PAKISTAN
GETTING MORE FROM WATER
A VISUAL GUIDE
The visual guide is developed by LEAD Pakistan based on World Bank Group's report *Pakistan: Getting More from Water*.


IS PAKISTAN WATER SECURE?

1. ASSESSING THE

Pakistan is not water secure

Pakistan is well endowed with water but water availability per person is comparatively low

Across 32 countries with less water per person than Pakistan

Average per capita GDP is 10 times that of Pakistan

Water use is heavily dominated by agriculture which contributes around 1/5th of national GDP but less than half of this is from irrigated crops

Economic contribution from water use in hydropower generation is significant

Current market value is US$ 1-2 B

Water-dependent ecosystems are in rapid decline but environmental outcomes are given scant attention.

Waterborne diseases and high levels of stunting undermine human capital, with woman and children affected the most.

Economic cost of degradation of the Indus Delta are estimated to be US$2 B per year.

Economic costs from poor water and sanitation, floods and droughts are about 4% of GDP.
WHAT UNDERMINES WATER SECURITY IN PAKISTAN?

Water security in Pakistan is undermined by:

1. Water resource management
   - Poor water data, information, and analytics
   - Weak processes for water resources planning and allocation
   - Environmentally unsustainable levels of water withdrawals
   - Low water productivity in agriculture

2. Gaps in water resource management
   - Quality of services is poor especially for urban households.
   - Inadequate domestic water coverage
   - Poor water service delivery
   - Inadequate mitigation of water-related risks

3. Water resource management
   - Poor water resource management
   - Poor financial and operational performance contributes to low productivity.

4. Inadequate water coverage
   - Quality of services is poor especially for urban households.

5. Climate change is an unmitigated risk
   - Likely to increase variability of inflows, increasing the severity of floods and droughts.

6. Climate change induced warming
   - Warming is expected to drive water demands up by 5% to 15% by 2047.

7. Basin-scale river sediment dynamics
   - River sediment dynamics can increasingly threaten the safety and operational performance of water infrastructure.

HOW WELL ARE WATER RESOURCES UNDERSTOOD?*

1. Some of Pakistan’s water resources are well qualified, while others are poorly assessed or simply overlooked in most resource assessments.

2. The surface water inflows to Pakistan from the Indus and its tributaries are measured sufficiently well.

3. Runoff generated within Pakistan and smaller hydrological units outside the Indus Basin, especially in parts of Balochistan, are not well measured and often ignored in water resource assessments.

4. Groundwater has usually been quantified in terms of withdrawals, but this leads to a significant double counting in resource estimates.

5. Average annual renewable resource is 229 BCM* and average water availability is estimated at 1,100 cubic meters per capita.

6. Severe groundwater depletion is evident in some areas but water logging, salinity and contamination are far serious problems to groundwater sustainability.

*The complementary infographic series based on the same report provides further facts and figures and analysis of water resources in Pakistan.
WHAT INTERVENTIONS CAN IMPROVE WATER SECURITY IN PAKISTAN?

Improving water security requires addressing large infrastructure gaps involving significant financial resources. The biggest challenges, however, are of poor governance and weak institutions. It will take concerted effort on many fronts by all governments and water users over many years.

Addressing infrastructure gaps:

1. Most important infrastructure gaps are associated with water supply and sanitation, irrigation and drainage services.
2. Modernization of irrigation and drainage infrastructure is required on a massive scale.
3. Continued investment in flood protection infrastructure requires complementary "soft" measures such as floodplain zoning, improved flood forecasting, and early warnings.
4. Large storage reservoirs can help improve some aspects of water security but do not address the most pressing water security issues.

Addressing challenges of governance:

1. The legal frameworks for water management need to be far more comprehensive. Alignment of policy frameworks with relevant legislation is important.
2. Significant policy work is required at the provincial level, because policy frameworks are partial, fragmented, or nonexistent, and implementation has been inadequate.
3. Institutional responsibilities for several aspects of water resource management need to be better delineated both at national and provincial levels and between entities at these levels.
## PATHWAYS TO WATER SECURITY

### WATER RESOURCES MANAGEMENT

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Strategic Objectives</th>
<th>Annual Cost</th>
</tr>
</thead>
</table>
| 1. Strengthen water data, information, mapping, modeling, and forecasting | • Improve water resources planning and system operations  
• Improve flood/drought risk assessment, planning, and mitigation  
• Increase transparency of, and access to, water information | US$1–10M |
| 2. Establish a multistakeholder process of basin-scale water resources planning for strategic basin planning | • Guide long-term sustainable economic development  
• Define agreed upon basin-level environmental flows  
• Improve interprovincial sharing, especially during droughts  
• Build climate resilience across all sectors, including the environment | < US$1M |
| 3. Establish provincial water planning and intersectoral water allocation mechanisms | • Support a smooth economic structural transformation  
• Better manage temporary water shortages, including risk sharing  
• Improve efficiency and equity of irrigation water distribution | US$1-10M |
| 4. Accelerate increases in agricultural water productivity | • Ensure future food security, given water availability constraints  
• Increase farmer incomes  
• Facilitate labor movement to other sectors  
• Contribute to overall increase in economic benefits from water | US$1-10M |
| 5. Adopt conjunctive planning and management of surface water and groundwater | • Maximize the use of aquifer storage for drought resilience  
• Ensure sustainable groundwater use  
• Improve equity in water access across command areas  
• Reduce water logging and salinization | < US$1M |
| 6. Construct limited new storage and review reservoir operations | • Better support multiple water management objectives  
• Manage changing flood risks and changing demand patterns  
• Improve reliability of rabi irrigation supply  
• Manage increasing variability of inflows, including flood mitigation  
• Mitigate sedimentation to improve storage longevity  
• Contribute to improved energy security | > US$1B |

### Pathways to Water Security

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Short-term (Less than 5 years)</th>
<th>Medium-term (5 to 15 years)</th>
<th>Long-term (More than 15 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure Investment</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Institutional Reforms</td>
<td>1 4 5 6</td>
<td>2 3</td>
<td></td>
</tr>
<tr>
<td>Policy Reforms</td>
<td>1 3 4 5 6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Legal Reforms</td>
<td>5</td>
<td>1</td>
<td>3 4</td>
</tr>
</tbody>
</table>
**LEGAL REFORMS**

- Clarify the legal mandates at federal level for water information collection and sharing. Strengthen provincial legal frameworks for land-use planning that considers flood risks.
- Establish a sound legal mandate for federally led cooperative basin planning. Strengthen provincial legal frameworks for water resource planning.
- Establish clear legal property rights for water, separate from land, and legal requirements to maintain public register of water licenses.
- Scope legal provisions to support pricing and trading of water rights.
- Establish provincial-level regulatory frameworks for groundwater access, management and regulation.

**POLICY REFORMS**

- Establish an implementation framework for the National Water Policy (NWP), with clear roles and responsibilities for water data and information.
- Establish an implementation framework for the NWP that articulates roles, responsibilities, time frame, and process for basin planning.
- Develop and implement provincial water policies to establish sectoral priorities to define allocation processes.
- Phase out subsidies for wheat and sugarcane. Support adoption of water efficient technologies and diversification to higher-value crops.
- Develop conjunctive water management plans at the district level that focus on building drought resilience.
- Review and revise reservoir standard operating procedures, based on detailed modeling and analysis.

**INSTITUTIONAL REFORMS**

- Strengthen technical capacity in the Water and Power Development Authority (WAPDA) and Indus River System Authority (IRSA) for water data management, modeling, and forecasting, including the use of Earth observations.
- Strengthen capacity of WAPDA and IRSA to enable periodic reviews of operating procedures and to support a multi-objective approach to operations.
- Establish a national water council to provide strategic framing for cross-jurisdictional basin planning. Strengthen federal government capacity for river basin management.
- Strengthen capacity for economic modeling within federal and provincial governments. Improve on-farm water management through farmer training and awareness raising.
- Strengthen the capacity of provincial water resource management departments for groundwater management and conjunctive planning.
- Build capacity of the Pakistan Council of Research in Water Resources (PCRWR) for basin-scale modeling and analysis of surface water–groundwater interactions.

**INFRASTRUCTURE INVESTMENTS**

- Expand national and provincial hydromet networks, including for cryosphere and groundwater monitoring. Establish interoperable national and provincial water information systems.
- Secure financing for construction of Diamer Bhasha Dam and associated power generation and distribution infrastructure.

---

**Complexity, Urgency, and Scale of Impact of Key Recommendations for Pakistan**

Note: Relative scale of impact is indicated by bubble sizes.
**SERVICE DELIVERY**

**RECOMMENDATIONS**

1. Modernize irrigation and drainage and improve operations
   - Improve irrigation service delivery in terms of efficiency and equity
   - Increase agricultural productivity, including more high-value crops
   - Ensure food security for a growing population
   - Enable reallocation of some water to cities and environment

2. Reform urban water governance and close infrastructure gap
   - Improve quality, equity and sustainability of urban water supply services
   - Reduce environmental and public health impacts of poor sanitation
   - Keep pace with population growth and urbanization

3. Improve rural sanitation
   - Improve quality and coverage of rural sanitation services
   - Reduce environmental and public health impacts of poor sanitation

**LEGAL REFORMS**

- Revise Provincial Irrigation and Drainage Authority (PIDA) legislation to clarify roles and responsibilities in irrigation management between PIDAs and provincial government departments.
- Establish legal mandate for regulatory oversight of urban water supply service provider performance.
- Strengthen the regulatory framework for pollution discharges.
- Establish clear legal mandate for the provision of rural sanitation services.

**POLICY REFORMS**

- Replace warabandi with new water sharing rules based on economic efficiency and farmer equity. Reform abiana to reflect realistic operation and maintenance (O&M) costs.
- Rationalize overlaps in the provincial policy frameworks and align with the Local Government Act (2015). Develop and disseminate standards for urban water supply service delivery and link service tariff increases to service quality.
- Establish provincial standards and targets for rural sanitation services.

**INSTITUTIONAL REFORMS**

- Strengthen the capacity of new provincial government water resources management departments to oversee PIDAs and performance of water user associations (WUA) and farmer organizations.
- Strengthen and empower urban water supply service providers. Establish independent regulators to oversee service provider performance.
- Strengthen the capacity and increase the financing of provincial government departments responsible for rural sanitation.

**INFRASTRUCTURE INVESTMENTS**

- Modernize irrigation system, including new hydraulic control structures and lining of canals in waterlogged and saline areas. Automate control of hydraulic structures using real-time data acquisition systems.
- Greatly increase the capacity and performance of wastewater treatment. Improve O&M of existing major distribution infrastructure.
- Invest in public infrastructure for rural sanitation services, including wastewater collection, basic treatment and disposal at the village level.

**ANNUAL COST**

- Modernize irrigation and drainage: US$10–100M
- Reform urban water governance: US$10–100M
- Improve rural sanitation: US$1–10M

**COMPLEXITY, URGENCY, AND SCALE OF IMPACT OF KEY RECOMMENDATIONS FOR PAKISTAN**

<table>
<thead>
<tr>
<th>Short-term (Less than 5 years)</th>
<th>Medium-term (5 to 15 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal Reforms</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Policy Reforms</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Institutional Reforms</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Infrastructure Investments</td>
<td>3 1 2</td>
</tr>
</tbody>
</table>

**Note:** Relative scale of impact is indicated by bubble sizes.
**WATER-RELATED RISK MITIGATION**

### RECOMMENDATIONS

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

### STRATEGIC OBJECTIVES

- Maintain natural green infrastructure for coastal protection
- Protect coastal groundwater resources
- Protect and restore delta ecosystems
- Build climate resilience of lower basin agriculture
- Manage the trade-offs and synergies between energy and water development and planning
- Inform investment choices

### ANNUAL COST

- **< US$1 M**
- **US$1-10 M**

### LEGAL REFORMS

Establish provincial-level regulatory frameworks for groundwater access and management.

### INSTITUTIONAL REFORMS

- Strengthen the technical capacity of water and environmental management agencies for climate change impact assessments and mitigation planning.
- Increase coordination between government departments at federal and provincial levels and strengthen capacity for joint energy-water analysis.
- Strengthen capacity in relevant technical institutions for multiple aspects of sediment monitoring, modeling, and analysis.

### POLICY REFORMS

- Develop long-term plans for sustainable management of the Indus Delta.
- Analyze the synergies and antagonisms between current national energy and water policy frameworks to inform policy implementation.
- Develop a management plan to guide long-term, basin-scale sediment management.

### INFRASTRUCTURE INVESTMENTS

- Assess the feasibility of barrier groundwater wells to slow seawater intrusion.
- Expand solar and wind power investment where sensible. Explore feasibility for small-scale hydro on irrigation canals. Continue major hydroelectric power investment with run-of-river focus.
- Ensure that new reservoir designs and barrage rehabilitation projects consider sediment related risks to structural safety and operational performance.

### COMPLEXITY, URGENCY, AND SCALE OF IMPACT OF KEY RECOMMENDATIONS FOR PAKISTAN

<table>
<thead>
<tr>
<th>Complexity, Urgency, and Scale of Impact</th>
<th>Recommendation</th>
<th>Legal Reforms</th>
<th>Policy Reforms</th>
<th>Institutional Reforms</th>
<th>Infrastructure Investments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less complex</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Less urgent</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>More urgent</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More complex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Relative scale of impact is indicated by bubble sizes.