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Pakistan is facing a water crisis.

Here is PUSH's report on how to manage it effectively

PUSH's Approach to Pakistan's Water Crisis

- Data, Statistics & Background

1. Yearly water availability is less than 1,000 cubic meters per person.
2. Pakistan crossed this level in 2005.
3. If it reaches 500 cubic meters, it will become a country that is absolute scarce of water by 2025.

"Do not waste water even if you were at a running stream"

Prophet Muhammad (PBUH)

4. 80 percent of people living in 24 major cities do not have access to clean water.

5. In the slums of Karachi, 16 million people do not have access to running water.

6. By 2025, Pakistan's water demand could reach 274 million acre-feet while the supply of water could remain at 191 million-acre-feet.

7. Rice, wheat, cotton and sugarcane-Crops like these are responsible for 95 percent of the country's water use.

8. Pakistan has an inefficient irrigation system that causes a 60 percent water loss.

9. Low water productivity in comparison with other countries. Water productivity is "the physical or economic output per unit of water application." Pakistan uses a lot more water to produce crops than in other countries.

10. 21 million lack access to clean water close to home & 30 million have no access to clean water.

11. 40% lack a facility to wash hands with soap & water.
12. Pakistan is among the top 10 countries with the lowest access to clean water near to home.

13. An international report a couple of years back ranks Pakistan third in the world among countries facing the highest threat of water shortage.

14. The districts on the left side of the Indus River starting from Ghotki to TandoAllahYar have normal soil whereas, the remaining area falls under saline and saline-sodic soils.

23. According to a FAO criterion Pakistan is likely to become water scant i.e. less than five hundred cubic meters per capita annually by 2035.

24. Pakistan's amount of water used per unit of GDP is world's highest, suggesting that no country's economy is more water intensive than Pakistan's.

25. Surrounded by 7,259 glaciers with 2,066 cubic kilometers of ice, the country is endowed with more glaciers than any other country in the world.

26. There were 20,000 wells in Pakistan in 1960 and now, in the absence of adequate regulation and enforcement, there are over one million. As a consequence, not only has the groundwater quantity depleted, it is contaminated with industrial waste and municipal effluent.

27. Tarbela commissioned in 1976 — are running on reduced capacity due to silting. Twice during recent years, they have reached the dead storage levels. This limits the water supply during the dry season and contributes to flooding during the rainy season.

28. Pakistan wastes nearly 29 million-acre feet of water during the flooding season due to inadequate reservoirs.

29. Pakistan has only a limited 30-day storage capacity compared to 900 days for the US. India has four times higher capacity at 120 days.

30. Bulk of Pakistan's farmland is irrigated through antiquated canal system, which in addition to being inefficient, is vastly underpriced recovering only a quarter of annual operating and maintenance costs. California is 50 per cent more, and even the Indian Punjab 30 per cent more from the same amount of water.

31. Lack of reliable surface water has made farmers shift towards the groundwater usage.

32. Rural sector suffers from head and tail disparities along irrigation canals where theft and manipulation of water by the powerful is common.

33. Successive governments have chosen short-term & high-visibility projects leading to mismanagement of funds.

34. Pakistanis waste water habitually. Charging water through smart-metered supply into the households is mostly nonexistent.

35. Water experts estimate that total annual freshwater in the Indus Basin fluctuates between roughly 140-270 Million Acre Feet (MAF) every year.

36. Conversely, United Nations Resolution 64/292 (2010) on the "Human Right to Water and Sanitation" states that a person's daily requirement to satisfy basic needs (drinking, eating, bathing, cooking, etc.) is 50-100 liters. Many commentators have argued that even this figure is overstated. Nevertheless, applying these estimates reveals that Pakistan's domestic demand stands at 18-36 MAF of water, comfortably below the Basin's total capacity.

37. 40% of all yearly deaths can be attributed to an insufficient supply of clean water & the over-distribution of water to agriculture as opposed to the household.

38. Sugar is one of the most water-intensive crops in the world. Pakistan is the 5th largest producer of refined sugar (after Brazil, India, Thailand, and China)

39. By 2025, Pakistan will face a water shortage of 31 million acre feet of water, or roughly about a third of the water used for irrigated agriculture in the country each year. This is especially significant, as irrigated agriculture accounts for 95 percent of Pakistan's water resources and employs 38.5 percent of its workforce.

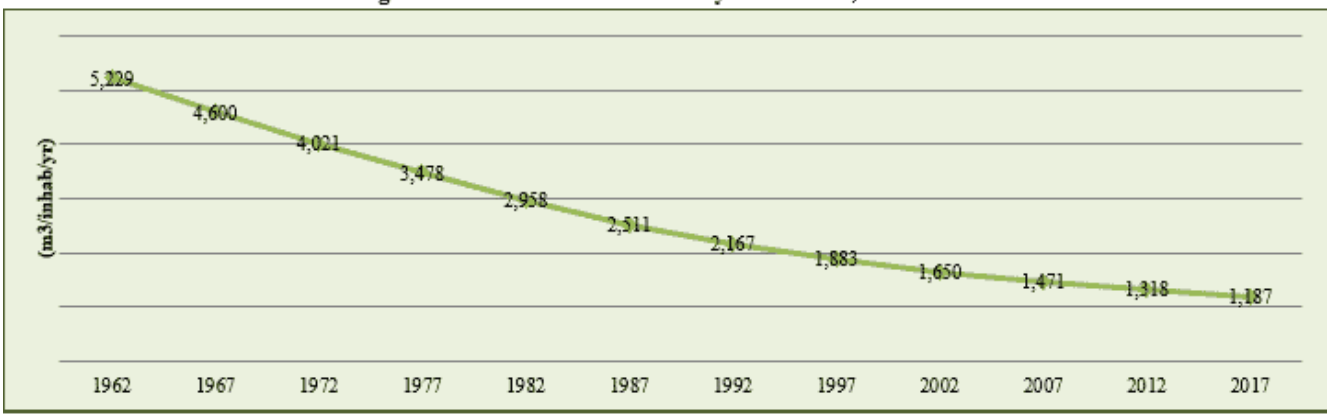
40. Next 30 years, climate change is anticipated to increase Pakistan's demands for water between 5 and 15 percent.

41. After leaving the mountains, Indus Basin's major rivers run over approximately 1000 feet thick alluvial deposits of sweet soils. The porosity of these alluvial soils has a huge capacity of absorbing fresh waters from the flowing rivers and storing it in the pore space.

42. The river-beds are wide, from a kilometer to more than 20 km at places, and their active floodplains are even wider, from 5 kilometers to more than 50 km. Overall, the alluvial deposits, underneath and beside the rivers, form the corridors of fresh water repositories (or riverine alluvial aquifers) are capable of storing more than 3000 million acre-feet (MAF) of usable freshwater. There's hardly a river system on the globe which has been blessed with such rich hydrogeological connections with sweet alluvium.

43. Pakistan ranks 14 among the 17 'extremely high water risk 'countries of the world, a list that includes hot and dry countries like Saudi Arabia

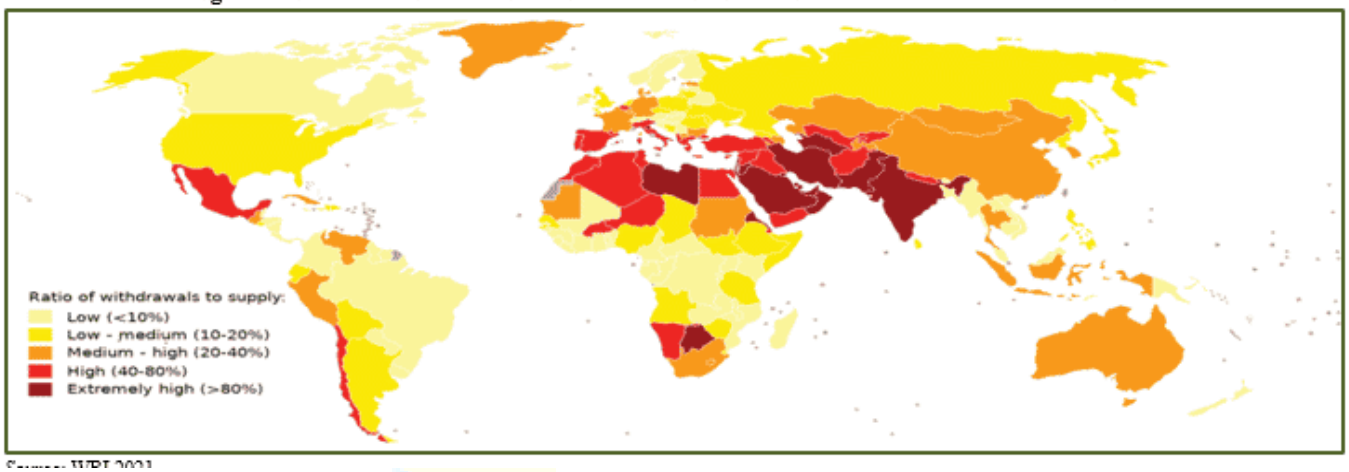
Fig. 1. Trend in Water Availability in Pakistan, 1962–2017



Source: FAO 2021.

44. Pakistan ranks 160th in the ratio of water withdrawals to water resources (in 2017), performing better than 18 countries only (Figure 3). Agriculture is the largest water consumer, accounting for 94 percent of annual water withdrawals followed by households (5.3 percent) and industry (including power generation) (0.8 percent)

Fig. 3. Water Stress: Freshwater Withdrawals as a % of Total Renewable Water Resources



Source: WRI 2021

45. In 2017, Pakistan ranked 8th lowest in the world, generating US$1.4 per cubic meter of water withdrawn. Malaysia ranked 35th (US$55.0/m3), Republic of Korea 37th (US$52.4/m3), China 71st (US$ 21/m3) and Turkey 87th (US$13.6/m3)

- Recommendations

1. Pakistan must expand its water storage, reduce water waste, improve water productivity and develop a framework that will help with the management of surface and groundwater

2. There is need to develop a strong monitoring and regulatory framework to manage the groundwater on sustainable basis. (PCRWR) through a series of experiments proved that the existing water use of these crops could be reduced by more than 50% simply shifting to bed plantation.

3. The planting of crops on raised beds is one of the improved irrigation techniques. It is being practiced for all crops all over the world and is an effective and improved irrigation method with several advantages. Bed plantation is an efficient irrigation method which increases the yield and reduces the crops logging risk.

4. It improves water distribution and water use efficiency, fertilizer use efficiency, reduced weed infestation and logging.

5. If 50% of the rice area is brought under bed plantation, on average 7 BCM water can be saved in a year.

6. It was found that bed plantation of rice increased net income by 12% and 68% as compared to conventional methods at research farm and farmer's field, respectively

7. There was 5% and 20% increase in net income in beds plantation as compared to zero tillage and farmer's field, respectively

8. If 50% (4.6 Mha) of the wheat crop area is converted 22 to bed plantation, on average 9.2 billion cubic meters (BCM) water can be saved during the wheat cropping season.

9. Using smart irrigation methods like sprinkler and trickling needs to be done. Canal water theft should be prevented. The country should start projects to trap rain water and use it to recharge aquifers. We must also line-up all canals to prevent seepage and thus water logging.

10. Start a mass campaign to educate people on water conservation and simultaneously implement conservation laws. Strictly regulate groundwater usage and prevent its illegal extraction. In this case the state should provide clean drinking water, supply of which should be metered and charged to consumers.

11. Production of sugarcane, in and of itself, could result in greater water insecurity. It must be regulated & monetized by Federal Government.

12. We must seek to substitute our domestic sugar demand – currently at 5.2 million tons annually (requiring an estimated 7-10 trillion liters of water) – by importing sugar from water-rich countries.

https://blogs.lse.ac.uk/southasia/2020/09/22/sugar-and-water-in-pakistan/

13. The flowing river continuously recharges the adjacent alluvial aquifers, and in the low flow season, the alluvial aquifers release water back into the rivers (a process called 'base-flow') – providing natural flow regulation and preventing the rivers from running dry. On average, 145 MAF of water flows through the rivers in one year, whereas the alluvial aquifers are capable of holding in excess of 3000 MAF. This implies that significant volumes of the river flow can be stored and released from the aquifer without worrying about a few drier years in a row. The trick for the future is to learn to manage the riverine aquifers. Riverine well fields are one of the very effective management options to exploit the natural potential of our alluvial aquifers within the riverine corridors of active floodplains.

14. A riverine well field is a set of relatively deeper tube wells installed very close to the river. The tube wells are put in a calculated geometry and follow a carefully worked pumping schedule to match different requirements of the day in different seasons. Through a system of piped water supply and overhead tanks, the water can be delivered over very long distances.

15. High pumping rates of riverine well fields are compensated by the matching aquifer recharge rates through the flowing river. And since aquifer storage is huge, blips in river recharge do not affect the supply pattern by the tube wells. With careful designs, riverine aquifers are the most sustainable groundwater management tools.

16. In the Indus Basin, we have almost 7000 kilometers of a corridor along the rivers where well fields of different capacities can be established. Riverine well fields provide clean, filtered and drinking quality water if simultaneously we ensure there is no dumping of wastes in the flowing streams in the country.

17. Improved irrigation efficiency can reduce today's on-farm water-requirements by 50 to 70 percent.

18. On-farm water-guzzling flood-irrigation, when replaced by efficient irrigation, will save another 25 to 30 MAF. This implies that the current consumption of 104 MAF in irrigation sector will be reduced to between 20 to 25 MAF, while the production will be increased due to higher per-acre yields and additional area brought under irrigation.

19. A net saving of more than 75 MAF is expected, which is equally more than 10 times the current storage capacity of Tarbela dam at 6.5 MAF. Efficient irrigation connected to piped water supply will get water to the field wherever and whenever it is required by the crop – not when the farmer gets his turn.

- What can we learn & adopt from the world.

20. Boston: Scoring at the top of the American Council for an Energy-Efficient Economy (ACEEE) City Energy Efficiency Scorecard for 2014 and 2015, Boston is leading the way U.S. cities focus on water conservation and energy efficiency. This city requires all large buildings to report their water use and comply with an assessment every five years to ensure that the water is being utilized properly. They also require buildings to adhere to an Energy Star certification and reduce electricity use which requires water.

21. Boston is employing technologies to utilize their water resource most efficiently and convincing their citizens to consume less water. Some technologies in place include leak-detection piping, adjusted water-pressure, replacement of faulty water meters and improved parks' irrigation practices. Boston also implements a water training program in their schools, educating their young citizens on the importance of future water conservation. These international practices can be replicated in Pakistan to ensure better management of water resources.

22. San Francisco also ranks high on the ACEEE City Energy Efficiency scorecard and implements water conservation practices on its property owners. These ordinances include utilizing low-flow shower heads, water-saving faucets/toilets and installation of insulation on water heaters and in attics to reduce heating and cooling costs. The San Francisco Energy Watch is a program that rewards property owners monetarily for investing in energy-saving appliances. Like Boston, San Francisco has energy codes and enforcement of these codes on large buildings to reduce energy and water use.

Water-metering technology which enhances the way that their residents can adjust their water usage using online databases. These smart meters give citizens an inside look on what their water is being used for and how much is utilized. This allows households to understand where their water consumption is used the most and alerts if there are any substantial increases which could signal a leak or other problem.

23. UK also provides incentives for home owners to install water-saving technologies and smart-water appliances to promote overall water conservation.

24. In 2008, China financed the $74 million North China Plain Water Conservation Project which would improve the agricultural practices that take place on the 250,000+ farms on North China Plain. The main improvements of the project include more efficient drainage and irrigation sprinklers and wells, farming practices like soil and environmental monitoring, ground-leveling support and institutionalized water and soil conservation practices. Since the initiative started productivity has increased 60-80% and groundwater depletion has been reduced or in some places eliminated.

25. South Korean government started a project in 2004 called Songdo, which is built on an artificial island and constructed to provide "green space" like rooftop vegetation. They also have installed rainwater collection systems which captures water to be recycled and used for household appliances, irrigation on parks and for industrial buildings, reducing the demand for freshwater. These systems not only capture the rainwater but store it in containers to reduce the commercial use of precious freshwater.

26. Seattle implements very strict building codes that require energy conservation policies to be enforced on new building plans. The enforcement is double checked by the city's council members and tested by a private third-party company. In 2005, the city was the first in the U.S. to become "carbon neutral" with their construction of hydroelectric dams in the northwest region. The mayor also endorsed a zero-funding policy into fossil fuel companies, paving the way for newer, eco-friendlier energy companies to provide services to the city.

27. Geothermal renewable energy is plentiful on the island of Milos in Greece because of its location on the Aegean Volcanic Arc. Magma trapped beneath the Earth's surface heats the surrounding rocks and the water trapped within the rocks creating geothermal reservoirs.

The hot water created is piped through underground wells where it becomes hot steam, which spins turbines and generates energy. Geothermal energy is used to convert sea water and brackish water by heating up water to form water vapor that is condensed into drinking water and water for irrigation. It is a source of abundant energy that is inexpensive and doesn't depend on fossil fuels. That is why the country's new geothermal desalination project is an ideal fit. The plant will provide desalinated water at a low cost to residents of the island.

28. United Kingdom is a leader in smart water metering technology, enabling residents to monitor their water usage online. Smart meters provide users with more detailed information about how water is being used and in what quantities. It allows households to get a better hold on their water usage each month and encourages residents to install water-efficient appliances and other water-saving technologies in their homes. It also helps customers pinpoint leaks that cause increased usage. By 2030, Thames Water, a leading U.K. provider, wants smart-water meters installed in every home it serves.

29. Accumulation of Rainwater was a way found to enjoy another water source and reduce the burden on traditional systems of water supply for the population. Another benefit is that accumulated rainwater helps prevent flooding during the storms.

30. Treatment and reuse of water is common for uses such as irrigation; recycled water is delivered on golf courses, zoos, farms and parks; It is also used in cooling towers and heaters, as well as, domestically, for watering gardens and plants. Los Angeles is also resuming the proposal to recycle water.

- Conclusion

Water management must be taken seriously by Pakistan's officials. Water losses to irresponsible irrigation & consumer consumption must be stopped immediately. Water conservation systems that are cost-effective must be implemented nationally. Smart-Water meters must be introduced in every household of Pakistan along with agricultural sector. Cap system must be introduced to stop waste of water. Projects to build rain-collecting reservoirs & riverine well fields must be done. We must educate our farmers nationally to do bed plantation of rice, wheat & sugarcane. Sprinklers must be used for irrigation.

Pakistan must improve water storage, reduce water waste, augment water productivity & invest in infrastructure to help manage surface and groundwater.

- Disclaimer

This report is derived from various excerpts & research work done by many institutions like PIDE & PCRWR. Data has been derived from various articles published in leading newspapers of Pakistan also. Nothing has been fabricated by members of PUSH. Team of PUSH appreciates the assistance of various research institutions & journalists of Pakistan who have helped in compilation of this report. o recycle water.