How Can Pakistan Get More Value from Its Water Resources?

Key Messages

- Pakistan’s water insecurity arises not from insufficient water, but from inefficient water management and use, and from poor delivery of irrigation and municipal water services. Collectively, these comprise the social, environmental and economic outcomes that Pakistan gets from its very considerable water resource.
- Water access and quality of both surface and groundwater have drastic social consequences, affecting thousands in both urban and rural areas. Women and children are especially vulnerable to waterborne diseases and improper sanitation.
- High levels of water abstraction and use, and widespread pollution are having devastating impacts on the health of rivers and wetlands across Pakistan, especially the iconic Indus Delta.
- Pakistan needs to pay more attention to the social and environmental dimensions of water security, which are undermining human capital and environmental sustainability.
- Agricultural reforms and irrigation modernization are needed to increase the economic efficiency of irrigation. Subsidies and other perverse incentives, as well as inefficient and outdated irrigation systems, mean that currently, eighty percent of utilized water goes to crops that constitute less than five percent of the national Gross Domestic Product (GDP).
- Climate change will exacerbate water insecurity. It will increase water demand and the variability of water supply. Sea-level rise and coastal storms will present additional challenges for management of the Indus delta and groundwater in the lower basin.
- Improved water management requires accurate, reliable and relevant data collection and consolidation, as well as strengthening of federal and provincial water policy and legal frameworks. The National Water Policy needs to proactively engage provincial and federal frameworks to make Pakistan more water secure and to enable the country to reach upper middle-income status by 2047.

Background

This brief summarizes key learnings from the World Bank’s report titled, “Pakistan: Getting More from Water”. The report explores water security in Pakistan through a conceptual framework (Figure 1) that highlights the balance of economic, social, and environmental outcomes (costs and benefits) from water and the appropriateness of this balance. A consideration of water sector architecture and performance—and how these determine outcome—provides reflections on improving aspects of sector performance and adjusting sector architecture for better outcomes. The analysis of sector performance considers: (i) management of the water resource, (ii) delivery of water services, and (iii) mitigation of water-related risks. The description of sector architecture considers water governance, infrastructure, and financing.

Water Security in Pakistan

Water insecurity is not water scarcity. There are 32 countries, which have less water per person compared to Pakistan, and 26 of these have a greater average per capita Gross Domestic Product (GDP). As the world’s sixth most populous country, Pakistan’s challenge is not the availability of water, but access by and management across various sectors, primarily agriculture, industries, municipal services, and the environment. Increasing demand by all sectors as a consequence of population increase, economic growth, and climate change will accentuate the need for better cross-sectoral management.

The World Bank report shows that water security is compromised by poor water resource management, inadequate irrigation and municipal water services, and a lack of additional domestic water supply and sanitation services, along with some important longer-term, and cross-sectoral risks. The consequences of this poor performance include widespread environmental degradation, several human health impacts, and sub-optimal economic performance, especially from irrigated agriculture.

In the long-run, without reform to existing policy, institutional, and legal provincial and federal frameworks, Pakistan will face major constraints in achieving upper middle-income status by 2047. Addressing water security in its social, economic and environmental outcomes is also a commitment under Sustainable Development Goal (SDG) 6—to ensure availability and sustainable management of water and sanitation for all. While acknowledging Pakistan’s commitments through the National Water Policy 2018, this policy brief provides additional recommendations to address water security in Pakistan.

How Well Are Water Resources Understood?

Some of Pakistan’s water resources are well qualified, while others are poorly assessed or simply overlooked in most resource assessments. A key challenge in assessing the actual water supply is the lack of credible and sufficient forensic data. The surface water inflows to Pakistan from the Indus and its tributaries are measured sufficiently well. Runoff generated within Pakistan—including in Balochistan outside the Indus Basin—is not well measured and is often ignored. Pakistan’s current total average annual renewable resource is estimated to be 229 BCM or around 1,100 cubic meters per capita, taking into account all hydrological units. This estimate is higher than other widely quoted estimates that consider only the major surface water inflows to the Indus Basin irrigation system.
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Policy Brief

centers. Sanitation arises as a major concern because no Pakistani city used in lieu of existing inadequate public infrastructure in major urban repair. Private tankers and privately-owned groundwater wells are water supply occurs frequently due to a lack of maintenance and the increasing rate of urbanization. Contamination and disruption in supply architecture, and these are expected to become starker with Within the urban realm, there are severe deficiencies in the water supply architecture, and these are expected to become starker with increasing economic activity. In the upper Indus Basin, rapid glacial melting will greatly increase risks of outburst floods. In the lower Indus Basin, rise in sea level and coastal storms will exacerbate climate change represents an additional challenge to improving water security. It is expected to increase flow variability between and within years, leading to the severity of floods and droughts. Potentially the greatest challenge from climate change will be the increases in water demand, especially for irrigated agriculture. A 5 percent to 15 percent increase in water demand is expected by 2047 in addition to the increase in demand from a growing population and increasing economic activity. In the upper Indus Basin, rapid glacial melting will greatly increase risks of outburst floods. In the lower Indus Basin, rise in sea level and coastal storms will exacerbate seawater intrusion into the delta and coastal groundwater. In coastal

### Economic Outcomes

Water-use is heavily dominated by agriculture sector which is heavily dependent on irrigation. The four major crops that use 80 percent of the irrigated water, contribute less than 5 percent to the GDP. Moreover, Pakistan loses almost USD 12 billion per year, about 4 percent of the GDP, due to poor domestic water supply and sanitation, floods, and droughts. Indus Delta’s degradation is also estimated to cost the country around USD 2 billion per year, in addition to costs related to pollution and environmental degradation. However, economic contribution from water-use in hydropower generation is significant.

The economic return from irrigation water has doubled over the last three decades in Punjab and Sindh but this is largely attributed to expansion of the irrigated area, groundwater and fertilizer use, mechanization, and some improvements in water management. Water productivity needs to improve markedly if Pakistan is to revitalize economic growth as potential to increase yields through additional inputs is now limited.

Economic modelling reveals that water scarcity will not prevent Pakistan from achieving upper-middle-income status, provided changes in the structure of the economy and increased productivity across all sectors. It can be forecasted that as diet changes and crop preferences reduce production of low-value cereals, more water can be used to diversify and move to high-value crops with greater export potential.

Within the urban realm, there are severe deficiencies in the water supply architecture, and these are expected to become starker with the increasing rate of urbanization. Contamination and disruption in water supply occurs frequently due to a lack of maintenance and repair. Private tankers and privately-owned groundwater wells are used in lieu of existing inadequate public infrastructure in major urban centers. Sanitation arises as a major concern because no Pakistani city possesses adequate wastewater treatment capacity.

Overall, water sector financing is inadequate. Provincial level water sector financing has increased in recent years, but federal financing has declined significantly in proportional terms, affecting investment in major infrastructure; reforms and institutional strengthening; urban services; flood mitigation; and environmental management. Even a bigger problem is slow expenditure, with only one-third of committed funds spent over the last four years. Slow expenditure reflects low institutional capacity and a risk-averse public sector.

### Social Outcomes

There is a high social cost emerging from poor water supply, high levels of contamination, and lack of proper sanitation. Inadequate sanitation and water contamination are particularly distressing for rural populations, where women and children are the most vulnerable. An estimated 20 percent to 40 percent of hospital admissions and a large proportion of infant deaths are linked to water-related diseases. On average, 39,000 children die annually as a result of water borne diseases. Poor water supply, sanitation, and hygiene contribute to high levels of childhood stunting, undermining human capital. They influence the main determinants of stunting including food insecurity, inadequate personal hygiene and feeding, an unhealthy environment, and inadequate health care. Another risk is arsenic contamination of water supplies which affects 50 to 60 million people in Punjab and Sindh.

Short-term migration in response to floods and droughts also bears a social cost for affected communities. Women are less likely than men to migrate individually in search of work or in response to water-related shocks. During the 2014-17 drought in Tharparkar (Sindh), 35 percent to 45 percent of families migrated to barrage areas in search of labor and grazing for livestock.

### Environmental Outcomes

From an environmental perspective, water-dependent ecosystems such as rivers, lakes, wetlands, and the Indus Delta are severely affected by excessive upstream water withdrawal, and dumping of untreated wastewater from agriculture, untreated industrial effluent, and raw sewage. This can threaten the more than 180 species of freshwater fish in the Indus Delta. In fact, four out of eight plant species that thrived in the delta have disappeared in recent years. Loss of biodiversity, reduced stocks of freshwater and estuarine fish stocks and other negative impacts on ecosystem services are some of the key concerns. This includes adverse impacts on Ramsar sites that support 18 threatened mammals. Basin-scale river sediment dynamics can increasingly threaten the safety and operational performance of water infrastructure—and the health of river and delta ecosystems.

Table 1 Average Annual Available Water Resources of Pakistan

<table>
<thead>
<tr>
<th></th>
<th>Surface water</th>
<th>Groundwater</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indus Basin</td>
<td>205.7</td>
<td>12.7</td>
<td>218.4</td>
</tr>
<tr>
<td>Makran Coast</td>
<td>6.2</td>
<td>0.7</td>
<td>6.9</td>
</tr>
<tr>
<td>Kharan Desert</td>
<td>2.9</td>
<td>0.6</td>
<td>3.5</td>
</tr>
<tr>
<td>Total</td>
<td>214.8</td>
<td>14.0</td>
<td>228.8</td>
</tr>
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Moreover, groundwater has usually been quantified in terms of withdrawals, but this leads to a significant double counting in resource estimates. Adjusting for this double counting reveals that water stress is less extreme suggesting a net annual withdrawal of around 136 BCM, or 59 percent of the total renewable water resource compared to 78 percent commonly quoted. Pakistan is indeed “water stressed,” but perhaps less so than typically assumed. This highlights the importance of understanding the internal recycling of water between the rivers, canals, and groundwater systems. Severe groundwater depletion is evident in some areas, but depletion is a small part of the overall groundwater balance. Water-logging and contamination are far more serious problems to groundwater sustainability.

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There is increasing need to understand the precise relationship between long-term water stress and migration, as the evidence-base is weak.

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Climate change represents an additional challenge to improving water security. It is expected to increase flow variability between and within years, leading to the severity of floods and droughts. Potentially the greatest challenge from climate change will be the increases in water demand, especially for irrigated agriculture. A 5 percent to 15 percent increase in water demand is expected by 2047 in addition to the increase in demand from a growing population and increasing economic activity. In the upper Indus Basin, rapid glacial melting will greatly increase risks of outburst floods. In the lower Indus Basin, rise in sea level and coastal storms will exacerbate seawater intrusion into the delta and coastal groundwater. In coastal
Sindh, this will further degrade the groundwater resource, groundwater-dependent ecosystems, and the productivity of irrigation.

The increasing damage from floods, in part a consequence of climate change, will need both infrastructure adjustments and adaptation measures. New reservoirs can reduce incremental storage loss owing to sedimentation, manage increasing year flow variability and mitigate flood risks. However, they cannot fully mitigate climate change impacts, improve water productivity and address the long-term problem of sedimentation.

**Institutional, Legal and Policy Readiness**

Governance issues in the water sector are related to inadequate legal frameworks, the incompleteness of policy frameworks and the inadequacy of policy implementation. There are no formal provincial frameworks to optimize water allocation in irrigated agriculture. The lack of efficient, equitable and transparent systems results in low productivity and lack of trust between farmers and service providers. In addition, there are deeply embedded vested interests in the status quo that have proved resistant to reform.

Significant policy work is required at the provincial level. Policy frameworks for irrigation and water resources management are partial, fragmented or nonexistent, and implementation has been inadequate. Provincial policy frameworks for urban water services lack clarity and alignment with relevant legislation. The legal frameworks for water management need to be far more comprehensive. Out of 48 legal elements for effective water management, only 16 to 19 are included in provincial legal frameworks.

Policy deficiencies stem from institutional problems including unclear, incomplete, or overlapping institutional mandates, and a lack of capacity in water institutions at all levels. Institutional responsibilities need to be better delineated at both national and provincial levels and between entities at these levels.

From a framework perspective, the National Water Policy provides several of the required reforms and investments to improve water security. It can also be used as a forum to facilitate inter-provincial and multi-stakeholder dialogue. A robust implementation plan, with clear responsibilities, realistic assessments, transparent monitoring and reporting processes, will be essential to ensure accountability and action. The establishment of a National Water Council is fundamental to mitigating inter-provincial tensions, and addressing social, environmental and economic safeguards in the management of the Indus River Basin water resources.

**Recommendations**

The recommendations of this report address infrastructure, institutional, legal and policy reforms under the following key areas:

**Water Resource Management**

1. Strengthen water data, information, mapping, modeling, and forecasting
2. Establish a multi-stakeholder process of basin-scale water resources planning
3. Establish provincial water planning and intersectoral water allocation mechanisms
4. Accelerate increases in agricultural water productivity
5. Adopt conjunctive planning and management of surface and groundwater
6. Construct limited new storage (when hydroelectric power justifies the expense) and review reservoir operations

**Water Services Delivery**

1. Modernize irrigation and drainage and improve operations
2. Reform urban water governance and close the infrastructure gap
3. Improve rural sanitation

**Water-related Risk Mitigation**

1. Improve understanding and management of climate risks to the Lower Indus and Indus Delta
2. Strengthen planning and management of water-energy interactions
3. Improve understanding and management of basin-scale sediment dynamics

**Immediate Lessons for Policy and Practice**

Pakistan needs to get more from its water, not get more water, as improving water-use efficiency and service delivery are the most pressing needs. The greatest challenges to Pakistan’s water sector are internal, not external. With urgent reforms, Pakistan can get more economic, social and environmental benefits from water.

Some of the most urgent interventions have to address both policy and practice. Strengthening service delivery necessitates modernizing irrigation and drainage and improving operations. Without reform, irrigation water use will limit water access by industry and services sectors, constraining economic growth. Reforming urban water governance and closing infrastructure gaps are crucial for improving water service delivery in cities. In rural areas, improving sanitation services needs immediate attention to reduce costs to health and environment. Improved management and strategic planning of water resources demands stronger collaboration between federal and provincial governments and other stakeholders. Updating hydromet systems is important to facilitate effective risk assessment, planning and mitigation of water-related disasters. The objective must be to build resilience in the face of a changing climate and growing water demands.
About LEAD Pakistan

Leadership for Environment and Development (LEAD) Pakistan is a reputable national institution, and has emerged as a thought leader in building consensus and shaping the development discourse in Pakistan. Particularly focusing on climate change, water governance and SDG implementation, LEAD strives to ensure that the federal and provincial governments’ development agendas are equitable, inclusive and in line with international commitments and global best practices.

We remain committed to the design, development and delivery of innovative policy solutions to promote economically sustainable, socially equitable, and environmentally responsible growth. With successful delivery of over 200 development initiatives to date and being the largest network based organization in Pakistan, we are endeavouring to enhance our impact on development in Pakistan, the South Asian region and beyond.