IWMI
International Water Management Institute

Transforming Water Governance in Pakistan

From Policy to Practice

Muhammad Ashraf and Zamir Ahmed Soomro



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Front cover photograph

The Hunza River flows beneath majestic mountains and lush greenery. (*Photo:* Dr. Muhammad Ashraf/IWMI)

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Acronyms and Abbreviations

AQUASTAT	FAO's Global Information System on Water and Agriculture
BCM	Billion cubic meter
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GMIS	Groundwater Management Information System
IBIS	Indus Basin Irrigation System
IRSA	Indus River System Authority
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
MDB	Murray–Darling Basin
MoWR	Ministry of Water Resources
NBI	Nile Basin Initiative
NDMA	National Disaster Management Authority
OECD	Organization for Economic Co-operation and Development
PakDMS	Pakistan Drought Monitoring System
PCRWR	Pakistan Council of Research in Water Resources
PMD	Pakistan Meteorological Department
UNDP	United Nations Development Programme
WAA	Water Apportionment Accord
WAPDA	Water and Power Development Authority
WASA	Water and Sanitation Agency

Executive Summary

Pakistan's water resources are central to its food security, public health, economic development, livelihoods and environmental sustainability. The world's largest contiguous irrigation system is supported by extensive groundwater use for domestic, industrial and agricultural purposes. However, growing water demands, changing water availability, groundwater depletion, deteriorating water quality, ecosystem degradation and increasing exposure to floods and droughts are placing greater pressure on water security. These challenges cannot be addressed through infrastructure development and technical interventions alone. These require effective governance of how water is allocated, used, protected and managed from field to the basin scale.

Pakistan has progressively established policies, laws, institutions, technical organizations and management arrangements to address its evolving water challenges. The National Water Policy 2018, provincial water policies and legislation, and emerging integrated water resources management approaches reflect a broader recognition of groundwater sustainability, water quality, environmental protection, stakeholder participation and climate resilience. Nevertheless, the existence of these arrangements does not necessarily ensure their effective implementation. A central argument of this report is that many governance weaknesses arise not only from missing elements, but also from weak connections among elements that already exist.

The country's existing governance arrangements can be strengthened and connected to achieve better water-management outcomes. It adopts a practical perspective, recognizing that water governance involves more than policies, legislation or individual institutions. It encompasses the responsibilities, resources, decisions, relationships and accountability mechanisms through which water is managed. The report identifies eight essential elements of a functioning governance system: policy and law; institutions; knowledge and data; finance and capacity; implementation; stakeholders; monitoring and accountability; and learning and adaptation. These provide a basis for examining governance performance, with particular attention to how they can function together.

The assessment recognizes considerable institutional experience and technical capabilities while identifying persistent gaps between policy commitments and implementation. Responsibilities are distributed across federal, provincial and local institutions, reflecting the diverse functions required for water management. Such distribution is not inherently a weakness; difficulties arise when responsibilities are unclear, authority and resources are insufficient, information is not effectively shared, or coordination and accountability arrangements fail to support collective decisions. Similar disconnections occur between regulation and enforcement, financing and institutional responsibilities, infrastructure and sustainable service delivery, and stakeholder participation and actual decision-making.

The water must be understood and managed as one interconnected system. Rivers, groundwater, irrigation networks, rainfall, drainage, wastewater, wetlands and downstream ecosystems interact across the water cycle, even though they are often managed by separate institutions. Decisions concerning surface-water allocation, groundwater abstraction, irrigation operations, urban water services and pollution control can therefore have consequences beyond individual sectors and administrative boundaries. The One Water and source-to-sea perspectives provide a basis for recognizing these relationships and strengthening the institutional connections required to manage them.

International experience from Australia, the Colorado River Basin and the Nile Basin illustrates different approaches to addressing shared water-management responsibilities, information needs, institutional coordination and changing water conditions. These experiences do not offer models that can be transferred directly to Pakistan. Rather, they demonstrate the importance of clear responsibilities, credible information, workable cooperation arrangements and the capacity to review and adjust management decisions in response to changing circumstances.

Moving from policy to practice requires strengthening connections across the governance process. Policies and laws must be translated into clear institutional responsibilities and operational procedures. Knowledge must reach decision makers in usable forms and at appropriate times. Financial resources must correspond to assigned responsibilities and expected results. Regulators, service providers and water users must have clearly defined roles, supported by monitoring, feedback and accountability. Federal, provincial and local institutions must perform their respective functions while maintaining effective two-way communication and coordination. Monitoring should lead not only to reporting, but also to evaluation, learning and corrective action.

The report proposes five immediate priorities for strengthening water governance in the country. (i) Clarify responsibilities by aligning institutional functions with appropriate authority, resources and accountability. (ii) Put commitments into operation by translating existing policies and laws into workable rules, procedures and actions. (iii)

Apply existing information to decisions by connecting available knowledge with planning, allocation, regulation and risk management. (iv) Make coordination result-oriented through arrangements for shared decisions, implementation and follow-up. (v) Monitor progress using a manageable set of indicators that assess implementation and outcomes.

These priorities should be supported by sustained institutional capacity, professional expertise, operational financing, meaningful stakeholder participation and transparent performance reporting. Existing technical initiatives, including water-accounting work and groundwater information systems, offer opportunities to improve decision support when their outputs are connected to the responsibilities and operational needs of government institutions. The emphasis should be on making existing capabilities more useful and sustainable, while establishing new arrangements where genuine functional gaps remain.

The report does not advocate continuous institutional restructuring or adoption of external governance models. Instead, it proposes a progressive approach in which existing arrangements are assessed, responsibilities and connections are strengthened, implementation is supported, and results are monitored and used to guide further improvement. Adaptation should become part of routine governance, enabling institutions to respond to changing water availability, groundwater conditions, water quality, climate risks and societal needs.

The central message is that effective water governance depends not simply on policies, institutions and technical capabilities, but on their ability to function as a connected and accountable system. By strengthening existing governance elements and the relationships among them, the country can move more effectively from policy commitments to practical action, contributing to improved water security, more reliable and equitable services, healthier ecosystems and greater resilience.

1. Pakistan's Water Challenges: Why Water Governance Matters?

1.1 Context

The Indus Basin Irrigation System (IBIS) supports Pakistan's food security, livelihoods, public health, economic development and ecosystems. How water is valued, allocated, used and protected affects almost every part of national development. Water security depends not only on how much water is available, but also on how effectively it is managed among competing sectors of its use.

Agriculture accounts for more than 90% of freshwater withdrawals, while the four major crops—wheat, rice, cotton and sugarcane consume around 80% of agricultural water contributing less than 5% of national Gross Domestic Product (GDP). This highlights the continuing challenge of producing greater economic and social value from limited water resources (Young et al., 2019). Inadequate water supply and sanitation, floods, droughts, groundwater depletion, pollution and degradation of rivers, wetlands and the Indus Delta affect human well-being, economic productivity and environmental sustainability.

These pressures are increasingly interconnected. Growing demands from agriculture, domestic, industry and energy must be balanced with groundwater sustainability and the water needed to maintain rivers, wetlands and the Indus Delta ecosystems. The challenge is therefore not only to develop more water but also how best the available water is shared, used, protected and managed in changing scenarios.

This report examines these challenges from a governance perspective. It considers what we already have in terms of policies, laws, institutions, knowledge and management arrangements; what is working; where important gaps and disconnections remain; and what can realistically be done to better govern the water resources. Drawing on country's experience and relevant global lessons, it focuses on practical ways to move from policy to practice. It is intended for policymakers, government agencies, planners and water practitioners, using plain language and visual communication to make complex governance issues easier to understand and act upon (Figure 1).



Figure 1. Scope and structure of the report.

1.2 Pakistan's water resources at a glance

The country's water resources are dominated by the Indus Basin, where rivers, glaciers and snowmelt, rainfall, groundwater, irrigation systems and ecosystems form an interconnected water system. About 74% of the country's river flow originates outside its borders. Therefore, any changes in upstream hydrology, water uses and climate would have great impact on irrigation, hydropower, groundwater recharge and downstream ecosystems (Ashraf, 2019).

The Indus and its major tributaries—the Jhelum, Chenab, Ravi and Sutlej, together with the Kabul River—provide the backbone of Pakistan's surface-water system. River flows entering the main irrigation system are measured at key River Inflow Monitoring (RIM) stations and provide essential information for water storage, allocation, reservoir operations and irrigation planning.

Long-term records show considerable variability in water availability in the system. A comparison of two periods, 1976–1998 and 1999–2022, indicates that average annual river inflows declined by about 14%. Average inflows from the western rivers declined by about 11%, while those from the eastern rivers declined by about 67% (Figure 2).

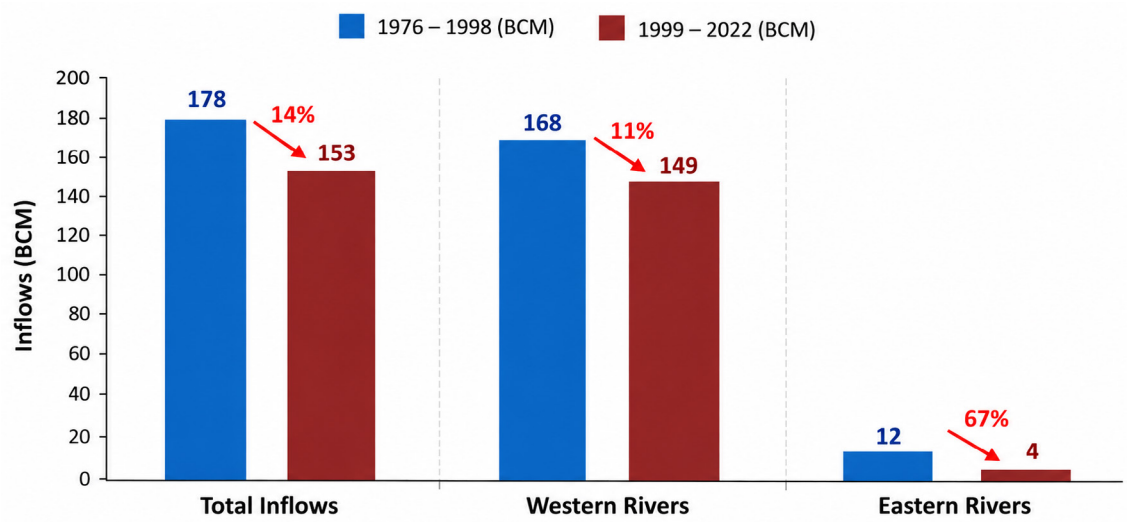


Figure 2. Average annual inflows to the Indus River System, 1976–1998 and 1999–2022.

Source: Authors' analysis of IRSA river-inflow records.

The changes vary among rivers and periods and should not be attributed to a single cause. Studies find interacting factors including precipitation, snow and glacier melt, global warming, hydrological drought and upstream water development (Sharif et al., 2013; Yaseen et al., 2022; Ashraf, 2019; Moorthy and Bibi, 2023; Taraky et al., 2024). For decision makers, the key message is simple; "Past averages should not be assumed to represent a fixed level of water availability. Planning should consider changing flows and increasing uncertainty".

Groundwater is invisible but equally important to country's water security. It has progressively changed from a supplementary source to an integral part of the water supply. Groundwater supplies over 50% of agricultural water, 90% of rural domestic water, 70% of urban water and 100% of industrial water nationally. It also provides an important buffer when canal water and rainfall are insufficient (Qureshi and Ashraf, 2019; Lytton et al., 2021).

Groundwater development has resulted due to the expansion and intensification of irrigated agriculture. The IBIS, originally designed for around 67% cropping intensities, now supports cropping intensities exceeding 150% in many areas, mainly through groundwater augmentation. Private tubewells have helped farmers meet seasonal and local shortages in canal water supplies. However, intensive abstraction has also contributed to falling groundwater levels and increasing pumping costs, while salinity and contamination constrain groundwater use in many locations (Qureshi et al., 2010; Lytton et al., 2021; Ashraf, 2025).

Groundwater conditions vary considerably across the country. Punjab has extensive alluvial aquifers closely linked with recharge from irrigation network (Figure 3) but faces depletion and localized salinity. Much of Sindh's groundwater is brackish, while coastal areas also face high salinity risks. Groundwater stress is particularly severe in several basins of Balochistan, alongside the decline of traditional Karez systems. Khyber Pakhtunkhwa has different mountain and piedmont aquifer systems, with localized groundwater decline (Ashraf and Sheikh, 2017; Lytton et al., 2021; Arshad et al., 2023).

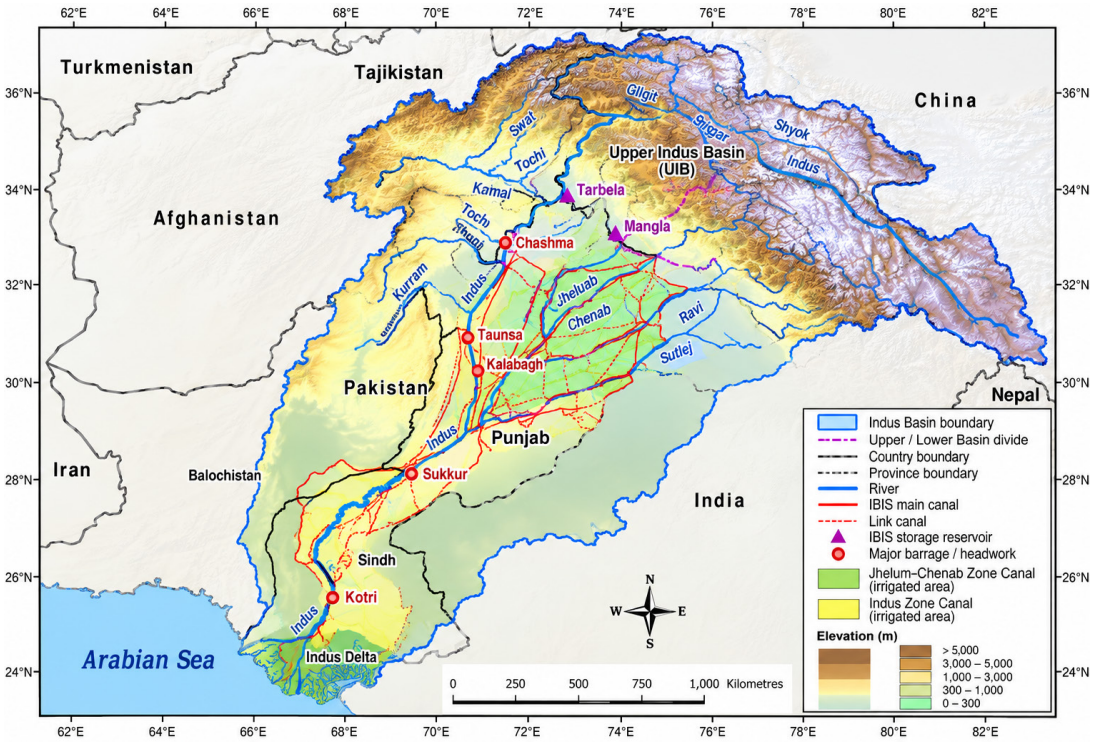


Figure 3. The Indus Basin Irrigation System, showing major rivers, reservoirs, irrigation infrastructure and management zones in Pakistan.

Source: Ahmad et al., 2021.

1.3 Changing water availability and growing demand

Pressure on water resources comes from both sides of the water balance; variable/uncertain availability and continuous growing demand. Agriculture remains by far the largest water user, whereas municipal and industrial requirements are also increasing with population growth, urbanization and economic activity.

FAO AQUASTAT data show that agricultural water withdrawals increased from 151.9 BCM in 1992 to about 172.4 BCM in 2022, while municipal withdrawals increased from 2.9 BCM to about 9.7 BCM over the same period (Figure 4). These withdrawals include water supplied from both surface and groundwater sources and should therefore not be directly compared with river inflows only. Instead, they demonstrate the scale of water use and Pakistan's dependence on the interconnected surface and groundwater system.

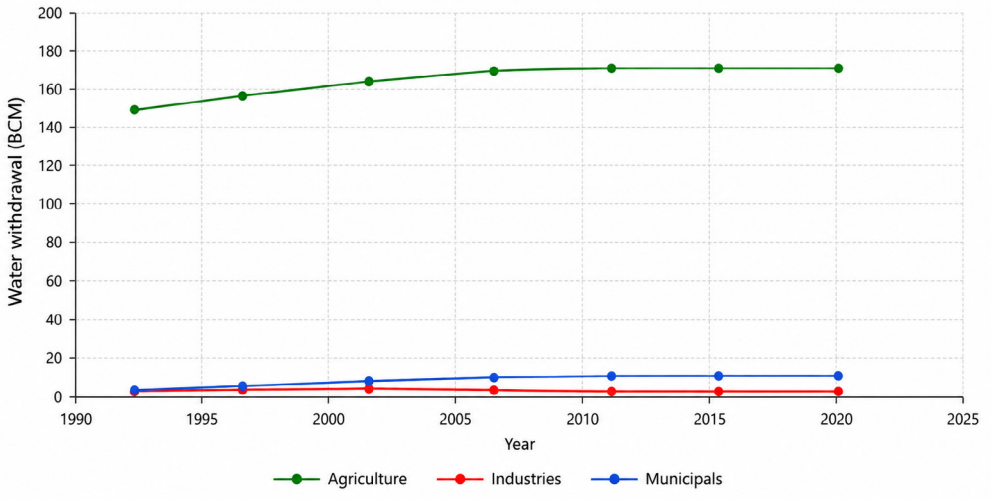


Figure 4. Sectoral water withdrawals in Pakistan, 1992–2022.

Source: FAO AQUASTAT.

Future water demand is also projected to increase across major sectors. Amir and Habib (2015) projected gross demand to rise from 163 BCM in 2015 to about 230 BCM by 2050 under a business-as-usual scenario, with higher demand under warmer climate scenarios. Another assessment reported by UNDP (2017) projected demand for agriculture, industry and municipal uses at 183.2 BCM under moderate demand management, compared with 219.6 BCM under a climate-change scenario by 2050. These projections differ in their assumptions and methods, but both point to increasing pressure on the existing water resources and the need to manage available water more effectively.

1.4 One Water System: From resources to governance

Water is often divided into categories for administrative convenience—surface water, groundwater, irrigation water, drinking water, wastewater, stormwater and environmental water. Different institutions are responsible for each category. In nature, however, these are not separate waters; they are different components of the same water cycle. Rain and snow contribute to rivers and aquifers; rivers and canals recharge groundwater; groundwater contributes to rivers s base flow and supports water supplies; water used by farms, cities and industries returns to the system through drainage, seepage and wastewater; and upstream interventions influence wetlands, floodplains, deltas and eventually the entire ecosystem.

This understanding is increasingly reflected internationally through the 'One Water Approach'. One Water treats water in its different forms and uses as parts of an interconnected system and seeks to manage them together rather than through isolated sectors. Closely related approaches include Integrated Water Resources Management (IWRM) and source-to-sea management, which recognizes that activities happening upstream can influence water quantity, quality, ecosystems and communities far downstream. International experience increasingly emphasizes that managing these connections requires integration not only within the physical water system, but also among the institutions and sectors responsible for managing it (Granit et al., 2017; US Water Alliance, 2016; FAO, 2020).

For the Indus Basin, the extensive irrigation network and the aquifer beneath it function together: seepage from rivers, canals and irrigated fields contributes to groundwater recharge; while groundwater pumping supplements canal water supplies and provides an important buffer when surface-water availability is insufficient. Thus, the decisions affecting one part of this system can have consequences elsewhere. Excessive pumping can diminish groundwater reserves; and untreated wastewater and agricultural drainage can transfer pollution through rivers, drains and aquifers. The World Bank's assessment of groundwater in the Indus Basin similarly emphasizes the close relationship between surface-water irrigation and groundwater recharge and abstraction (Lytton et al., 2021).

The same principle extends beyond surface water and groundwater. Water originating in the mountains moves through rivers, reservoirs, irrigation systems, farms and cities before reaching—or being consumed before reaching—wetlands, floodplains, the Indus Delta and the Arabian Sea (Figure 5). Water quantity and quality and ecosystem health are therefore connected from source to sea. Managing one part without considering its effects on the others can shift problems rather than solving them (Granit et al., 2017).

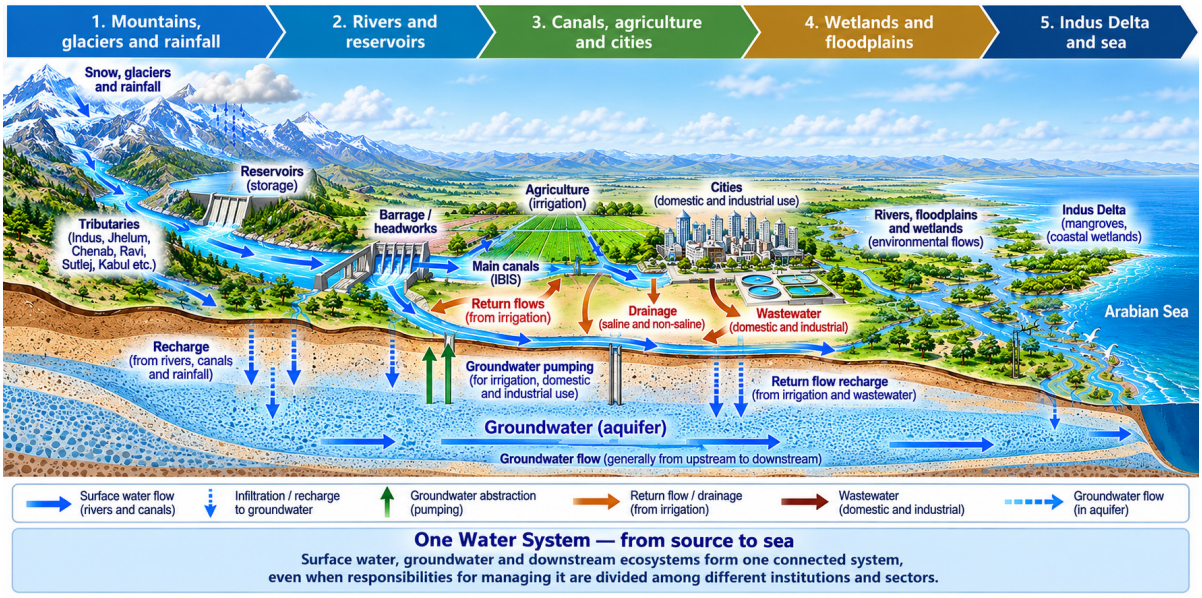


Figure 5. One Water System—from source to sea.

Source: Authors' conceptualization based on Granit et al. 2017.

> **Key message:** *Water functions as one interconnected system, even when it is managed through separate sectors and institutions.*

1.5 From water development to managing scarcity and uncertainty

Pakistan's water-development history has been shaped by major investments in reservoirs, barrages, canals and drainage systems that enabled the expansion of irrigated agriculture and supported national socio-economic developments. For decades, increasing water requirements were addressed largely by expanding and improving supply—storing, diverting, conveying and developing water for agriculture and other uses. These investments remain essential, but the context in which they operate has now changed.

Population growth, urbanization and increasing demands from agriculture, cities, industry and energy are placing greater pressure on available water. Groundwater stress, pollution and ecosystem degradation add further constraints, while the variability discussed earlier means that historical river-flow averages cannot be assumed to represent a fixed level of future water availability. Pakistan therefore faces the combined challenge of developing water resources where appropriate, using existing supplies more efficiently, and managing increasing competition and uncertainty (Ashraf, 2025; Durrani, 2026).

Climate variability and change further complicate this challenge. The country must manage both; too little and too much water. Droughts and shortages can constrain agriculture, water supply and ecosystems, while floods can cause widespread human and economic losses. The 2022 floods, for example, affected about 33 million people and caused an estimated US$14.9 billion in damages and US$15.2 billion in economic losses (Government of Pakistan, 2022) besides losing huge volume of freshwater. These contrasting risks underline the need to manage water security under conditions of increasing variability and uncertainty.

Such conditions raise questions that infrastructure alone cannot answer: How to manage water when supplies are limited? How much groundwater can be abstracted sustainably? How should water quality and ecosystems be protected? How should decisions in one part of the water system account for consequences elsewhere—and who is responsible and accountable for these decisions?

Engineering and infrastructure remain fundamental, but these questions also require informed decisions, clear rules, capable institutions, coordination and accountability. The challenge is therefore not only to develop water resources, but also to govern how best water is allocated, used, protected and managed under changing climatic and anthropogenic conditions.

2. Water Governance: Foundations and Functioning

2.1 Perspectives on water governance

Water problems do not arise only from lack of infrastructure or technical solutions. They can also result from ambiguous policies, laws, institutions and decision-making arrangements through which water is managed. Water governance therefore goes beyond any individual policy, law, institution or strategy. It concerns the rules, processes and relationships through which decisions about water are made, implemented and reviewed (Bevir, 2012; OECD, 2015; Soomro et al., 2023).

To put it in simple way: water governance determines who gets water, when and how; who makes decisions; who is responsible for implementation; and who is accountable for the outcomes. It includes the political, social, economic and administrative arrangements that influence water use and management, as well as the relationships among governments, institutions, water users and other stakeholders (OECD, 2015).

However, what makes governance work in practice? Is having a sound policy enough? Is establishing an institution enough? Is collecting good data enough? Each is necessary, but none can deliver results in isolation. Using knowledge and information, policies and laws can be translated into action by capable institutions. Finance, professional skills and operational capacity must support implementation. Water users and other stakeholders need meaningful opportunities to participate, while monitoring and accountability are needed to determine whether rules are followed and intended results are achieved. As conditions change, the system must also be able to learn from experience and adjust its decisions. These requirements can be summarized through eight essential elements of water governance (Table 1).

Table 1. Essential elements of water governance.

Governance element	Main role
Policy and law	Set direction, rights, responsibilities and rules
Institutions	Transform policies and laws into decisions and coordinated action
Knowledge and data	Provide evidence for planning and decisions
Finance and capacity	Provide the resources, skills and capability to act
Implementation	Transform policies, plans and decisions into action
Stakeholders	Bring users, communities, private sector and other interests into decisions and shared responsibility
Monitoring and accountability	Keep the progress and institutions on track, identify whether the intended results are achieved
Learning and adaptation	Use experience and new information to improve future decisions

These eight elements are not proposed as another rigid and isolated governance framework. They provide a simple way to understand the main requirements of a functioning governance system and, more importantly, to examine how those requirements work together. A country may have policies, laws, institutions, technical expertise and infrastructure and still experience weak governance if these elements operate largely in isolation. The elements pointed out in this chapter provide the basis for examining what is needed to strengthen water governance in practice.

This need for connection is particularly important in water governance because water does not follow administrative or sectoral boundaries. Decisions about irrigation, groundwater, drinking water, wastewater, flood management, ecosystems and land use can affect one another. Governance therefore provides the arrangements through which different responsibilities, institutions and interests can work together while balancing social, economic and environmental needs. Figure 6 provides a simple illustration of how governance elements may be present but function weakly when the connections among them are incomplete.

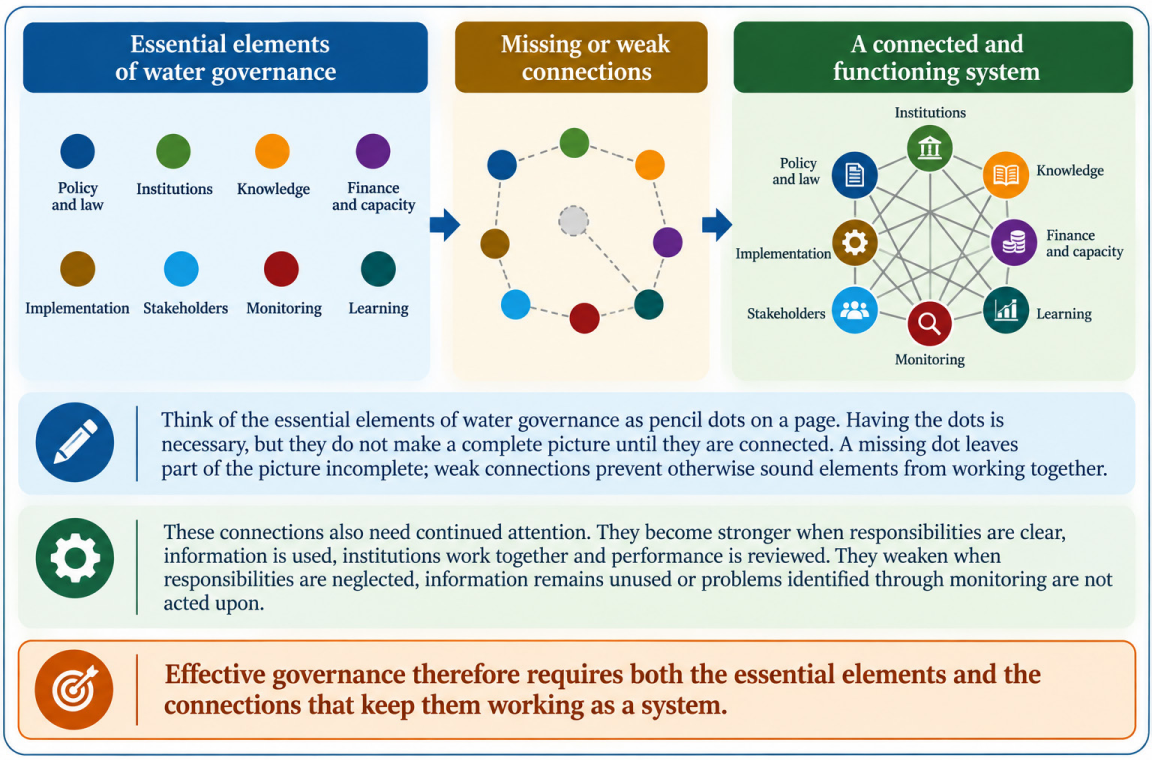


Figure 6. Connecting the missing dots.

2.2 From policy to practice: Governance as an integrated process

Policies and laws establish intentions, priorities and rules, but their real value depends on what happens after they are adopted or implemented. How does a policy become action? And how do we know whether that action has produced the intended result? Responsibilities must be clear, institutions must have the authority and capacity to act, resources must be available, decisions must be informed by reliable knowledge, and implementation must be monitored and evaluated. Governance is therefore best understood as a continuous process connecting knowledge and policy with decisions, actions and outcomes.

The process begins with understanding the water resource, the needs it must serve and the problems to be addressed. Scientific knowledge, monitoring and practical experience inform policies, plans and rules. Responsibilities are then assigned to institutions which need appropriate authority, skills and financial resources to act. Policies and plans are translated into allocation decisions, regulation, infrastructure, services and other actions. Monitoring shows what has happened and whether the intended results are achieved.

Nevertheless, should the process end once a policy or programme has been implemented? Implementation itself generates information and experience. Together with monitoring and evaluation, this needs to feed back into future decisions. What worked well can be continued or strengthened; what does not work can be corrected; and policies and management practices can be adjusted as water availability, demand and other conditions change. Learning and adaptation are therefore part of governance itself, not activities that begin only after something has gone wrong. Figure 7 illustrates the cycle—from knowledge to outcomes, and then back through learning and adaptation to inform future decisions.

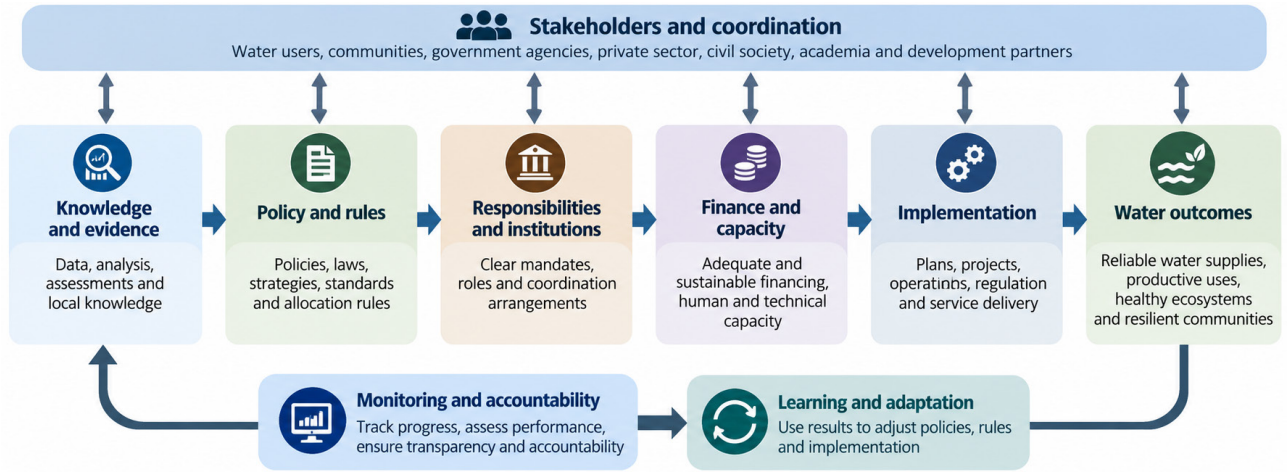


Figure 7. Water governance: from knowledge to outcomes and back.

> **Key message:** *Governance succeeds when policy, institutions, knowledge, resources, implementation and accountability function as a connected and adaptive process.*

These connections operate in different directions. Vertical connections link policy and decision-making with implementation and bring information on results back to decision makers. Horizontal connections enable institutions, sectors, jurisdictions and stakeholders to work together where responsibilities overlap or where decisions by one sector or actor affect others.

Moving from policy to practice therefore does not necessarily require continuously creating new policies, institutions or programs. In many situations, progress can come from making existing arrangements work better together: connecting knowledge with decisions, responsibilities with authority and resources, implementation with monitoring, and monitoring with corrective action and learning.

2.3 Missing links in water governance

Consider some practical questions. Does a policy clearly identify who is responsible for implementing it? Does the institution responsible have the authority, appropriate staff, information and financial resources needed to act? Does information collected through monitoring reach those making decisions? And when problems are identified, does corrective action follow?

A policy may establish an objective without clearly assigning responsibility for implementation. An institution may have responsibility but lack the authority or resources needed to act. Data may be collected but not used in decisions. Regulations may exist without adequate monitoring or enforcement. Stakeholders may be consulted without their knowledge or concerns influencing decisions. Monitoring may repeatedly identify problems without triggering corrective action. These may appear to be separate governance failures, but often they reflect weak or missing links within the same governance process (Table 2).

Table 2. Examples of missing or weak governance links.

Weak or missing connection	Likely consequence
Policy ↔ implementation	Commitments remain largely on paper
Responsibility ↔ authority and resources	Institutions are expected to deliver but cannot act effectively
Knowledge ↔ decisions	Information is collected but insufficiently used
Institution ↔ related institution	Decisions become fragmented or responsibilities overlap

Continued >>>

Weak or missing connection	Likely consequence
Regulation ⟷ monitoring and enforcement	Rules exist but compliance remains weak
Finance ⟷ responsibilities and priorities	Essential functions remain underfunded or spending does not support intended outcomes
Stakeholders ⟷ decisions	Participation has limited influence on implementation
Monitoring ⟷ learning and corrective action	Problems are identified but continue to recur

The consequences of these weak connections eventually appear in the water system itself: inefficient or inequitable allocation, uncontrolled abstraction, groundwater decline, deteriorating water quality, poorly maintained infrastructure, ecosystem degradation and weak preparedness for floods and droughts. Over time, persistent governance weaknesses can also reduce confidence among institutions and water users.

The distinction between a missing element and a missing link is therefore important. If something is not working, is the necessary governance function absent—or does it already exist but fail to connect effectively with the rest of the system? If an essential function is genuinely absent, it may need to be established. But where the necessary policy, institution or technical capability already exists, creating another structure may not solve the problem. Rather this may create another missing dot. The first step should therefore be to determine whether existing elements have clear responsibilities, adequate capability and effective connections with one another.

3. Water Governance in Pakistan: Progression and Current Landscape

3.1 Water governance development

The present water governance system did not emerge from a single design. It developed progressively in response to changing needs—first to operate large irrigation systems, later to develop major water infrastructure and manage interprovincial water allocation, and more recently to address groundwater, water quality, environmental sustainability, climate risks and growing competition among water users.

The foundations of the system were laid during the colonial period, when water governance mainly centered around the development and operation of large canal irrigation networks. The Canal and Drainage Act of 1873 provided the legal basis for canal administration and gave irrigation departments a central role in surface-water delivery. This created strong engineering and administrative capacity for irrigation management, while groundwater regulation, environmental protection, broader stakeholder participation and integrated resources water management remained largely outside its mandate.

After independence, Pakistan retained much of this colonial legacy while developing institutions for emerging national priorities. The establishment of the Water and Power Development Authority (WAPDA) in 1958 strengthened national capacity for major water and hydropower infrastructure. The 1991 Water Apportionment Accord, followed by the establishment of the Indus River System Authority (IRSA) in 1992, provided arrangements for sharing Indus Basin waters among the provinces. These developments addressed important needs, but institutions continued to evolve largely around particular functions, sectors and administrative responsibilities.

Over time, country's water challenges became complex. Increasing dependence on groundwater, expanding urban and industrial demand, deteriorating water quality, environmental pressures, floods and droughts, and climate-related risks required attention beyond conventional canal irrigation and infrastructure development. Responsibilities consequently became distributed across irrigation, agriculture, environment, local government, water and sanitation agencies (WASAs), disaster-management organizations, research institutions and other related bodies. The system gained considerable institutional experience and technical capability, but many of its components developed independently.

More recent national and provincial reforms reflect a gradual shift towards integrated water governance. The National Water Policy 2018, together with provincial water policies, Water Acts and IWRM strategies, has broadened the governance agenda to include groundwater sustainability, environmental protection, water quality, stakeholder participation, improved information systems, equitable allocation and climate resilience. This does not replace the need for effective irrigation management. Rather, it places irrigation within the wider water system on which agriculture, cities, industries, communities and ecosystems depend.

The present governance landscape therefore reflects successive stages of development rather than a single institutional design. Institutions and arrangements created for irrigation, infrastructure and interprovincial water sharing now coexist with newer policies and approaches addressing a broader range of water-security concerns. Figure 8 shows this progression—from canal administration and infrastructure development towards a more integrated approach to water governance. The resulting challenge is not simply to add more institutions, but increasingly to ensure that arrangements developed at different times and for different purposes can work together effectively.

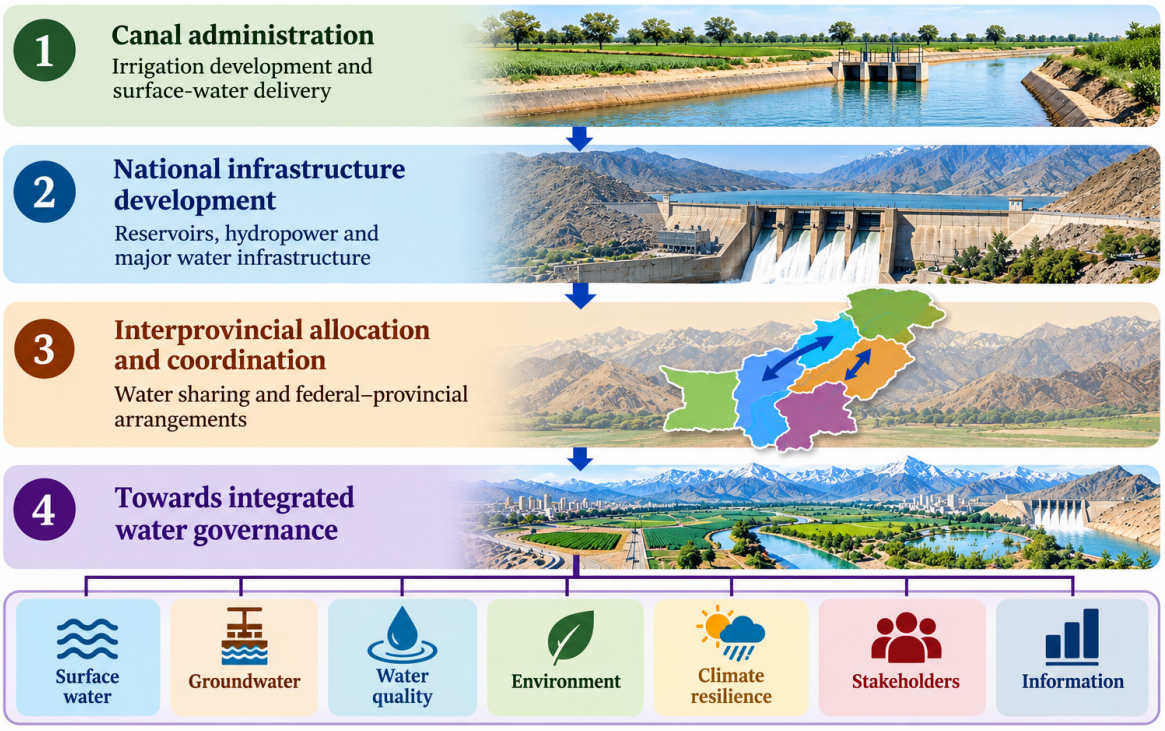


Figure 8. Evolution of water governance in Pakistan.

3.2 Policy and legal framework

Substantial water policy and legal framework at federal and provincial levels have been developed. These combine older arrangements governing irrigation and interprovincial water allocation with newer policies and legislation that view water more broadly as an economic, social and environmental resource.

At the national level, the National Water Policy 2018 provides overarching policy direction for water security. It recognizes the respective roles of federal and provincial governments and addresses water conservation, basin-level planning, groundwater, climate change, water quality, stakeholder participation, information management, demand management, financial sustainability and institutional capacity.

The provinces have progressively developed their own policies and legal arrangements. Punjab Water Policy 2018 and the Punjab Water Act 2019 provide policy and statutory foundations for integrated water management and regulation. The Khyber Pakhtunkhwa Water Act 2020, together with its IWRM Strategy 2019, provides legal and strategic basis for integrated planning, regulation and institutional coordination. Sindh Water Policy 2023 broadens the governance perspective across surface water, groundwater, wastewater, wetlands, the Indus Delta and other water-dependent systems. Balochistan IWRM approach places particular emphasis on groundwater sustainability, watersheds and water management under increasing water scarcity.

Together, these frameworks show a significant broadening of Pakistan's water-governance agenda. Policy attention now extends beyond infrastructure development and canal-water distribution to groundwater regulation, equitable allocation, stakeholder participation, regulatory oversight, information systems, financial sustainability, climate resilience, environmental protection, water quality, conservation, demand management, and wastewater management and reuse.

However, the existence of a policy or law does not by itself mean that its provisions are fully operational. The governance landscape includes instruments with different legal status and at different stages of implementation. Policies and strategies establish direction; legislation provides statutory authority; and implementation may require supporting rules, institutional arrangements, financial and human resources, monitoring and enforcement mechanisms. It is therefore important to distinguish between what policies intend, what laws authorize, and what has become operational in practice. Table 3 summarizes the major national and provincial policy and legal frameworks and the broad governance direction they provide.

Table 3. Major water-policy and legal frameworks.

Level/jurisdiction	Major framework	Broad governance direction
Federal	National Water Policy 2018	National water-security direction and integrated governance
Federal/ interprovincial	Water Apportionment Accord 1991; IRSA Act 1992	Interprovincial surface-water allocation and coordination
Punjab	Water Policy 2018; Water Act 2019	Integrated water management and regulatory framework
Khyber Pakhtunkhwa	Water Act 2020; IWRM Strategy, 2019	Integrated planning, regulation and institutional coordination
Sindh	Water Policy 2023	Integrated management across surface water, groundwater and wider water-dependent systems
Balochistan	IWRM Policy 2024	Groundwater, watershed management and water management under scarcity

The important question is therefore not simply whether policies and laws exist, but whether their provisions are translated into practice through clear responsibilities, workable rules, capable institutions, adequate resources and sustained implementation.

3.3 Institutional roles and responsibilities

Water-governance responsibilities are distributed across different levels of government and many institutions. This reflects the nature of the water system itself. Rivers and major infrastructure cross provincial boundaries, while irrigation, groundwater, drinking water, sanitation, environmental protection and service delivery require action closer to where water is managed and used. The resulting system combines national coordination, provincial resource management and regulation, and local service delivery.

At the federal level, responsibilities principally concern matters of transboundary, national and interprovincial importance. The Ministry of Water Resources (MoWR) provides federal policy and coordination functions. The National Water Council and its Steering Committee provide high-level policy and coordination arrangements under the National Water Policy. Water and Power Development Authority has a major role in water-resources infrastructure development, while IRSA administers interprovincial surface-water allocation under the 1991 Water Apportionment Accord. Other federal institutions contribute specialized functions: Pakistan Council of Research in Water Resources (PCRWR) undertakes water-resources research, generate and disseminate knowledge, Pakistan Meteorological Department (PMD) provides meteorological and climate information, and National Disaster Management Authority (NDMA) coordinates national disaster-risk management and response.

At the provincial level, much of the responsibility for water-resource management and regulation rests within provincial jurisdictions. Irrigation or water-resources departments remain central to irrigation, drainage and surface-water management. Groundwater, agriculture, drinking-water supply, sanitation, wastewater, water quality, environmental protection and disaster management involve additional departments, authorities and service providers. Provincial water governance therefore depends on cooperation among several institutions rather than a single department.

At the local and service-delivery level, responsibilities become more dispersed. Local governments, public health engineering departments, WASAs and other designated service providers have roles in municipal water supply, drainage, sanitation and wastewater services. Water users, farmer organizations and community institutions also participate in aspects of irrigation and local water management, although their roles and participation vary across the institutions.

This distribution of responsibilities is not inherently a governance weakness. Different functions appropriately require different institutions and levels of government. Problems arise when responsibility is separated from the authority, information, finance or accountability required to carry it out, or when decisions made by one institution are poorly connected with others.

Effective governance therefore does not require placing all water functions under one organization. It requires clarity about who is responsible for what, what authority and resources accompany that responsibility, and how

institutions exchange information, coordinate decisions and remain accountable for results. Figure 9 summarizes these responsibilities across federal, provincial and local/service levels and highlights the connections needed among them.



Figure 9. Institutional roles and responsibilities in water governance system.

3.4 Towards integrated water governance

Pakistan's water-governance system is often described mainly through its weaknesses. However, important efforts have also been made to strengthen the system. The governance agenda has broadened beyond its traditional focus on irrigation infrastructure and surface-water distribution, with increasing attention to integrated resource management, regulation, information, groundwater and environmental sustainability. This progression can be seen across five broad areas: policy direction, legal and regulatory reform, groundwater governance, information and monitoring, and the wider water-security agenda (Figure 10).

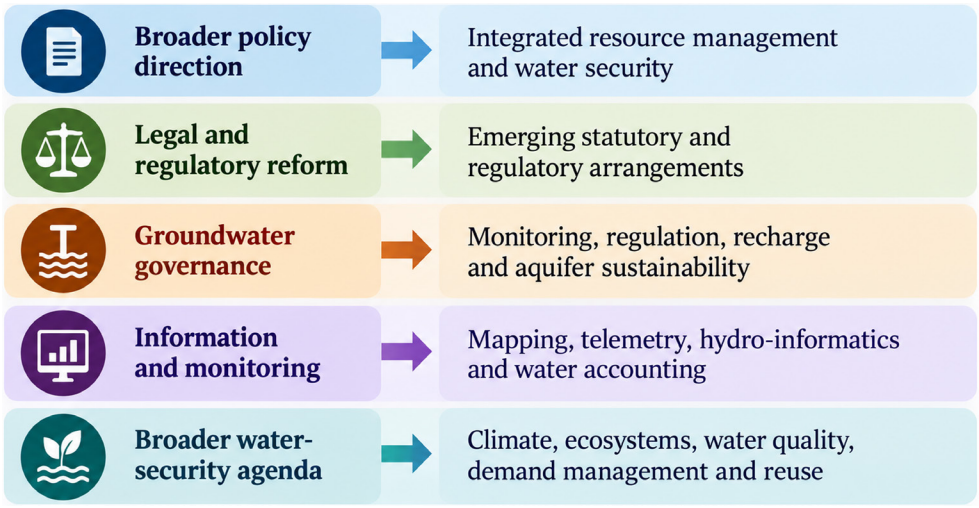


Figure 10. Advancing towards integrated water governance.

One important advancement is the development of a broader policy framework. The National Water Policy and subsequent provincial policies, Water Acts and IWRM strategies increasingly recognize integrated water-resources management, groundwater sustainability, equitable allocation, stakeholder participation, environmental protection and climate resilience. Their legal and operational development differs, but these issues are now more clearly reflected in policy direction than in the traditional irrigation-centered model.

Progress is also visible in institutional and regulatory reforms. National and provincial councils, commissions and regulatory arrangements have been established or proposed to improve strategic direction, coordination and oversight. Punjab and Khyber Pakhtunkhwa have statutory water frameworks, while other provinces are developing or strengthening their respective arrangements. These reforms indicate movement towards governance that extends beyond irrigation administration alone.

A further change is the growing recognition of groundwater as a resource requiring active governance. Provincial frameworks increasingly address groundwater assessment, monitoring, regulation, licensing, recharge and conjunctive management. Groundwater governance is consequently becoming more visible within national and provincial policy arrangements, although implementation remains at different stages of development.

Water information and monitoring are receiving greater attention as well. Federal and provincial institutions generate hydrological, meteorological, groundwater, water-quality and irrigation-system information, while newer policies increasingly call for integrated information systems, telemetry, water accounting and decision-support tools. International development partners and research organizations have also supported this progression through technical assistance, information systems, groundwater assessments, institutional strengthening and capacity development. The direction of reform is therefore moving beyond simply collecting data towards using information more systematically for water decisions.

The governance agenda has also widened to include climate resilience, environmental sustainability, water quality, conservation and demand management, and wastewater treatment and reuse. This broadening is important as it reflects growing recognition that water security cannot be achieved through infrastructure development and supply management alone.

These developments should not be interpreted as evidence that integrated water governance has been achieved. Rather, they show that many of the necessary foundations are now present or emerging. The challenge is to translate this broader policy direction, institutional development and technical capability into sustained implementation and stronger connections across the governance system.

3.5 From policy to practice: Governance gaps

The preceding sections demonstrate the essential elements of a water-governance system in the country: policies and laws, established institutions, technical organizations, infrastructure, regulatory provisions, monitoring arrangements and an increasingly broad approach to water management. However, the presence of these elements does not necessarily mean that they function as a system. The assessments behind this report indicate that some persistent weaknesses lie in the connections among governance functions and institutions, rather than in the complete absence of those elements. Figure 11 provides an overview of these weak connections.

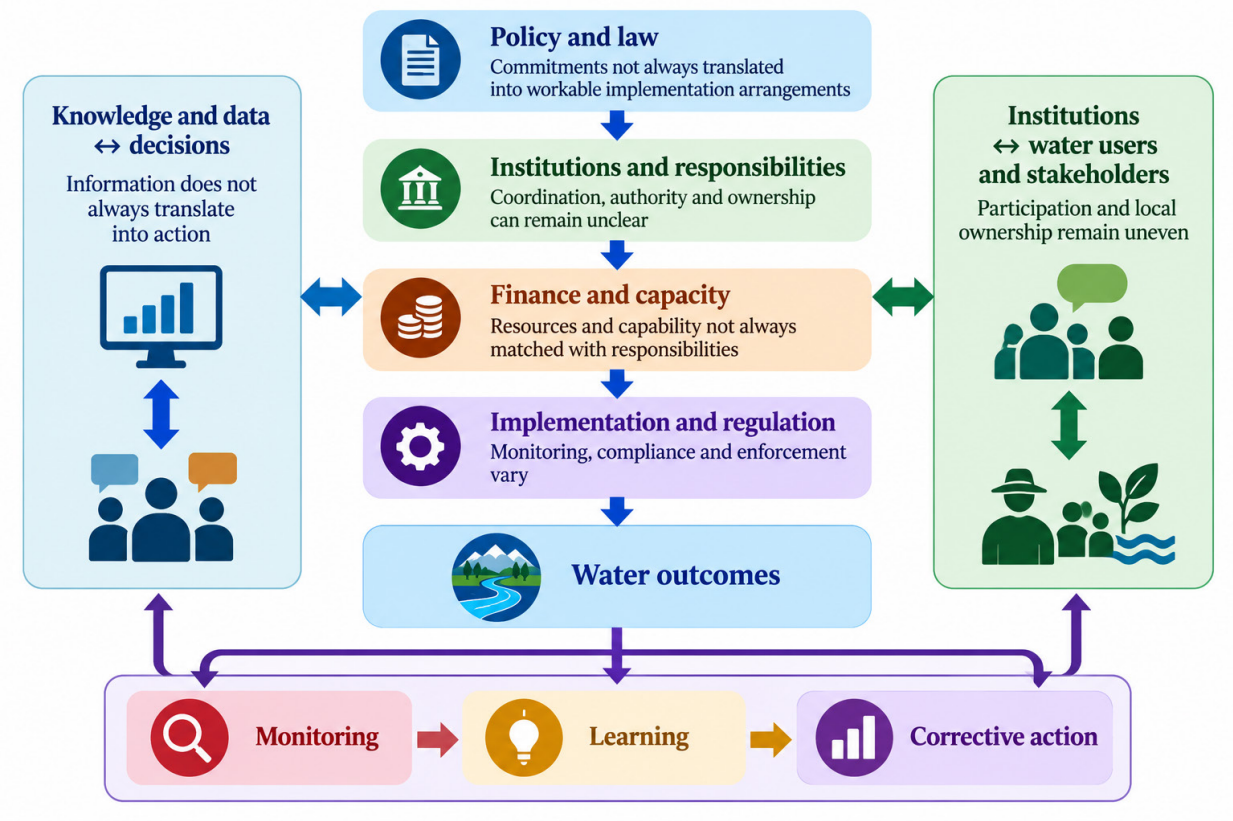


Figure 11. Weak governance connections.

A major gap remains between policy and implementation. National and provincial policies increasingly set objectives for integrated water-resources management, groundwater sustainability, equitable allocation, environmental protection and climate resilience. However, policy commitments are not always accompanied by supporting rules, clearly assigned responsibilities, adequate and regular financial arrangements, institutional capacity and sustained implementation mechanisms. The result can be a clear disconnect between what policy intends and what institutions can deliver.

A second gap occurs among institutions. Water responsibilities are spread across federal and provincial governments and among irrigation or water-resources departments, agriculture, environment, local government, public health engineering, regulatory bodies, technical organizations and service providers. Such distribution is necessary, but overlapping responsibilities, unclear institutional ownership and inconsistent coordination can weaken collective action.

The connection between knowledge and decisions also remains incomplete. Federal and provincial institutions generate substantial water-related data, but monitoring systems, standards and knowledge platforms differ among organizations. Limitations in data sharing, validation, integration and interoperability can interrupt the data-to-decision chain through which observations become useful information, knowledge and management action. The issue is therefore not simply whether data exist but whether it reaches the right place, at the right time and in a usable form.

Similar gaps occur between regulation and enforcement. Policies and legal frameworks increasingly recognize licensing, abstraction control, water rights, groundwater regulation and compliance monitoring. However, regulatory and operational capacity varies across jurisdictions, and some arrangements remain under development. Rules have limited influence on actual water use when monitoring, compliance and enforcement mechanisms are weak.

Another gap lies between infrastructure and sustainable service delivery. Pakistan has extensive experience in developing and operating water infrastructure, but sustainable service delivery also requires maintenance, asset management, adequate financing, performance monitoring and accountability. Municipal water supply, drainage, wastewater and reuse illustrate this challenge more clearly because responsibilities are dispersed among several institutions and jurisdictions.

Finally, governance requires stronger connections between institutions and people. Policies increasingly recognize stakeholder participation, but the role of local governments, communities and water users in decision making, monitoring and shared responsibility remains limited. Participation is most useful when it influences decisions and strengthens ownership, compliance and accountability rather than being only a consultation exercise.

4. Strengthening the Essential Elements of Water Governance

Chapter 2 identified eight essential elements of a functioning water-governance system: policy and law, institutions, knowledge and data, finance and capacity, implementation, stakeholders, monitoring and accountability, and learning and adaptation. This chapter builds on these elements by examining what is needed to strengthen them and improve their connections.

The focus is not simply on whether policies, institutions, information and other arrangements exist, but on whether responsibilities are clear, institutions are capable, knowledge informs decisions, adequate resources support implementation, regulation and accountability are effective, participation is meaningful, and monitoring leads to learning and adaptation. As discussed earlier, strengthening these elements does not necessarily require creating new institutions. In many cases, the priority is to improve the clarity, capability and functioning of existing arrangements, as well as the connections among them and how these elements need to operate across the interconnected water system through a One Water perspective.

4.1 Transparent rules and responsibilities

Effective water governance begins with clarity about who is responsible for what, what authority each institution has, and how related responsibilities are connected. Policies provide overall direction, but implementation depends on laws, regulations, institutional mandates and operating procedures that translate policy directions into action.

Where responsibilities are distributed among institutions, their respective roles and relationships need to be clearly defined. Problems arise when responsibilities overlap without clear coordination, an important function lacks institutional ownership, or responsibility is assigned without the authority needed to act.

A workable institutional mandate should therefore establish the legal basis for action, functions and responsibilities, authority to act, and relationships with other responsible institutions. Where responsibilities are shared, it should be clear who leads, who supports, who implements, who provides information and who is accountable for results.

Transparency strengthens these arrangements. Responsibilities, decision procedures, standards, permits and regulatory requirements should be accessible and understandable to the institutions and people affected by them. This allows decisions and institutional performance to be understood, reviewed and, where necessary, questioned.

Rules also need to remain workable under changing conditions. Water availability, groundwater conditions, climate risks and competing demands are not static. Governance therefore requires sufficient certainty to establish responsibility and accountability, while allowing management decisions to respond to the changing circumstances.

> **Key message:** *Effective governance requires every important function to have clear ownership, adequate authority, transparent procedures and well-defined relationships with other responsible institutions.*

4.2 Capable institutions

Clear responsibilities achieve little unless the institutions responsible for them can deliver. Institutional capability depends on whether an organization has the authority, professional skills, operational capacity and resources needed to perform its assigned functions.

Pakistan already has an extensive institutional structure across federal, provincial and local levels. The priority should therefore be to determine whether the necessary governance functions are clearly assigned and effectively performed, rather simply assuming that every emerging water challenge requires a new institution.

This requires a function-based rather than organization-based view. Sustainable groundwater management, for example, requires assessment and monitoring, abstraction regulation, recharge management and links with surface-

water planning. Water-quality governance requires monitoring, standards, pollution control and enforcement. Water-information management requires the capacity to collect, validate, analyze and share information for decisions. The organizational location of these functions is less important than ensuring that they have clear ownership, adequate capability and effective connections with related functions.

Where important functions are weak, they can be strengthened within existing arrangements, reassigned where ownership is unclear, or connected through formal coordination where responsibilities are shared. New institutional arrangements may be justified where a genuine functional gap remains, but institutional creation should follow identification of the gap rather than substitute for it.

Institutional capability also depends on continuity. Monitoring, regulation, infrastructure operation and maintenance, planning and institutional learning are long-term responsibilities and cannot depend entirely on short-term projects. Multidisciplinary staffing, appropriate and timely recruitment, clear job responsibilities, professional development and institutional memory therefore directly affect the ability of institutions to deliver over time.

> **Key message:** *Institutional strength depends less on organizational size or the creation of new authorities than on the ability to perform necessary functions consistently, persistently and effectively.*

4.3 Knowledge for informed decisions

Water is not static in nature. It is dynamic and keeps on changing over time and space, both in terms of its quantity and quality. Therefore, knowledge about how much water is available, where it is, how its quantity and quality vary, who is using it and how effectively it is being used for informed decision making will have great consequences for its governance. Without reliable knowledge, decisions on water allocation, its regulation, infrastructure planning, groundwater management, drought preparedness and environmental protection cannot be made appropriately rendering weak water governance.

Pakistan already generates substantial water-related data through institutions responsible for hydrology, irrigation, groundwater, meteorology, agriculture, water quality, environment and research. The principal challenge is therefore not simply to generate more data, but to strengthen the data-to-decision chain. Data collected through different systems need appropriate standards, quality checking, sharing, integration and interpretation before they can effectively support decisions.

Data alone are not useful. These are discrete values that have different meanings to different users. Data become useful when it is verified, checked for its quality, converted into information and then to knowledge in a way that the decision makers can use it for better and informed decision making (Figure 12).

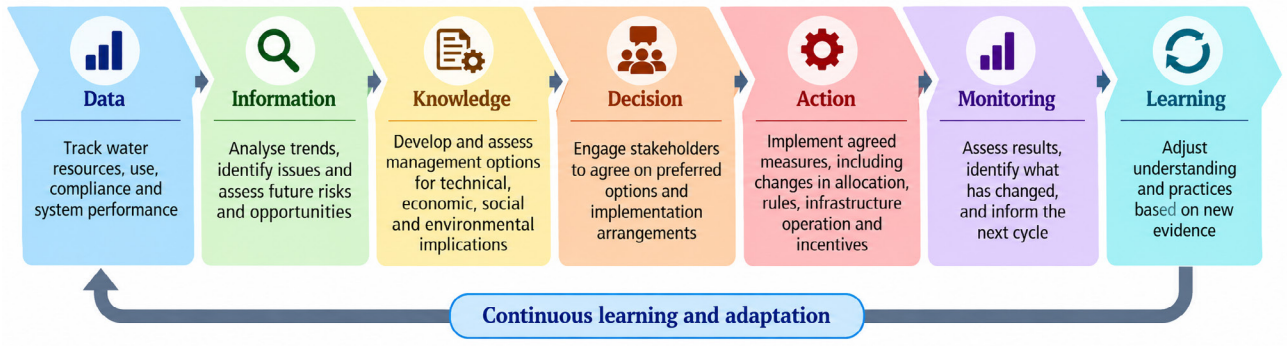


Figure 12. Continuous learning and adaptation cycle.

In fact, all these steps are forward and backward interconnected. A gap or disconnect anywhere along this pathway affects the overall water governance. For example, data may exist but remain dispersed among institutions, inaccessible to other users, used different standards, or insufficiently integrated to answer practical management questions.

Effective water governance also requires a broader and more integrated knowledge base. Decision makers need information on surface water, groundwater, water quality, water demand for different sectors, wastewater and other water sources, climate risks and ecosystem conditions. Bringing these different forms of information together can help

decision makers understand the wider consequences of water-management choices rather than considering each part of the system in isolation.

Knowledge should also flow in both directions. Scientific institutions provide monitoring, analysis and modelling, while farmers, service providers, water users and communities hold practical knowledge about local water conditions and service performance. Connecting scientific evidence with operational and local knowledge can improve the relevance of decisions and their implementation.

Accessible information on water availability, allocation, groundwater conditions, water quality and institutional performance can also strengthen accountability and informed participation. Information sharing is therefore part of governance itself, not merely a technical activity (Figure 13).

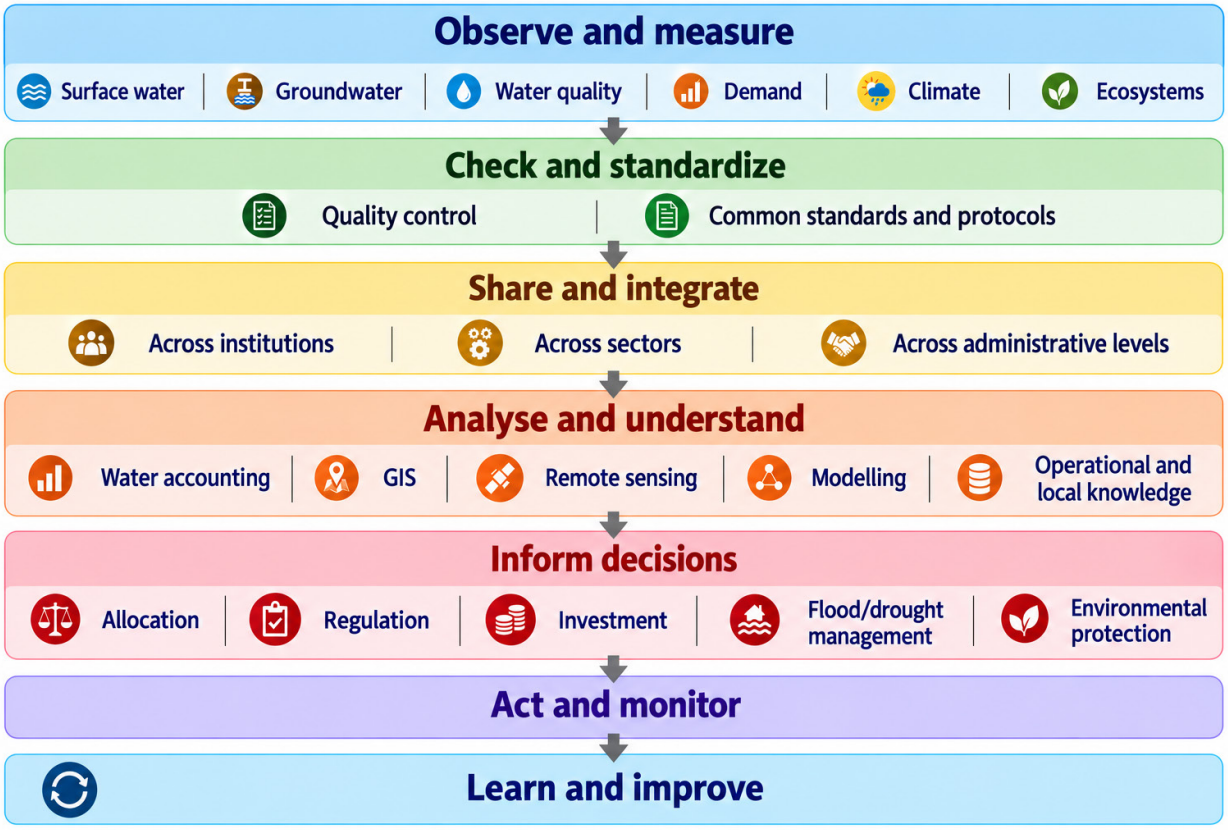


Figure 13. From water data to informed decisions.

4.4 Regulation and accountability

Policies provide direction, but effective governance requires rules and regulations that can be applied, compliance that can be checked, and institutions and users that are accountable for their actions. Regulation translates broad policy objectives into practical requirements for water allocation, abstraction, service delivery, water quality, pollution control and resource protection.

The current policies and legislation increasingly recognize water-use authorization, licensing, abstraction control, monitoring and enforcement. However, their institutional and operational development varies across jurisdictions. Groundwater illustrates the challenge more clearly. Establishing a licensing or regulatory requirement is the last step. Effective regulation also requires knowledge of who is abstracting groundwater, the condition of the aquifer (where are the hotspots and where are bright spots), whether abstraction complies with applicable requirements, and the ability to take corrective action where necessary. Effective regulation therefore requires a connected chain.

A license has limited value if it is not based on realistic groundwater conditions (aquifer characteristics, specific yield, recharge rates and sources, groundwater quality, abstraction rate etc.) and hence its compliance cannot be monitored. Similarly, monitoring has limited value if non-compliance does not lead to appropriate corrective action. Regulation therefore depends not only on having rules, but also on the practical capacity to administer, monitor and enforce them.

Regulation should also respond to changing resource conditions. Groundwater abstraction limits, allocation arrangements and environmental requirements need to remain connected with monitoring and scientific evidence. As water availability, aquifer conditions and competing demands change, regulatory decisions may need adjustment.

Accountability applies to the regulators (institutions), service providers as well as to the water users. Regulators, service providers and implementing agencies should be able to show what decisions were made, on what basis, whether agreed actions were carried out and what results were achieved. Transparent information and performance review therefore connect regulation with institutional accountability (Figure 14).

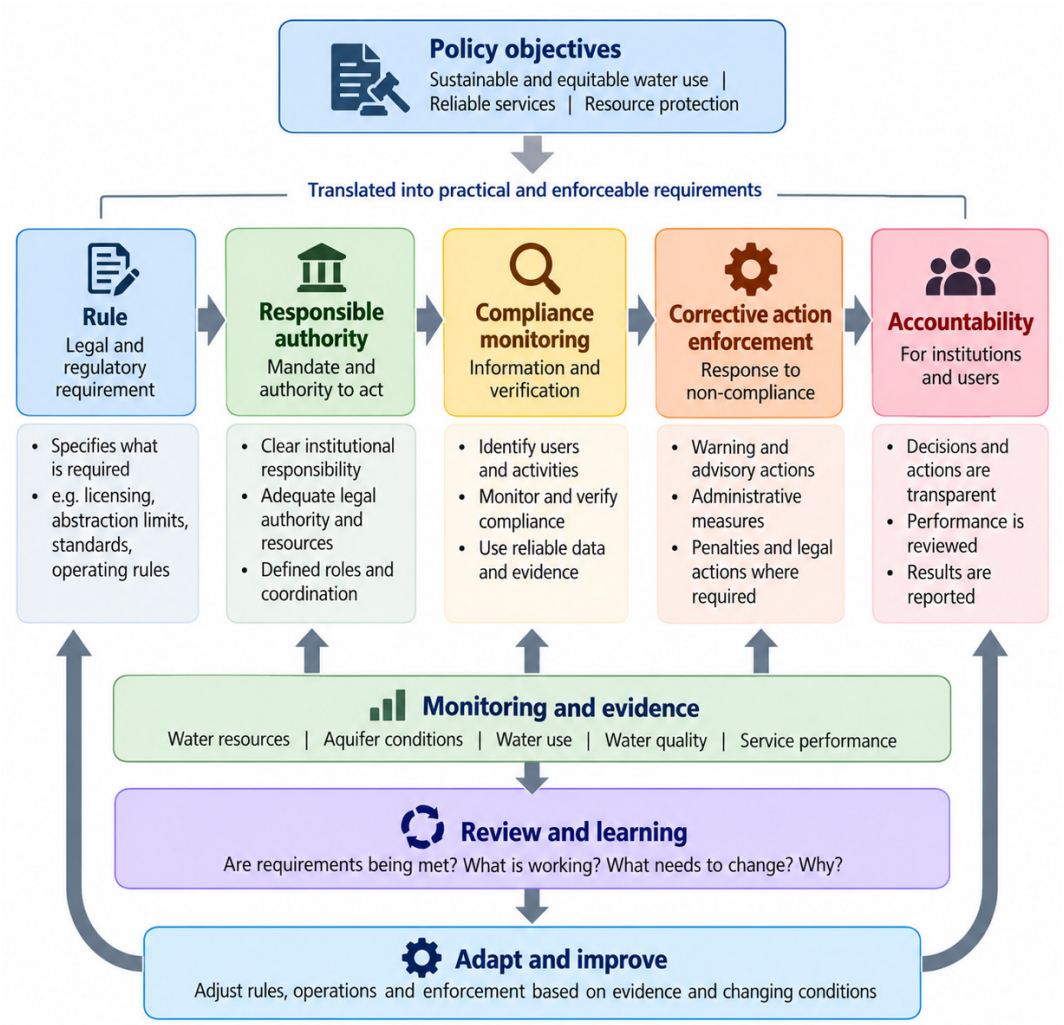


Figure 14. Water governance accountability cycle.

4.5 Sustainable financing and incentives

Water governance cannot function through policy commitments and institutional mandates alone. Responsibilities must be supported by the financial resources required to carry them out, while incentives should encourage institutions and water users to act consistently for sustainable water management.

Financial sustainability is broader than financing new infrastructure. It includes operation and maintenance, monitoring, regulation, information systems, professional capacity, resource protection and continued service delivery. Infrastructure without adequate maintenance can deteriorate; a regulator without sustained resources may be unable to monitor compliance; and an information system without continuing support for updating and technical capacity can become redundant over a short period of time.

The important question is therefore not simply how much budget is spent on water, but whether financing is aligned with responsibilities and intended outcomes. Institutions cannot reasonably be held accountable for groundwater monitoring, regulation, infrastructure maintenance or water services if their responsibilities are not supported by predictable resources.

Financial sustainability also requires a closer relationship between service delivery, service quality and cost recovery. This involves understanding what service is provided, what it costs, who benefits, what can reasonably be recovered from users, and what should remain publicly financed.

Cost recovery should not be understood simply to increase water charges. Water has social, economic and environmental functions, and users differ greatly in their ability to pay. Financing arrangements therefore need to balance financial sustainability with affordability, equity and the public interest. Public finance remains important for functions whose benefits extend beyond individual users, including resource monitoring, flood and drought preparedness, ecosystem protection, research and strategic infrastructure maintenance.

Financing also influences behaviour. Subsidies, tariffs, investment programs and other incentives can encourage conservation, efficient irrigation, groundwater recharge, wastewater reuse, pollution reduction and improved service performance—or, if poorly aligned, encourage excessive abstraction or inefficient use. Financing and incentives should therefore reinforce, rather than work against water-policy objectives (Figure 15).



Figure 15. Aligning financing, responsibilities and accountability.

> **Key message:** *Sustainable water governance requires financing not only infrastructure and projects, but also the institutions, services and management functions that must continue after projects completion.*

4.6 Participation and shared responsibility

Water decisions affect farmers, households, industries, communities and ecosystems. Sustainable governance therefore requires appropriate roles for those who use, manage, regulate and depend on water. National and provincial policy frameworks increasingly recognize participation by water users, communities, farmers, civil society, the private sector, research organizations and public institutions.

Participation, however, is more than consultation. Informing stakeholders after a decision has been made differs from involving them in identifying problems, considering options, implementing agreed actions or monitoring results following co-creation and co-design principles. Meaningful participation requires clarity about who participates, at what stage, for what purpose with what responsibility and carries what kind of takeaways.

Pakistan already has experience with farmer and water-user participation in irrigation management, while current policies and institutional arrangements provide for broader stakeholder involvement. The priority is therefore to strengthen these arrangements so that participation has a meaningful connection with decisions, implementation and monitoring.

The need for shared responsibility is particularly clear in groundwater management. Groundwater use results from large numbers of individual decisions by farmers, households, industries and service providers. Public institutions remain responsible for assessment, policy, regulation and protection of the public interest, but sustainable management also depends on how users respond to aquifer conditions, abstraction rules, recharge opportunities and incentives. Similar shared responsibilities arise in water conservation, pollution control, wastewater reuse, protection of local water sources and management of sustainable ecosystems.

Participation can also strengthen the knowledge base by connecting scientific evidence with the practical experience of farmers, utilities, water users and communities. As a result, the concept of citizen science is being recognized worldwide. This can improve understanding of local conditions, confidence building of the end users and the relevance of management decisions.

Trust develops when people can understand how decisions are made, what information is used, whether rules are applied fairly and whether institutions follow through on agreed actions. It cannot be created through consultation or awareness campaigns alone. Transparent decisions, credible information, fair procedures and reliable institutional performance provide a stronger basis for trust.

Shared responsibility must not, however, become a way of shifting public responsibilities to communities. Government institutions remain responsible for policy, regulation, public-interest protection, and maintenance of major infrastructure and service provisions. Participation complements these functions where stakeholder knowledge, behaviour, cooperation and oversight can improve outcomes.

> **Key message:** *Participation becomes meaningful when stakeholders have clear roles, access to credible information and a genuine connection with decisions and actions — not merely an opportunity of consultation.*

4.7 Monitoring, learning and adaptation

Water governance operates under changing and dynamic conditions. River flows vary, groundwater levels rise or fall, water demand changes, infrastructure ages, cities expand, technologies develop and climate variability adds uncertainty. A governance system that establishes policies and implements fixed plans without reviewing their results can therefore become increasingly disconnected from actual conditions.

Monitoring provides feedback needed to respond. It should examine both the physical water system and governance performance. River flows, groundwater levels, water quality and ecosystem conditions matter, but so do regulatory compliance, service performance, infrastructure condition and progress in implementing policies and plans. Monitoring has limited value if information is collected only for reporting. Its governance value comes when results are evaluated, understood and used to improve subsequent decisions (Figure 16).



Figure 16. Planning, implementation, monitoring, learning and adaptation cycle.

Groundwater provides a clear example. Management arrangements established under one set of aquifer conditions may become unsuitable when water levels, quality, recharge, abstraction or demand change. Monitoring should therefore inform subsequent decisions on abstraction, recharge, allocation, incentives and other management measures. The same principle applies to floods and droughts, where experience from each event should inform subsequent forecasting, preparedness, operations and risk management.

Learning also needs to extend beyond individual projects. Many pilot projects have been implemented, new technologies and development initiatives have been undertaken in different water-management settings. However, most of those initiatives could not be upscaled or adopted after the closure of the projects. Institutional learning requires documenting what worked, what did not, why, and under what conditions. A successful intervention cannot automatically be reproduced elsewhere as hydrology, farming systems, institutional capability, social conditions and incentives may differ. Learning therefore means understanding the conditions under which an approach works and whether it can be adapted elsewhere (Figure 17).

Adaptation also applies to governance arrangements themselves. Policies, regulations and operating procedures should periodically be reviewed against changing water conditions and implementation experience. Adaptation does not mean continuously reorganizing institutions. More often, it means practical adjustments—improving an operating procedure, revising a regulation, changing an allocation decision, strengthening coordination, redirecting investment, improving monitoring or modifying an incentive.

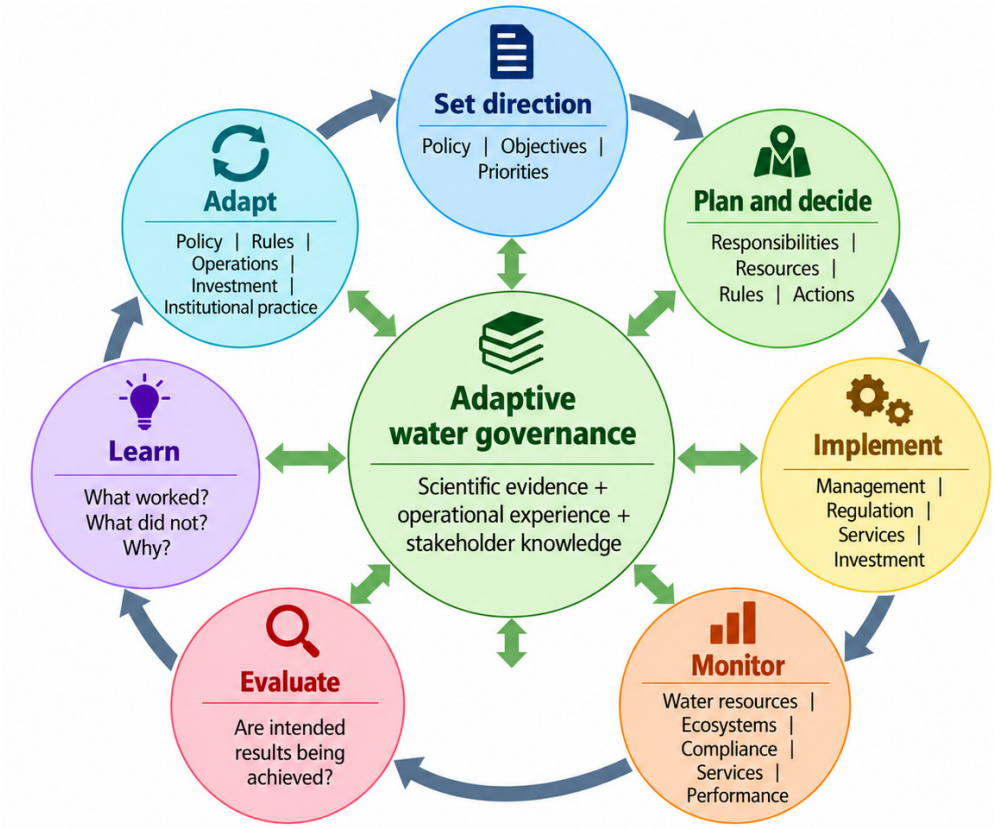


Figure 17. Adaptive water governance cycle.

4.8 One water: From source to sea

The One Water perspective introduced in Section 1 recognizes rainfall (hill torrents), surface water, groundwater, wastewater, drainage, and ecosystems as interconnected parts of the overall water system. The governance requirement is to ensure that decisions affecting one part of this system take account their consequences for others. This requires stronger connections among institutions, information sharing, planning processes and management decisions that are often organized separately.

Such connections cannot depend only on informal coordination or personal relationships among officials. Where responsibilities for connected parts of the water system are assigned to different institutions, coordination should be an institutional requirement rather than a matter of discretion. Laws, regulations and formal operating arrangements should define where coordination is required, which institutions must participate, what information must be shared, and how joint or interdependent decisions are to be made and followed through. This allows coordination to continue despite changes in leadership, personnel or institutional relationships.

One priority is to strengthen conjunctive management of surface water and groundwater. Although the two resources are often managed through different institutional arrangements, their interaction needs to be reflected in water assessment, allocation, monitoring and management. Decisions on canal operations, irrigation efficiency and surface-water allocation, for example, should consider their implications for groundwater recharge and abstraction, while groundwater management should take account of its relationship with surface-water availability.

A second connection is between excess water and water scarcity. Flood management, storage, groundwater recharge, water conservation and drought preparedness should not be treated entirely as separate functions. Where technically, socially and environmentally suitable, water available during wet seasons can contribute to storage and aquifer replenishment. It will not only enhance water availability but will also improve resilience during dry periods.

A One Water approach also requires broader consideration of treated wastewater, drainage effluent, stormwater, rainwater and floodwater within water planning. Their potential contribution depends on quality, location, timing and intended use, together with appropriate safeguards for public health, groundwater and downstream ecosystems. Governance arrangements therefore need to connect their assessment, regulation and use with wider water-resource planning.

The source-to-sea perspective adds an upstream–downstream dimension. Decisions at upstream storage, water allocation, abstraction, pollution control and land-management can affect downstream water quantity, quality and ecosystems. Environmental requirements therefore need to be considered within water planning, allocation and monitoring rather than only after development decisions have been made. This approach is equally applicable for eastern and western rivers and small to medium perennial and non-perennial rivers and streams.

The Indus Delta illustrates this governance connectivity more clearly. The Water Apportionment Accord recognizes the need for escapage below Kotri to check seawater intrusion, while questions remain concerning the institutional arrangements for determining, allocating, administering and monitoring environmental flows. Effective governance also requires distinguishing occasional downstream or flood flows from an environmental-flow regime that considers the timing, duration, quantity and quality of water required for sustaining downstream ecosystems.

These examples show that strengthening individual governance elements is not enough if decisions remain disconnected across the water system. Policies and rules, institutions, knowledge, financing, implementation, participation, monitoring and learning need to operate with an understanding of their interactions across the wider system.

5. Lessons from International Water Governance

Water governance challenges are not unique to Pakistan. Countries and river basins around the world have had to respond to scarcity, drought, competing demands, environmental pressures and changing hydrological conditions. Their experiences provide useful evidence of how governance arrangements can evolve when existing systems come under pressure.

The purpose of examining these experiences is not to identify an exotic model for the country. It is to understand how other governance systems have addressed problems that are also relevant to Pakistan, what enabled their responses to work, where difficulties remained, and which underlying principles may be useful within our own context.

This chapter examines three experiences with particular relevance to Indus Basin: the Murray–Darling Basin, the Colorado River Basin, and the Nile Basin. They differ greatly in their physical, institutional and political settings, but each provides lessons about governing shared water resources under pressure.

5.1 Learning from experiences – Not copying models

Water governance develops within unique physical, political, institutional, economic and social conditions. An arrangement that works in one setting may depend on laws, institutional capacity, financing, administrative traditions and social conditions that differ greatly from country to country and region to region. International experience should therefore provide lessons rather than templates.

International comparison is most useful when it begins with the governance problem. Therefore, the guiding question for this chapter is: what did countries or basin authorities do when they came across a governance challenge, why did the response work—or struggle—in that setting, and which part of the experience could realistically be adopted?

This approach separates the function from the institutional arrangement used to perform it. A country or basin may have created a basin authority, developed a water market, established an interstate agreement or built a cooperative river-basin platform. Pakistan may not need the same arrangement, but the underlying function—such as coordinating jurisdictions, clarifying allocation, improving water accounting, protecting downstream requirements or informed decisions as water availability changes—may still be highly relevant.

International experience should therefore be examined selectively. A useful practice may need to be modified, simplified or implemented through institutions that already exist. The important question is whether it can help strengthen a governance function or connection that it needs (Figure 18).



Figure 18. From international experience to Pakistan's context.

5.2 Australia: Governing a shared basin under scarcity

Australia provides a particularly relevant experience because management of the Murray–Darling Basin (MDB) requires several jurisdictions to govern a shared river system. The Basin extends across New South Wales, Victoria, Queensland, South Australia and the Australian Capital Territory, with responsibilities shared between these jurisdictions and the Commonwealth Government. This creates a governance challenge similar to Pakistan: how to manage a shared river system when hydrological and administrative boundaries do not coincide and water becomes increasingly scarce.

Australia's present arrangements developed progressively. Increasing pressure on the Basin, particularly during the Millennium Drought, exposed the problems associated with excessive water extraction and environmental degradation. Reform increasingly emphasized clearer water entitlements and allocation arrangements, stronger water accounting and greater recognition of environmental requirements. The National Water Initiative, Water Act 2007 and Basin Plan became important parts of this evolving framework (National Water Commission, 2011; Australian Government, 2026).

An important lesson is that basin-wide governance did not remove the responsibilities of states and territories. Instead, mechanisms were developed to connect jurisdictions within a common framework. Basin-level planning and coordination coexist with responsibilities exercised by participating jurisdictions and other institutions. For Pakistan, the important learning is that integrated basin governance does not necessarily require one institution to control the entire basin; it requires sufficiently clear rules, responsibilities and coordination arrangements to connect decisions across provinces.

Australia also illustrates the importance of making water allocation more explicit and transparent. Reforms have established statutory planning arrangements and limits on water diversions, while environmental requirements have been incorporated more explicitly into basin planning, including measures to recover water for environmental flows.

Water markets are an important part of MDB. Such markets operate within established water-rights, regulatory and monitoring arrangements, and their functioning continues to require rules for transparency, integrity and compliance. The more transferable principle is simpler: allocation becomes more credible when rights and responsibilities are clear, resource availability is measured, decisions are transparent and environmental requirements are clearly considered.

Reliable information is central to this process. Hydrological monitoring, water accounting and public reporting support planning and allocation, while the Water Act itself provides for the collection, collation and sharing of water information to support management decisions. This governance connection is shown in Figure 19.

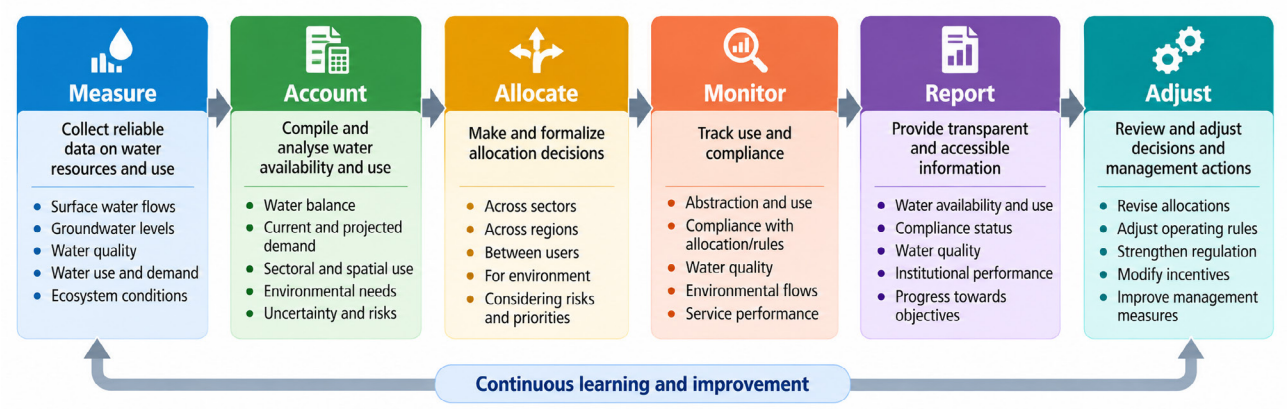


Figure 19. Water governance pathway from measurement to adaptive management.

The lesson is not merely to create more databases. Information becomes valuable when it influences allocation and management, while monitoring becomes valuable when its results influence subsequent decisions.

Australia also demonstrates that governance reforms are continuing process. Monitoring, review and adjustment remain necessary as water availability, environmental conditions, knowledge and competing demands change. The Water Act itself remains subject to periodic review, including a statutory review underway in 2026–27.

> **Lesson for Pakistan:** *A shared basin does not require all responsibilities to be centralized. It requires jurisdictions to work through sufficiently clear rules, shared information and coordinated planning, with arrangements for accountability, monitoring and adaptation.*

5.3 Colorado River: Adapting rules to a changing river

The Colorado River Basin provides a different lesson. Its central challenge is not only scarcity, but how established rules for sharing a river continue to function when hydrological conditions change. The river is shared by seven U.S. states and Mexico, while Tribal Nations also have important rights and interests in the Basin. It supports agriculture, cities, hydropower and ecosystems across a complex institutional landscape.

Colorado River governance developed through compacts, treaties, laws, court decisions and operating agreements rather than through a single basin institution. These arrangements provided rules for sharing and operating the river across jurisdictions and created a degree of predictability. Prolonged drought, lower runoff and declining reservoir storage, however, have increasingly tested arrangements developed under earlier hydrological conditions. In 2026, historically low runoff and reservoir levels further demonstrated the pressure that changing conditions can place on established operating arrangements (Bureau of Reclamation, 2026a).

> Allocation rules provide stability, but stability should not mean rigidity. When the resource changes, governance needs mechanisms that can preserve agreed rights and responsibilities while allowing operations to respond to the amount of water available.

The Basin also demonstrates that adaptation takes place through negotiation among institutions rather than through a single authority. Federal agencies, Basin states, Tribal Nations, water agencies and Mexico participate through different legal and institutional arrangements, and their interests do not always coincide. Negotiation is therefore an inherent part of adapting basin operations.

The recent process for post-2026 river operations provides a practical example. A range of operational alternatives was developed and evaluated using modelling and extensive engagement with Basin States, Tribal Nations and other stakeholders. Full consensus on long-term operations was not achieved, and in August 2026 a Decision Framework for 2027–2036 and operating guidelines for 2027–2028 were issued (Bureau of Reclamation, 2026b). The framework provides for operating guidelines to be developed periodically as conditions and agreements evolve. The relevant governance pathway is shown in Figure 20.

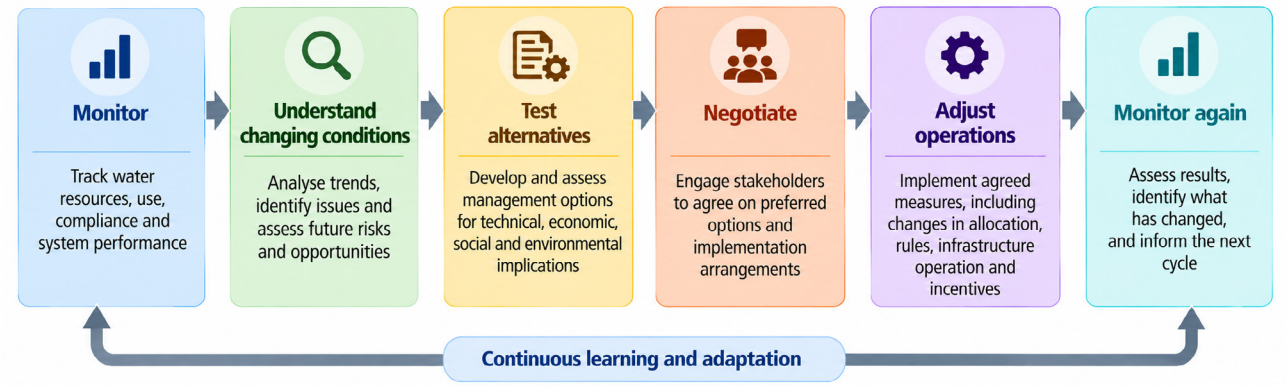


Figure 20. Adaptive water management cycle through monitoring, assessment and operational adjustment.

Scientific information alone, however, cannot determine how shortages, risks and benefits should be shared. Data and modelling can clarify changing conditions and the consequences of different choices, but institutions are still needed to negotiate among competing interests. Reclamation's alternatives process illustrates this distinction: modelling was used to compare operational approaches and trade-offs, while extensive institutional and stakeholder engagement remained necessary.

The Colorado River also crosses an international boundary, adding another governance complexity. Cooperation between the United States and Mexico continues through bilateral arrangements. In September 2026, the two countries approved Minute 334 covering cooperative measures through 2028, including water-use reductions and other measures for managing difficult hydrological conditions. This illustrates why basin, national, subnational and international processes need to remain connected.

> **Lesson for Pakistan:** *Rules are essential for sharing water, but long-term governance also requires mechanisms for responding when water availability changes. Durable rules and adaptive management need to work together.*

5.4 Nile Basin: Cooperation across boundaries

The Nile Basin provides another interesting experience. Its relevance lies less in providing a governance model than in demonstrating the difficulty—and necessity—of cooperation where water crosses political boundaries, interests differ and upstream decisions can affect downstream users.

An important feature of the Nile experience is that cooperation does not depend on resolving every disagreement first. The Nile Basin Initiative (NBI) provides a basin-wide platform for consultation, coordination, knowledge development and cooperative water-resources management. It also supports institutional and technical capacity and provides shared knowledge and analytical tools for decision-making. This demonstrates that countries sharing a river can cooperate on information, technical analysis, planning and mutually beneficial activities even when questions of water allocation remain contested (Nile Basin Initiative, 2017). A useful progression of the Nile Basin is given in Figure 21.



Figure 21. Process for strengthening institutional collaboration in water governance.

Sharing knowledge is particularly important where interests differ. Basin-wide information, analytical tools and hydrological monitoring can provide a stronger common basis for understanding water conditions and assessing alternative choices. Better information does not eliminate political disagreement, but it can help move discussion from unilateral perceptions to better-informed negotiation of risks, benefits and trade-offs. The NBI-supported cooperation has included joint water-balance analysis, basin-wide hydrological monitoring and knowledge-based cooperative planning.

The Nile experience also shows that institutional cooperation and formal legal arrangements may develop at different paces. Legal frameworks can provide principles, rights and obligations for cooperation. However, formal agreements alone do not remove differences among countries. Continuing dialogue, information exchange and institutional engagement therefore remain important.

Another useful lesson is that cooperation does not need to focus only on dividing water. Shared rivers can also create opportunities for coordinated planning, watershed management, flood and drought management, energy cooperation and benefit-sharing. This broadens the question from simply how water should be divided towards how cooperation can produce wider benefits while protecting legitimate water needs. The NBI's programs provide practical examples through coordinated investments, watershed initiatives, hydrological information and regional power interconnections (Nile Basin Initiative, 2026).

> **Lesson for Pakistan:** *Cooperation does not require every disagreement to resolve. Dialogue, credible shared information, joint analysis and practical cooperation can continue while more difficult issues are being negotiated.*

5.5 Translating international lessons into Pakistan's context

The Murray-Darling basin, the Colorado River and the Nile basin differ greatly in geography, institutions, economies and political settings. Their governance arrangements cannot be directly transferred to Pakistan. However, the lessons can be learnt from principles and functions that address comparable governance problems to improve water governance in the country. Table 4 illustrates how the three experiences provide complementary lessons.

Table 4. Transferable water-governance lessons from international experience.

Experience	Governance challenge	Transferable lesson
Australia	Governing a shared basin under scarcity	Connect jurisdictions through clear allocation arrangements, water accounting, environmental requirements and coordinated planning
Colorado River	Maintaining workable rules under hydrological changes	Combine durable rules with monitoring, negotiation and the ability to adjust operations
Nile Basin	Cooperation where interests differ across boundaries	Maintain dialogue, shared information, joint analysis and practical cooperation even where difficult issues remain unresolved

From the above discussion, several broader principles emerge. Shared water requires coordination across boundaries; allocation requires credible rules and information; environmental and downstream requirements need an explicit place in planning; and monitoring needs to inform subsequent decisions. Governance arrangements also need sufficient flexibility to respond as hydrological, social and economic conditions change.

These lessons should not be interpreted as arguments for copying particular institutional arrangements. Australia's water markets, Colorado River compacts and Nile Basin institutions were developed under different legal, political and economic conditions. Their relevance to Pakistan lies primarily in the governance functions they perform and the problems they seek to address, rather than in their organizational forms.

> Pakistan already has several national and provincial policies, laws, institutions, allocation arrangements, professional organizations and stakeholder structures. The relevant question is therefore not which foreign system Pakistan should adopt, but what governance function needs strengthening, what arrangement already exists, where is the weak connection, and what can international experience teach us about improving it?

Applied in this way, Australia's experience draws attention to connections among allocation, water accounting, environmental requirements and provincial responsibilities. The Colorado experience highlights the need to keep established rules workable as water conditions change. The Nile experience demonstrates the continuing value of shared information, dialogue and practical cooperation where interests differ. International learning can therefore help the country strengthen its functioning and improve connections of its existing governance system without requiring it to reproduce another institutional model.

6. From Policy to Practice: Strengthening Governance Connections

This chapter examines how existing governance arrangements can be connected more effectively to deliver results.

6.1 Existing governance connections

For each governance function, the starting questions are: What arrangement already exists? Who is responsible? What prevents it from working as intended? Is the obstacle authority, capacity, information, finance, coordination or accountability—or is there a genuine institutional gap?

Groundwater illustrates this approach. Before proposing another organization, it is useful to determine who is already responsible for groundwater management, whether that responsibility has adequate legal authority, whether information on aquifer conditions and abstraction is available, whether monitoring supports regulation, and whether groundwater decisions relate to surface-water management. Only where these functions cannot reasonably be performed through existing arrangements should a new institutional mechanism become the preferred response.

The same principle applies to existing professional capacity. Pakistan already generates hydrological, meteorological, irrigation, groundwater and water-quality information, while farmer organizations, communities and traditional systems such as the Karez hold knowledge and experience developed through practice. Reform should recognize and strengthen useful capacity wherever it already exists rather than automatically replacing it with standardized arrangements.

This does not mean preserving every existing arrangement. Mandates may need clarification, laws may require amendment, responsibilities may need reassignment and new mechanisms may sometimes be justified. The principle is to begin with the required function and the existing system before adding another institutional layer.

> **Working principle:** *Strengthen what exists where it can perform the required function; add something new where a genuine functional gap remains.*

6.2 Policy–Implementation connections

National and provincial policies increasingly recognize major water challenges and provide policy directions and commitments. The more difficult task is translating these commitments into actions. A commitment to groundwater sustainability, conservation, water-quality improvement, integrated planning or climate resilience produces results only when it is connected to responsibility, operational arrangements, capacity, finance and implementation.

The first connection is between policy and responsibility. For an important policy commitment, it should be clear who leads, who supports, who provides technical information, who regulates where necessary, and who is accountable for progress. A broadly stated responsibility shared among several organizations can otherwise become a responsibility effectively owned by no one.

The second connection is between policy and operational arrangements. Broad intentions need to become rules, plans, procedures, standards and actions. Sustainable groundwater management, for example, requires more than its recognition in policy. Depending on local conditions, it may require aquifer assessment, information on wells and abstraction, monitoring of groundwater levels and quality, recharge management and workable regulatory arrangements. These functions then need to be assigned to institutions capable of carrying them out.

The third connection is with capacity and finance. Responsibility needs to be matched with the people, skills, information and operational capacity required to perform it, as well as predictable financing to support implementation and continuing functions. A policy commitment without adequate capacity or financial resources may therefore remain formally assigned but weakly implemented.

Policy implementation also extends beyond the water sector. Agriculture, energy, land use, urban development, environment and climate policies can support or work against water objectives. Policy coherence therefore depends not only on the quality of water policy itself, but also on whether important decisions in related sectors reinforce its objectives.

Finally, implementation needs feedback. Monitoring should show whether actions are producing the intended results, and that experience should inform subsequent policy and operational decisions. Figure 22 illustrates the connections between policy commitments to measurable results.

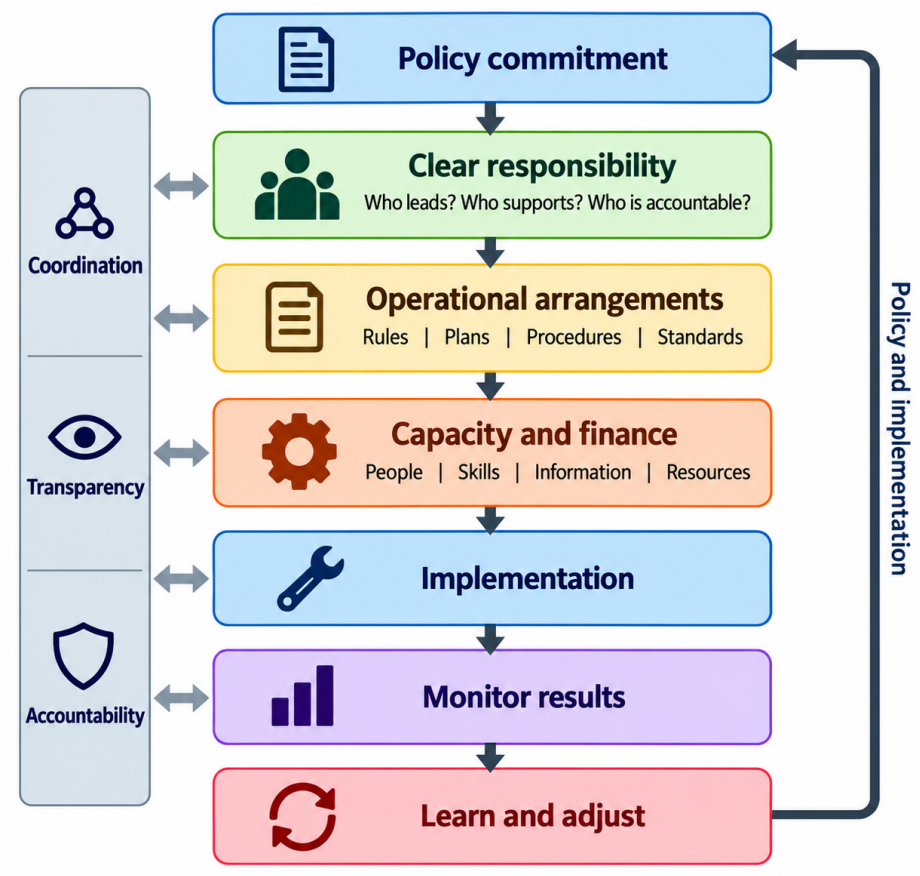


Figure 22. From policy commitment to achieving results.

6.3 Institutions–Responsibilities connections

Water governance necessarily involves multiple institutions. Interprovincial allocation, irrigation, groundwater, drinking water, sanitation, water quality, environmental protection, flood and drought management, research and climate information cannot realistically be managed by one organization. Multiple institutions are therefore not inherently a governance weakness.

Problems arise when responsibilities are shared without clearly defined roles and without proper authority, information, capacity or accountability needed to perform it. An institution may be expected to regulate but lack monitoring information. Another may collect valuable information without a clear route for using it in decisions. One organization may construct infrastructure while responsibility for its operation, maintenance or environmental consequences lies elsewhere. A practical way to examine these connections is to start with the function rather than the organization: who leads, who supports, who implements, who provides information, who regulates or verifies, who coordinates and who is accountable for the result?

This approach can identify both duplication and gaps. It also helps distinguish between a problem requiring a new institution and one that can be addressed through clearer mandates, better information sharing or stronger coordination among existing institutions.

Coordination should be institutionalized around specific decisions, rather than depending on informal relationships or adding an additional administrative layer. Groundwater management, flood management and urban water each may fall

within mandates of several institutions. The important question is therefore not simply whether a coordination committee exists, but what decision requires coordination, which institutions must contribute, who has authority to decide, what information must be shared, who implements the decision and how follow-up occurs. Where such coordination is essential, these responsibilities should be established through appropriate rules, procedures or formal institutional arrangements.

6.4 Knowledge–Decision connections

Pakistan already generates substantial information on water and related issues. River and canal observations, meteorological data, groundwater investigations, water-quality monitoring, agricultural information and research provide an important technical base. The governance issue is whether this knowledge reaches the right forum or authority, at the right time and in a usable form. Connecting knowledge with decisions therefore requires more than collecting additional data. For each important management decision, institutions should be able to ask: what information is needed, who produces it, who checks its reliability, who needs it when it is needed and how will it influence the decision?

Water accounting provides one example. Information on river flows, groundwater, rainfall, return flows and water use becomes more useful when brought together to show where water comes from, where it goes, how it is used and how the balance is changing. Such information can support allocation, drought planning, groundwater management, infrastructure operations and ecosystem regulations.

Appropriate and timely available information also matters. A seasonal forecast that reaches decision makers after irrigation or reservoir decisions have already been made, may have less or no value. Forecasts, monitoring and analysis therefore need to connect with the decision calendar of the institutions expected to use them.

Knowledge alone, however, does not necessarily lead to action. Decision makers and institutions also need sufficient motivation or incentive to act on what the evidence shows. Where action is difficult, costly, politically sensitive or weakly rewarded, credible knowledge may be available without producing a corresponding response. Connecting knowledge with decisions therefore also requires attention to the incentives, accountability and institutional motivations that influence whether evidence is acted upon.

Knowledge should also move in both directions. Scientists and professional organizations provide observation, analysis and modelling, while water managers, farmers, communities and service providers contribute operational and local knowledge. Bringing these perspectives together can improve both the questions being investigated and the practicality of resulting decisions. The objective is therefore not simply to get more information or larger databases. It is credible knowledge that reaches the right decision makers at the right time, is acted upon, and is followed by monitoring of the results.

6.5 Financing-performance connections

Policies and institutional responsibilities cannot be implemented without adequate and sustained financing. The important governance question is therefore not only how much money is allocated to water, but whether financing is connected to agreed priorities, assigned responsibilities and expected results.

The first connection is between responsibility and finance. An institution expected to maintain irrigation infrastructure, monitor groundwater, control pollution or operate an information system needs appropriate financial resources to carry out that responsibility. Assigning functions without financing them creates an implementation gap.

Financing also needs continuity. Infrastructure construction may be funded as a project, but operation and maintenance, monitoring, regulation, information systems and professional capacity building continue after projects close. Investment decisions should therefore consider from the beginning who will operate, maintain, monitor and finance the intervention over time.

The second connection is between finance and performance. Public expenditure should make it possible to understand what was financed, what was delivered and whether the intended water-management outcome was achieved. Monitoring can then inform future investment: successful approaches may be strengthened or adopted, while repeatedly underperforming interventions should be reconsidered rather than recurring financed.

This does not mean judging water governance only in financial terms. Affordability, equity, environmental benefits and other public interests remain important. The principle is one of alignment and accountability: Finance should follow responsibility, while accountability should follow finance.

6.6 Regulator–Provider–User connections

Water governance becomes most visible where rules, services and water use meet. Regulators establish and enforce requirements; service providers deliver and maintain services; and farmers, households, industries and other users make daily decisions about water use. These roles differ, but their effectiveness depends on how well they connect (Figure 23).

Regulators need clear requirements, credible information for monitoring compliance and practical means of corrective action. Service providers need to deliver reliable services, maintain infrastructure, provide information and respond to users. Users need to understand their rights and responsibilities, applicable rules, service standards and how concerns can be raised.

These connections matter in practice. A groundwater abstraction license has limited effect if users do not understand it or abstraction cannot be monitored. Encouraging farmers to improve water-use efficiency becomes more difficult when irrigation deliveries are unpredictable. Pollution standards achieve little when discharges are not monitored or practical means of compliance are lacking.

The relationship should also work in the reverse order. Users can provide information about service failures, impractical rules and locally effective solutions. Such feedback can help regulators and service providers improve rules and services. Participation therefore complements regulation and service delivery; it does not replace government responsibility.

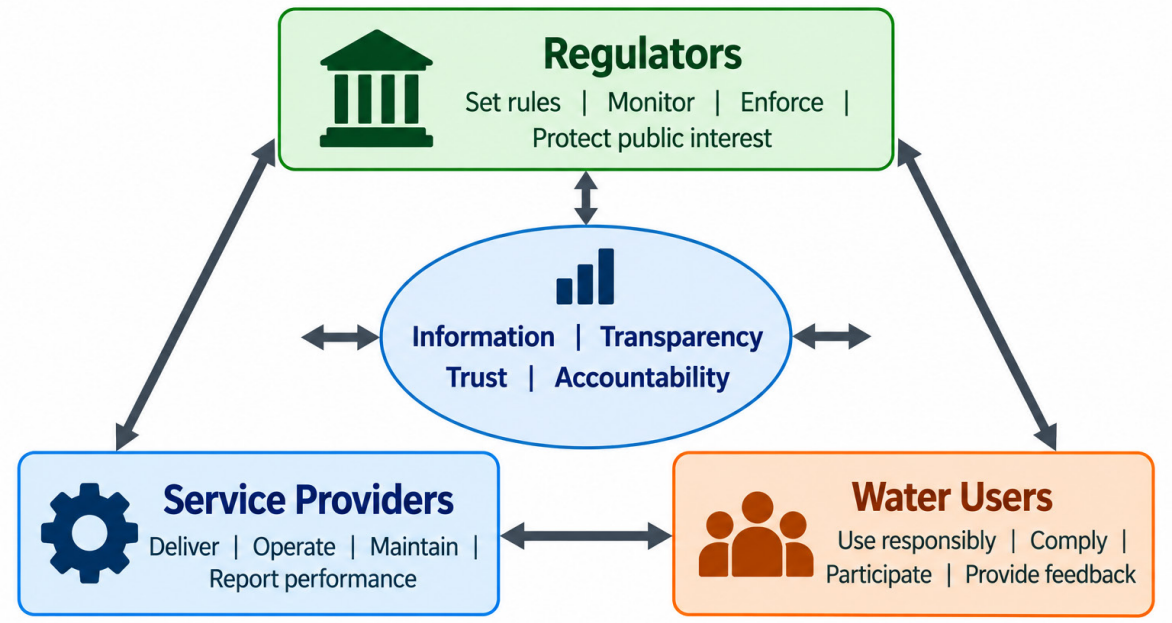


Figure 23. Regulator–provider–user connections.

> **Key message:** *Water governance works better when rules, services and user responsibilities reinforce one another.*

6.7 Connections across the water system

Administrative responsibilities may be divided, but the water system itself remains connected. Surface water, groundwater, rainfall, floods, wastewater, drainage and ecosystems interact across the water cycle. The governance implication is that decisions affecting one part of the system should consider their consequences for others.

For surface water and groundwater, this means planning them conjunctively. Canal supplies affect groundwater recharge and groundwater levels, while pumping can supplement insufficient or unreliable surface-water deliveries. Decisions on allocation, abstraction, groundwater management and recharge therefore need to inform one another rather than being made separately.

For floods and droughts, it means connecting risk management with water management. Where conditions permit, watershed measures, flood retention, spreading and aquifer recharge can help retain part of excess water for later use,

while groundwater can provide a buffer during drought. Managing these conditions separately can miss opportunities to strengthen longer-term water security.

For cities, it means connecting decisions on water supply, groundwater, stormwater, drainage, wastewater treatment and reuse rather than treating each as an isolated service.

For ecosystems and downstream areas, it means considering how upstream abstraction, storage, irrigation operations, groundwater use and pollution affect rivers, wetlands, floodplains and the delta.

These connections do not require one institution to manage the entire water cycle. They require institutions with different mandates to share relevant information, consider cross-system consequences and coordinate decisions where those consequences cross institutional or geographical boundaries. Governance institutions may be divided by mandate, but water cannot.

6.8 Connections across levels of governance

Pakistan's federal structure distributes water-governance responsibilities among different levels. The objective is not for federal, provincial and local institutions to perform the same functions, but for each level to perform its appropriate role while remaining connected to the others.

Federal and interprovincial functions are particularly important for national policy direction, interprovincial allocation and coordination, strategic infrastructure, common information and standards, research, forecasting, disaster-risk management and international water matters. Provinces are closer to much of the actual resource management, regulation, irrigation, environmental management, planning and investment. Local governments, service providers, farmer and water-user organizations and communities perform functions closest to service delivery and water use.

The critical requirement is a two-way connection. Policy direction, standards, technical support and resources need to move towards implementation, while monitoring information, implementation experience and local feedback need to move back towards provincial and national decision making. Figure 24 illustrates these connected levels of governance and the two-way flow between them.

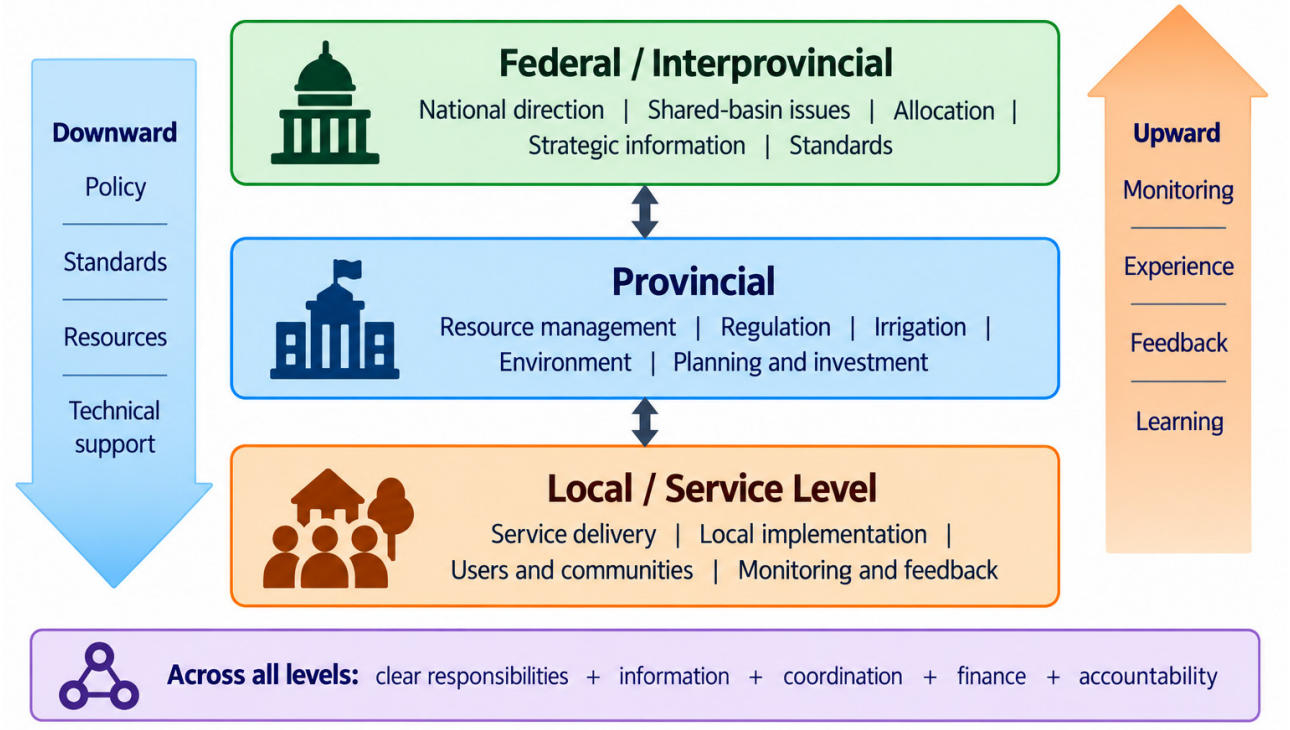


Figure 24. Connected levels of water governance.

> **Key message:** *Different levels do not need to perform the same functions. They need to perform their respective functions while remaining connected.*

6.9 Monitoring, learning and adaptation

Governance connections need to remain functional as conditions change. Water availability varies, demands grow, technologies evolve, institutions change, and floods and droughts expose weaknesses that may not have been apparent when policies or operating arrangements were established. Monitoring, learning and adaptation therefore provide the feedback that keeps the governance system responsive (Figure 25).

Monitoring should cover both water conditions and governance performance. Alongside river flows, groundwater levels, water quality, floods, droughts and ecosystem conditions, institutions need to know whether policies are being implemented, responsibilities are being performed, regulations are working, services are improving and investments are producing their intended results.

Monitoring alone is insufficient. Results need to be evaluated to understand what worked, what did not, and why. Scientific evidence, operational experience and knowledge from communities and users can help determine whether the problem lies in policy design, unclear responsibility, weak capacity, inadequate financing, poor compliance or changing external conditions.

Learning should then lead to proportionate adjustment. This may involve changing procedures, strengthening coordination, reallocating resources, modifying operating rules, improving incentives or addressing capacity gaps. It does not require repeated institutional restructuring. The process can be summarized as a continuing feedback pathway:

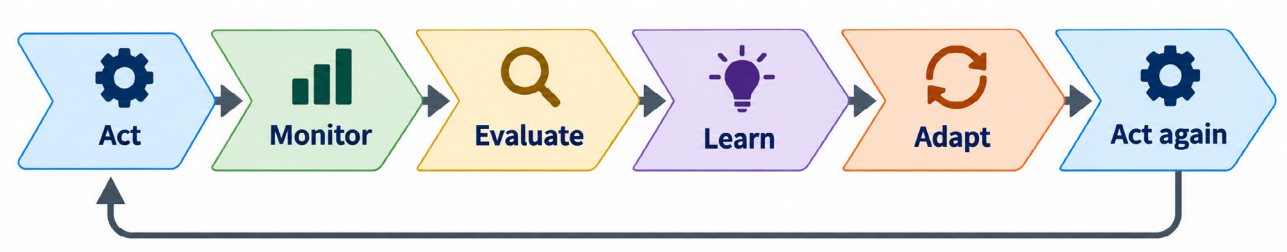


Figure 25. Iterative cycle of action, monitoring, evaluation, learning and adaptation.

Floods and droughts provide particularly important opportunities for institutional learning. Experience with forecasts, infrastructure, coordination, preparedness and community response should feed into subsequent planning rather than being lost once the immediate emergency has passed. Likewise, pilot projects and new technologies should be scaled based on evidence about their technical performance, affordability, institutional requirements and suitability to different conditions rather than successful demonstrations alone.

7. The Way Forward

Pakistan has established policies, laws, institutions and technical capabilities that provide a basis for improving water governance. The immediate priority is to translate existing commitments into workable arrangements and measurable results. Reform should begin by identifying where responsibilities are unclear, essential functions are inadequately supported, or connections between institutions and decisions are weak. New institutional arrangements should be considered where genuine functional gaps cannot be addressed through existing structures.

A practical starting point is to translate policy and legal commitments into clear operational responsibilities, procedures and actions. Each important governance function should have an identifiable responsible institution, with appropriate authority, resources and accountability. Particular attention is needed where responsibilities overlap across federal, provincial and local institutions, or where decisions concerning water allocation, groundwater, water quality, flood management and environmental protection depend on several agencies. Coordination should be organized around specific decisions and expected results, with agreed procedures for implementation and follow-up. Table 5 identifies five immediate priorities that can guide this initial effort.

Table 5. Immediate priorities for strengthening water governance in Pakistan.

Immediate priority	Practical focus
Clarify responsibilities	Match assigned functions with authority, resources and accountability
Put commitments into operation	Translate existing policies and laws into workable rules, procedures and actions
Apply existing information to decisions	Connect available information with planning, allocation, regulation and risk-management decisions
Make coordination result-oriented	Establish arrangements for shared decisions, implementation and follow-up
Monitor progress	Use a limited number of meaningful indicators to assess implementation and results

Improving the use of existing information should be an early priority. Water availability, allocation, groundwater conditions, water quality, water use and climate-related risks are monitored and studied by different institutions, but their value depends on how effectively the information supports decisions. Agreed information-sharing procedures should specify which institutions generate and maintain data, which agencies require it, and who is responsible for interpreting and applying it. Information should be made available in forms and within timeframes appropriate to planning, regulation, operations and public communication.

Existing technical initiatives offer opportunities to strengthen these connections. For example, the International Water Management Institute's (IWMI) work on water accounting, water resources assessment, Pakistan Drought Monitoring System (PakDMS) and the Groundwater Management Information System (GMIS) developed through collaboration with the various stakeholders illustrate approaches for organizing and presenting water-resource information. Such initiatives can support more informed decisions when their outputs are linked to the responsibilities and operational requirements of relevant government agencies. The priority is therefore not only to develop information systems, but also to establish arrangements for their continued use, maintenance and improvement.

Sustained implementation will require corresponding improvements in institutional capability and financing. Responsible agencies should periodically assess whether they possess the technical expertise, staffing, operational resources and management capacity needed to perform their functions. Multidisciplinary capability is increasingly important, particularly where water decisions involve groundwater, water quality, ecosystems, climate risks, economics and social considerations. Recurrent financing should support essential functions such as monitoring, regulation, information management, operations, maintenance and professional development, rather than depending predominantly on short-term projects.

Collaboration should also extend beyond government institutions. Water users, communities, service providers, research organizations and other stakeholders can contribute practical knowledge, identify implementation difficulties and help evaluate outcomes. Their participation should be linked to identifiable decisions and feedback arrangements, rather than limited to occasional consultation. At the same time, coordination among federal, provincial and local institutions should respect their respective mandates while providing workable mechanisms for addressing shared water-management responsibilities.

Progress should be assessed through transparent reporting on both implementation and outcomes. A manageable set of performance indicators can help determine whether agreed responsibilities are being fulfilled, services are improving, information is influencing decisions and coordination arrangements are producing results. Monitoring and evaluation should lead to periodic review and proportionate adjustments in rules, procedures, operations, investments or institutional arrangements. Such adaptation is particularly important as groundwater levels, water availability, water quality, climate risks and societal demands change. Lessons from floods, droughts, infrastructure operations and development initiatives should be incorporated into subsequent decisions rather than being lost when individual projects or programmes end.

These improvements should progressively become part of routine public administration, planning, budgeting, service delivery and accountability. The objective is not a one-time reform exercise, but a governance system in which responsibilities are exercised, information is used, decisions are implemented, performance is reviewed and corrective action follows when needed. Figure 26 brings together this progression from existing governance arrangements to stronger connections and improved outcomes.

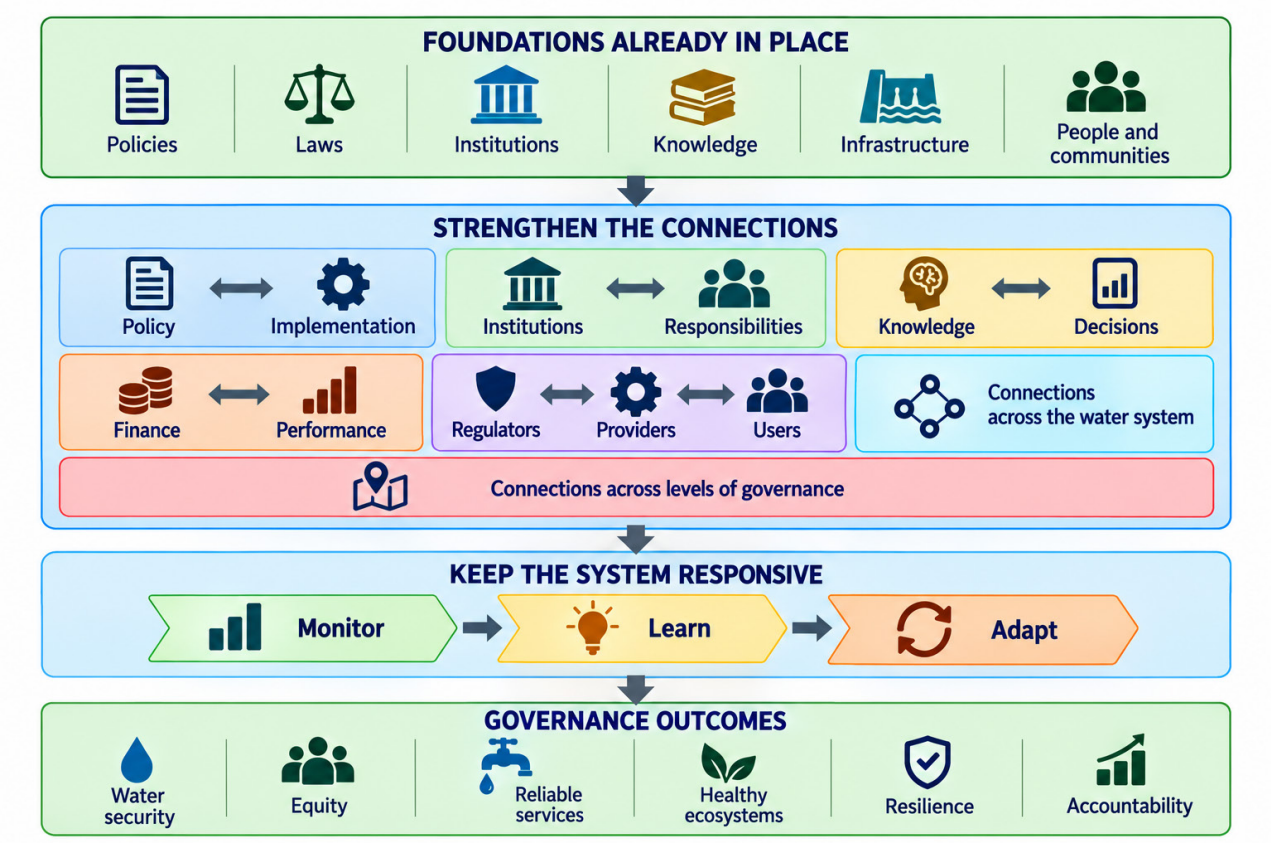


Figure 26. From policy to practice – a connected water-governance system.

Ultimately, the effectiveness of water governance should be judged by the outcomes rather than by the number of policies, institutions or programs established. Strengthening existing governance functions and the connections among them offers a practical pathway towards improved water security, more reliable and equitable services, healthier ecosystems and greater resilience.

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