IFAD*) will work with local organizations to educate and implement these practices in rural areas, where farms are mainly found.

The solution that would by far conserve the most water for Pakistan would be reforming their irrigation methods. Pakistan favors the flood irrigation method, which involves water being supplied by pipes or ditches, and it flows over the ground. This method is outdated, uncontrolled, and inefficient. Instead, farmers should seek out a new method of irrigation known as a drip irrigation system. This system allows water to drip onto the soil where the crop is rooted, at very low rates. This happens by the placement of “drippers” close to the plants. (*fao.org*) Advantages of this method include eliminating plant diseases, reducing leaching of water and nutrients below the root zone (*The University of Rhode Island*), and decreasing the amount of evaporation that occurs. This system is very efficient and makes the best possible use of the available water, while preventing water wastage, and also producing a high crop yield. When compared to the traditional flooding system, the drip irrigation system can save up to 80% of water when managed correctly. Studies have revealed that specifically in Pakistan, a variation of the drip system has led to water savings of up to 50%. (*World Wildlife Fund*) This makes more water available for the other sectors, for example, public use. Installing these systems would initially be costly, 125,000-200,000 Rs is the average price which equates to just under 1,000 USD. Regardless of this initial price, the method is overall cheaper to operate over time. (*Bollevani Sathish Kumar*). Once again, the IFAD along with the Pakistani government would fund these projects and work with local farmers to help this method become widespread. This method provides a long-term solution that would allow food production rates to be unaffected while conserving as much water as possible. Drip irrigation also prevents soil erosion and does

not require the farmland to be leveled off, which promotes ecological disturbance. The list of advantages could go on and on.

Applying these changes to the way Pakistan grows its food, would allow for optimal water conservation and efficiency. Combined with proper management and the continuation of educating this population, water levels would be sure to rise over the next few years. This water crisis is a serious problem in the country, and if immediate action is not taken soon, food will suffer, people will suffer and animals will suffer too. Conditions could improve with small steps like these being taken to end the long-term practices that wastewater, which unfortunately Pakistan just does not have.

### *Works Cited*

*Muslim Majority Countries 2021*,

<https://worldpopulationreview.com/country-rankings/muslim-majority-countries>.

Qureshi, Asad Sarwar. "Water Management in the Indus Basin in Pakistan: Challenges and Opportunities." *BioOne Complete*, International Mountain Society,

<https://bioone.org/journals/mountain-research-and-development/volume-31/issue-3/MRD-JOURNAL-D-11-00019.1/Water-Management-in-the-Indus-Basin-in-Pakistan--Challenges/10.1659/MRD-JOURNAL-D-11-00019.1.full>.

(www.dw.com), Deutsche Welle. "Water Crisis: Why Is Pakistan Running Dry?: DW: 07.06.2018." *DW.COM*, <https://www.dw.com/en/water-crisis-why-is-pakistan-running-dry/a-44110280>.

"Pakistan Population (Live)." *Worldometer*,

<https://www.worldometers.info/world-population/pakistan-population/>.

*Www.pbs.gov.pk*.

[https://www.pbs.gov.pk/sites/default/files/tables/rename-as-per-table-type/AIDS\\_0.pdf](https://www.pbs.gov.pk/sites/default/files/tables/rename-as-per-table-type/AIDS_0.pdf).

"Customs and Cuisine of Pakistan." *Together Women Rise*,

<https://togetherwomenrise.org/customsandcuisine/customs-and-cuisine-of-pakistan/>.

"Education in Pakistan." *WENR*, 2 Nov. 2021, <https://wenr.wes.org/2020/02/education-in-pakistan>.

"Private Healthcare in Pakistan – Costly, Unregulated and Predatory." *The Express Tribune*, 18 Nov. 2019,

<https://tribune.com.pk/article/90951/private-healthcare-in-pakistan-costly-unregulated-and-predatory>.

"International Monetary Fund - Homepage." *IMF*, <https://www.imf.org/en/Home>.

(www.dw.com), Deutsche Welle. "Water Crisis: Why Is Pakistan Running Dry?: DW: 07.06.2018." *DW.COM*, <https://www.dw.com/en/water-crisis-why-is-pakistan-running-dry/a-44110280>.

"The Crisis Potential of Pakistan's Increasing Water Stress." *South Asian Voices*, 22 June 2020, <https://southasianvoices.org/the-crisis-potential-of-pakistans-increasing-water-stress/>.

Salman, Aneel, et al. "Pakistan's Looming Water Crisis." *East Asia Forum*, 14 Nov. 2021, <https://www.eastasiaforum.org/2021/11/13/pakistans-looming-water-crisis/>.

"The Water Crisis in Pakistan." *BORGEN*, 7 May 2020, <https://www.borgenmagazine.com/water-crisis-in-pakistan/>.

"Wash: Water, Sanitation and Hygiene." *UNICEF Pakistan*, <https://www.unicef.org/pakistan/wash-water-sanitation-and-hygiene-0>.

"For Karachi's Women, Toxic Water Makes a Tough Life Tougher." *The Express Tribune*, 23 Feb. 2020, <https://tribune.com.pk/story/2162850/karachis-women-toxic-water-makes-tough-life-tougher>.

*ISAS.NUS.EDU.SG*, <https://www.isas.nus.edu.sg/papers/the-diamer-bhasha-project-a-continuing-challenge-for-pakistan/>.

"Can the Indus Delta Be Saved by the Construction of Diamer-Bhasha Dam?" *The Express Tribune*, 18 May 2020, <https://tribune.com.pk/article/96317/can-the-indus-delta-be-saved-by-the-construction-of-diamer-bhasha-dam>.

"Aerobic Rice." *Aerobic Rice - IRRI Rice Knowledge Bank*, <http://www.knowledgebank.irri.org/step-by-step-production/growth/water-management/aerobic-rice>.

ProximateSolutions.com, Design, and Code by. "Why Flood Irrigation Is Waste of Resources?" *Farm Dynamics Pakistan*, 2 May 2019, <https://fdp.com.pk/why-flood-irrigation-is-waste-of-resources/>.

Marcos, Fernanda C. C., et al. "Drought Tolerance of Sugarcane Propagules Is Improved When Origin Material Faces Water Deficit." *PLOS ONE*, Public Library of Science, <https://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0206716>.

Written by Imran Mukhtar, Freelance Contributor. "Here's How a New Scheme in Pakistan Is Helping Farmers Beat Drought." *World Economic Forum*, <https://www.weforum.org/agenda/2021/01/pakistan-farmers-water-security-agriculture-drought-climate-change/>.

*Living Waters - WWF*. <http://assets.wwf.org.uk/downloads/thirstycrops.pdf>.

*Chapter 6. Drip Irrigation*, <https://www.fao.org/3/s8684E/s8684e07.htm>.

"Drip Irrigation." *URI HomeASyst*, 5 Aug. 2014, <https://web.uri.edu/safewater/protecting-water-quality-at-home/sustainable-landscaping/drip-irrigation/>.

<https://www.biotecharticles.com/Agriculture-Article/Drip-Irrigation-Advantages-and-Disadvantages-of-Drip-Irrigation-4086.html>