

Strategic Analysis Paper

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Water Resources in Pakistan: Scarce, Polluted and Poorly Governed

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Key Points

- Pakistan continues to experience acute water scarcity, largely driven by drought and intensive agriculture.
- Water is severely polluted by human, agricultural and industrial waste.
- There are few effective channels to mitigate the water crisis. Current laws do not reflect the poor state of Pakistani water resources and governance is lacking.
- The recent National Water Policy is a milestone and a positive step, but its wording means that it will not necessarily be the solution that many are hoping for.

Summary

Despite having [more glaciers](#) than anywhere else in the world and its location in the Indus River Basin, Pakistan is at risk of acute water scarcity. Its surface and groundwater sources are both increasingly stressed and severe drought conditions persist in parts of the country due to a lack of rain. At the same time, Pakistan has an extensive agriculture sector, which uses flood methods of irrigation to grow water-intensive crops. Water infrastructure in Pakistan is outdated and in poor condition, which wastes even more water, while little is stored because of a lack of reservoirs and sediment build-up in existing facilities. The water that is available is often unclean, having been polluted by human, agricultural and industrial waste, with little infrastructure in place to provide clean water.

The problem is made worse by poor governance and management in the water sector. While there are laws governing water, they are often archaic, dating back to the colonial era. Other attempts to reform water management have simply added new bureaucracy on top of the existing framework, creating agencies with overlapping duties.

While the adoption of the National Water Policy in 2018 has been a cause for optimism in Pakistan, its vague and sometimes contradictory wording raise concerns that the country's water crisis will continue to worsen.

Analysis

Water Resources and Scarcity

The poor state of Pakistan's water resources gained international attention in 2018 due to speculation that the country [could become absolutely water scarce \(in which a country cannot provide enough water due to physical shortages\)](#) by 2025, along with a novel initiative by the recently-elected Imran Khan government [to fund new dams](#) entirely through crowdsourcing. Last year, Pakistan's two largest dams, the Tarbela and Mangla Dams, both [reached](#) or [approached](#) their dead storage levels (where there is too little water for the dam to operate) on at least two occasions, causing further alarm.

Pakistan's water comes from a [number of increasingly stressed sources](#), including rainfall, glacial runoff, rivers and groundwater. While [around 60 per cent](#) of precipitation comes from monsoon rains, a significant proportion is distributed during winter (December to March) weather patterns. Due to Pakistan's diverse geography, rainfall tends to vary significantly from region to region. Much of the country is arid or semi-arid, with three-quarters of Pakistan receiving less than 250 millimetres of rain per year and [droughts are common](#) in many areas. In Sindh and Balochistan, severe drought conditions have [been caused by](#) a lack of rain during the winter and monsoon rainfall periods. Analysis by the United Nations Development Programme suggests that while more research must be done on the impacts of climate change on precipitation in Pakistan, trends over the last 30 to 50 years suggest that [rainfall has decreased in Balochistan](#) and in coastal areas (although it has increased on average in some parts of the country). The rate of ice melt [has also been affected](#) by climate change, creating a greater risk of flooding and extreme water cycle variability. [Snowmelt and glacial runoff](#) also contribute between 35 and 40 per cent and 25 to 35 per cent of Indus Basin river flows, respectively, making their contribution indispensable to Pakistan's hydrological cycle.

The Indus River system contains most of Pakistan's surface and groundwater resources. In 1951, surface water availability per capita [was 5,260 cubic metres](#) per person. By 2016, that had fallen to close to 1,000m³, a trend that is expected to continue. Groundwater extraction rates are also concerning. Pakistan currently extracts approximately 61 cubic kilometres of water from its aquifers each year, which far exceeds sustainable limits. As a result, [Pakistan is commonly considered](#) to be both water-stressed (high water withdrawals relative to availability) and water-scarce (low water availability per capita). The situation is made worse by Pakistan's [rate of water usage](#) – the fourth-highest in the world – while its water intensity

rate (the amount of water used per unit of GDP) is the highest in the world. This suggests that Pakistan's economy is more water-intensive than any other.

To combat these levels of water stress and scarcity, much has recently been made by the Pakistani Government about a relative lack of large dams and reservoirs in the country. While the crowdfunding methods undertaken by the government to build new dams [are unrealistic](#), limited storage capacity has also contributed to increased water scarcity. Pakistan has up to 30 days' worth of storage capacity, which not only limits the amount of water available during the dry season, but also [contributes to flooding](#) during wet seasons, as there are few dams to absorb the excess water. Sedimentation has also compounded the problem. Silt that naturally exists in rivers becomes trapped by reservoirs, sinking to the bottom, and thereby [decreases storage capacity](#). According to a [2015 hydrographic survey](#), the storage capacity of the Tarbela Dam [has declined by 35 per cent](#) since it was commissioned.

Much of Pakistan's high water use stems from its largely agrarian economy. Almost [70 per cent of the population](#) is directly or indirectly employed in the agriculture sector, which accounts for 26 per cent of its gross domestic product. Pakistani farmers cultivate [21.2 million hectares](#) of land, of which more than 80 per cent is irrigated. Farming is dominated by four [water-intensive](#) crops: wheat, sugarcane, rice and cotton. As a result, [93 per cent](#) of the water consumed in Pakistan is used for agriculture (the global average is closer to [around 70 per cent](#)). While Pakistan's irrigation system is vast, [it is outdated](#) and poorly maintained. In particular, much of Pakistan's agriculture is dependent on flood irrigation methods, which involves flooding fields using canals or tube wells. Many of the waterways that carry water from rivers for this method of irrigation are not appropriately lined, leading to further seepages of [up to 40 per cent](#).

Intensive irrigation also has implications for Pakistan's groundwater supply, as a lack of reliable surface water has caused farmers to increasingly rely on groundwater. Of the water used for irrigation, [approximately half](#) comes from aquifers, in part because it is not subject to seasonal availability. While it is a convenient water source, an increase in pumping in recent decades has led to a [significant decline in groundwater tables](#), especially in Punjab and Sindh, where agriculture is the most widespread. Unchecked groundwater abstraction has contributed to the Indus Basin aquifer becoming the second-most stressed in the world, according to a study conducted [between 2003 and 2013](#).

Water Quality and Water, Sanitation and Health

Pakistan's water crisis is not limited to increasing scarcity, with poor water quality also posing a serious problem. Both surface and groundwater sources are affected by the issue. Currently, [around 56 per cent](#) of people in Pakistan have access to safe drinking water, while 30 per cent of diseases and 40 per cent of deaths are [linked to unclean water](#). The divide is also stark between rural and urban populations; up [to 70 per cent](#) of rural Pakistan has no access to clean water. Bacterial contaminants in water and soil have risen considerably in the last 15 years, according to one report by [the World Bank](#). That water is largely left untreated, posing a major health hazard.

Underdeveloped wastewater treatment facilities are a key contributing factor to Pakistan's poor water quality. Only Islamabad and Karachi have biological waste treatment facilities, and they are, at best, only partly functional. Even if they were to operate at their full capacity, it is estimated that they would be able to treat just [eight per cent](#) of Pakistan's wastewater. Without dedicated facilities to treat wastewater, many toilets are connected to leaching pits or septic tanks, which are connected to open drains, while many rural households still rely on latrines. [Open defecation](#) is not uncommon in rural areas. Households then dump the accumulated faecal waste from latrines and septic tanks into rivers and fields, in the absence of dedicated waste disposal initiatives. The consequences of poor waste treatment practices are particularly evident in rural areas, where toilet facilities and piped water are often lacking. As a result, diarrhoeal diseases are most [prevalent in rural areas](#).

Pakistan's water supply is also prone to contamination from other sources. Industrial waste often [receives minimal treatment](#), which has led to increasing levels of water pollution as industries (particularly textiles and tanneries) have become more prevalent. Of over 6,000 registered industries, [1,228 are considered](#) "highly polluting." Pakistan's two largest industrial estates, both located in Karachi, simply discharge heavy metals, oil and other hazardous materials directly into rivers. The problem is exacerbated by the lax enforcement of environmental regulations and by deliberate concessions granted to industrial bodies by the government. In order to [secure foreign exchange](#), Pakistan encourages the growth of key industries by granting rebates and reducing costly regulations that could otherwise help to protect polluted waterways. The agricultural sector is also responsible for much of the contamination of Pakistan's water resources, [due to runoff](#) from chemical fertilisers and pesticides.

While these phenomena most visibly affect surface water, Pakistan's aquifers are also prone to poor water quality. Water from the Indus Basin is naturally high in arsenic and, while research on arsenic poisoning in Pakistan is limited, estimates suggest that [50 to 60 million](#) Pakistanis who depend on groundwater are at risk, especially around Lahore and Hyderabad. Studies have also discovered high levels of arsenic-related skin disorders in rural Pakistan. Additionally, Indus Basin aquifers are closely connected to surface waters, allowing contaminants from the surface to easily [leach into groundwater](#). The aggressive extraction of groundwater has also been [accompanied by the rising salinity](#) of aquifers.

Policy, Politics and Implications for the Future

Along with physical barriers to water security, water politics has also exacerbated the crisis. As a result of colonial-era water laws and a lack of serious governance, Pakistan's water policies have come to be dominated by [three main factors](#): a dependence on increasingly archaic laws and frameworks; a strong preference for large-scale engineering projects to solve water issues (the recent drive to build two large dams, [despite concerns](#), is a typical example); and loosely defined water rights. In many cases, land ownership defines who has a right to water. Much of Pakistan's water infrastructure is also in poor condition, due to a culture of ["build/neglect/rebuild"](#) in public works management. That is true even of the

large-scale engineering projects that Pakistan invests so heavily in, including dams, the failure of which could be catastrophic.

Pakistan's water resources are managed at a provincial level, posing another dilemma for water management. Inter-provincial disputes have dominated the debate on water reform. Although the 1991 [Water Accord](#) mitigated some provincial concerns (by allocating water to provinces based on a particular formula) the system of implementation, which is overseen by the Indus River System Authority (IRSA), is lacking and there is no way to monitor flows in the event of a dispute. [Criticisms of the IRSA](#) have increased over the last decade due to its inability to manage the needs of all provinces, which has been caused by the ongoing reduction in water flows. Other attempts at reform have [created a number of agencies](#) with overlapping duties and responsibilities, creating inefficient management and further reducing the possibility of good water governance.

Although current trends in water management are alarming, there have been some potentially positive indicators for the future. [In 2018](#), Pakistan's Council of Common Interests finally approved the milestone National Water Policy (NWP). The exhaustive 41-page document specifies, among other things, that ten per cent of funds from the national Public Sector Development Programme will go towards water infrastructure, as well as setting out goals to reduce the water lost through degraded infrastructure. While the document [represents a breakthrough](#) for water management, there have been concerns that there are simply [too many recommendations](#) outlined by the policy, making sections contradictory and vague. While the NWP may help to advance water management and reduce tensions between provinces, without strong governance or enforcement, it is likely that little will change, leaving Pakistani water security in an increasingly precarious position.

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