

Water Resource Governance in Crisis Conditions: A Diagnostic Framework and Transition Pathway from Reactive Supply Management to Adaptive, Basin-Based Governance in Iran

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Abstract: Iran's water crisis is commonly described as a consequence of declining precipitation, recurrent drought and climate change, yet a growing body of evidence suggests that governance and management failures are at least as important as physical scarcity in explaining the severity of the crisis. This paper presents a structured diagnostic and conceptual framework for water resource governance under crisis conditions, developed from the operational experience of a regional water company in south-eastern Iran and synthesised with the international literature on integrated water resources management, adaptive governance and water security. Rather than applying a data-driven or machine-learning model to a hydrological time series, as in the companion papers of this issue, the study uses a qualitative policy-analysis approach to identify the structural and operational pathologies that most commonly undermine water governance: a project-oriented rather than problem-oriented management culture, weak demand-side management, over-abstraction of groundwater relative to aquifer recharge, a persistent gap between legally permitted and hydrologically sustainable allocations, limited data-driven decision-making, administrative rather than basin-scale management, fragmented coordination among sectoral agencies, weak scenario-based foresight, and performance-evaluation criteria for managers that reward physical implementation over resource sustainability. Building on this diagnosis, the paper proposes an integrated governance model comprising a five-pillar operational strategy (protection, monitoring, demand management, governance and resilience), a six-stage adaptive decision-making cycle, a three-tier provincial and national water-security dashboard, a revised set of manager performance indicators, and a short-, medium- and long-term action roadmap. The framework reframes the central policy question from 'how can more water be supplied?' to 'how can limited water resources be governed so that today's vital needs are met while the capacity of the resource is preserved for the future?', and offers a transferable diagnostic checklist for regional water authorities operating under similar hydro-climatic and institutional stress.

Keywords: Water governance, Integrated water resources management, Groundwater depletion, Demand management, Basin-scale governance, Adaptive management, Water security, Iran

1. Introduction

Water is one of the few resources whose scarcity can simultaneously threaten food security, public health, the environment, industry, employment, migration patterns and regional development (Grey and Sadoff, 2007; Srinivasan et al., 2017), and its absence is increasingly recognised as a drag on economic growth more broadly (Sadoff et al., 2015). For this reason, a water crisis should not be defined narrowly as a physical shortage of water. A region may face a genuine physical deficit and yet experience a comparatively mild crisis, while another region with similar or even more favourable hydro-climatic conditions may experience a severe crisis because of how its water is allocated, consumed and governed. The severity of a water crisis is therefore determined jointly by the physical availability of the resource and by the quality of the management and governance system that allocates it (Rogers and Hall, 2003; Bakker and Morinville, 2013).

Iran is a clear illustration of this distinction. Renewable water availability per capita has fallen sharply over the last four decades because of a

combination of reduced precipitation, rising temperatures, population growth and rapid, largely unregulated expansion of irrigated agriculture (Madani, 2014). Over-abstraction of groundwater to compensate for this gap has produced some of the most severe rates of aquifer depletion in the world: a nationwide analysis of more than 30,000 wells found that Iran's aquifers lost roughly 74 billion cubic metres of storage between 2002 and 2015, an amount comparable to the loss from the country's largest surface reservoirs (Noori et al., 2021). This depletion is not merely a water-balance statistic; it has produced land subsidence of tens of centimetres per year in several basins, threatening infrastructure and irreversibly reducing the long-term storage capacity of aquifers (Motagh et al., 2008). Madani et al. (2016) describe the resulting situation as a state of 'water bankruptcy', in which consumption has for decades exceeded renewable supply, financed by the equivalent of drawing down a savings account that cannot be replenished on human timescales. These are not purely hydrological outcomes: they are the cumulative result of decades of supply-oriented, project-driven management

operating with limited demand control, weak inter-agency coordination and allocation decisions that were not tied to the sustainable yield of the resource.

This reframing has direct implications for how the problem should be studied and addressed. If the crisis were purely climatic, the appropriate response would be almost entirely technical: more storage, more transfer infrastructure, better forecasting of supply. If, as the evidence above suggests, governance and institutional design are at least as important as physical scarcity, then the central strategic question changes. It is no longer only ‘how can more water be produced?’, but ‘how can a limited and increasingly uncertain resource be governed so that today’s vital needs are met while the capacity of the resource is preserved for the future?’ This is, in essence, the shift from water-supply management to water governance (Rogers and Hall, 2003; OECD, 2015).

International experience offers a well-developed vocabulary for this shift. Integrated water resources management (IWRM) has, since the 1990s, promoted the coordinated management of water, land and related resources to maximise economic and social welfare without compromising the sustainability of vital ecosystems (Global Water Partnership, 2000; Gleick, 2003). The Organisation for Economic Co-operation and Development (OECD) has distilled international practice into twelve principles of water governance covering effectiveness, efficiency and trust, organised around clear roles and responsibilities, appropriate scales within basin systems, policy coherence, capacity, data and information, financing, regulatory frameworks, innovative governance, stakeholder engagement, trade-offs across users and generations, and monitoring and evaluation (OECD, 2011, 2015; Akhmouch and Correia, 2016). In parallel, the concepts of adaptive management (Pahl-Wostl, 2007, 2009) and resilience thinking (Folke et al., 2010) emphasise that, under deepening climatic uncertainty, governance systems must be able to learn, monitor outcomes and revise decisions continuously rather than execute a fixed, one-off plan. This paper draws on this literature to interpret the operational experience of a regional water company in Iran and to synthesise it into an applied diagnostic and planning framework.

The specific objectives of the paper are: (i) to identify and organise, from institutional operating experience, the structural and operational pathologies that most commonly undermine water resource management under crisis conditions; (ii) to relate these pathologies to established concepts in the international water governance literature; and (iii) to synthesise a practically applicable governance framework — comprising a five-pillar operational strategy, a six-stage adaptive decision cycle, a tiered water-security dashboard, revised performance indicators for managers, and a staged action roadmap — that regional water authorities

operating under comparable hydro-climatic and institutional stress can use to guide a transition from reactive, crisis-driven management towards proactive, data-informed and basin-based governance.

2. Materials and Methods

2.1. Approach and Scope

This study is a qualitative, conceptual policy analysis rather than a quantitative or data-driven modelling study. Unlike the companion papers in this issue, which apply machine learning, deep learning and hybrid metaheuristic-optimised models to hydrological, meteorological or remote-sensing time series, the present analysis has no numerical dataset as its object: its subject matter is the institutional and managerial process by which water-related data, once produced, is translated — or fails to be translated — into decisions. The material analysed comprises (i) the operational and policy experience of the Sistan and Baluchestan Regional Water Company, a provincial authority responsible for water resource management in a structurally water-stressed, semi-arid region of south-eastern Iran that includes the transboundary Hirmand (Helmand) basin and the Hamun wetlands, and (ii) a targeted review of the international peer-reviewed and institutional literature on integrated water resources management, water governance, groundwater governance, adaptive management and water security. The analysis followed four steps, summarised in Fig. 1: (1) structural and operational pathologies limiting effective governance were identified from institutional practice and organised into recurring themes; (2) each theme was cross-referenced against established governance concepts and frameworks to check its consistency with, and to situate it within, the wider literature; (3) the themes were synthesised into an integrated operational model — a five-pillar strategy, an adaptive decision cycle and a tiered monitoring and reporting system; and (4) the model was translated into a staged action roadmap distinguishing measures that can be implemented immediately from those that require medium- and long-term institutional change. This method follows the tradition of policy and governance diagnostics used elsewhere in the water sector (Rogers and Hall, 2003; Foster and Garduño, 2013; Molle, 2009) and is intended to generate a transferable checklist rather than to test a statistical hypothesis; it should therefore be read as a structured expert synthesis, not as an empirically validated causal model, of the kind recommended as a complement to more formal system dynamics and simulation tools for conceptualising water resources problems holistically (Mirchi et al., 2012).

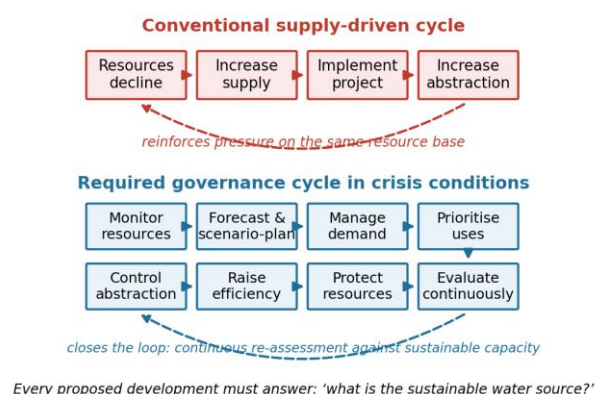


Figure 1. Conceptual shift from the conventional, supply-driven management cycle (top) to the governance cycle required under crisis conditions (bottom); the latter is the organising logic of the diagnostic and planning framework developed in this paper

2.2. Institutional Context

Sistan and Baluchestan, in south-eastern Iran, is among the country's most water-stressed provinces. It combines an arid to semi-arid climate, high inter-annual rainfall variability, and dependence on the transboundary Hirmand/Helmand river for the Hamun wetlands and for irrigation in the Sistan plain, a river whose upstream flows are also affected by dam operation and land use outside Iran's borders. Recurrent, multi-year droughts in this basin have repeatedly desiccated the Hamun wetlands, with severe consequences for agriculture, dust emissions and rural livelihoods (Madani et al., 2016). These conditions make the province a particularly demanding, but also particularly informative, setting in which to examine which elements of water governance make the practical difference between a manageable shortage and a full-blown crisis, because the physical hydrology alone already sits at the boundary of what conventional supply-side management can address.

2.3. Terminology

Throughout the paper, **water management** is used to denote the operational tasks of supplying, allocating and distributing water, whereas **water governance** denotes the broader set of political, institutional, regulatory and social processes through which decisions about water are made, implemented and revised (Rogers and Hall, 2003). **Sustainable capacity** denotes the volume of surface or groundwater that can be withdrawn indefinitely without depleting storage or degrading quality, which is distinguished in this paper from **legal capacity** (the volume that permits and allocation rules currently authorise) and **technical capacity** (the volume that infrastructure is physically able to deliver); the gap between these three quantities is treated as a central diagnostic variable in Section 3.3.

3. Diagnostic Findings: Structural and Operational Pathologies

Nine recurring pathologies emerged from the operational and policy review. They are not independent: each reinforces several of the others, which is itself an important finding, since it implies that piecemeal reform of a single pathology is unlikely to be effective without a coordinated transition.

3.1. Project-Oriented Rather than Problem-Oriented Management

A recurring pattern is the translation of management objectives into a checklist of infrastructure projects: treatment plants, transmission lines, distribution networks and storage reservoirs. Infrastructure is necessary, but when the physical progress of projects becomes the de facto measure of managerial success, the connection between a project and the underlying water-security problem it was meant to solve can be lost. Evaluation confined to 'physical progress' does not verify whether a completed project actually reduced over-abstraction, closed a supply-demand gap sustainably, or simply relocated the pressure on the resource. This is a specific manifestation of what Molle et al. (2009) describe as the persistence of a 'hydraulic mission' culture in water bureaucracies, in which expanding supply infrastructure remains the organisation's default response even after the marginal cost, in resource and financial terms, of doing so has risen substantially.

3.2. Weak Demand-Side Management

In many basins, demand management is treated as a secondary, voluntary measure rather than a core pillar of policy, even though, when resources are limited, increasing supply capacity without controlling demand simply postpones the crisis rather than resolving it (Brooks, 2006). Demand management as understood in this paper spans consumption-pattern reform, reduction of non-essential use, efficiency improvement, adjustment of cropping patterns towards less water-intensive crops, loss reduction in distribution networks, wastewater reuse and recycling, and the deployment of smart metering and monitoring technologies. Absent a comparable institutional weight to supply-side investment, these measures tend to be implemented only during acute shortage episodes and abandoned once the acute pressure subsides, precluding the durable behavioural and infrastructural change that demand management requires.

3.3. Groundwater Over-Abstraction as a Strategic, Intergenerational Threat

Aquifers function as strategic, intergenerational reserves rather than as an elastic backup supply (Famiglietti, 2014; Foster and Garduño, 2013). Abstraction in excess of renewable recharge can mask a supply deficit in the short run, but in the medium and long run it produces a well-documented cascade of consequences: falling water tables, deepening (and increasingly costly) wells, declining water quality, drying of traditional wells and *qanats*, land subsidence,

and an irreversible loss of aquifer storage capacity (Wada et al., 2010; Motagh et al., 2008; Noori et al., 2021). Groundwater management confined to counting or licensing wells, without reference to the water balance and storage trend of the aquifer itself, is therefore addressing the wrong variable: the number of authorised wells is a poor proxy for the sustainability of abstraction once actual extraction, whether licensed or not, is compared against recharge.

3.4. The Gap Between Legal Allocation and Sustainable Capacity

A distinct and often underappreciated pathology is the divergence between three conceptually different quantities: the legal capacity created by permits and allocation decisions, the technical capacity of extraction and conveyance infrastructure, and the sustainable capacity of the underlying resource (Section 2.3). The existence of a legal entitlement to withdraw water does not guarantee that a corresponding physical, sustainable capacity exists. Where allocation decisions are made primarily against legal or technical capacity rather than sustainable capacity, cumulative permitted abstraction can substantially exceed what the resource can renewably provide, a pattern consistent with the broader international finding that water rights and allocation regimes are frequently decoupled from real-time resource accounting (Foster and Garduño, 2013).

3.5. Weak Data-Driven Decision-Making

Water management without accurate, timely data reduces, by default, to management by estimation and reaction. A senior manager should in principle be able to obtain, at short notice, a reasonably accurate picture of surface-water status (reservoir volumes, river inflows, dam inflow and outflow, precipitation forecasts, evaporation), groundwater status (aquifer levels, abstraction volumes, storage deficit, well status, rate of level decline) and consumption by sector (domestic, agricultural, industrial, environmental and other uses). In practice, data of this kind is frequently collected for regulatory record-keeping rather than organised into a decision-support product; OECD (2015) and Akhmouch and Correia (2016) identify exactly this gap between data availability and data use as one of the more persistent weaknesses in water governance internationally. A decision-support system for water resource management therefore needs to move beyond a passive information register and become an active tool for decision-making, forecasting and early warning.

3.6. The Case for Basin-Scale Governance

Water does not respect administrative boundaries: a decision taken in one county or province can have immediate or delayed consequences for a downstream or neighbouring jurisdiction. Water resource management organised along administrative lines therefore structurally struggles to represent the interdependence of users within a single hydrological system. The alternative, basin-scale governance, evaluates

allocation, abstraction, development and environmental decisions within the water balance of the basin or sub-basin as a whole rather than within an administrative unit (Molle, 2009; Global Water Partnership, 2000). This is one of the most consistently recommended reforms in the international literature (OECD, 2011), although its implementation is well known to be politically and institutionally demanding where administrative and hydrological boundaries diverge, as they do in most Iranian provinces including Sistan and Baluchestan.

3.7. Fragmented Inter-Agency Coordination

A water crisis is rarely the sole responsibility of the agency formally designated as the water authority. In the Iranian institutional setting, the Ministry of Energy, the Ministry of Agriculture Jihad, the Department of Environment, the Ministry of Industry, Mine and Trade, the Ministry of Interior, municipalities and regional planning bodies each control part of the decision chain that determines water demand and allocation. Where the policies of these agencies are not coordinated, one agency's demand-reduction programme can be offset, or even reversed, by another agency's simultaneous policy of demand expansion (for example through incentives for water-intensive cropping or industrial development in a stressed basin). Effective water governance must therefore be defined more broadly than the management of the water agency alone (Rogers and Hall, 2003); it requires policy coherence across sectors, one of the twelve OECD (2015) principles of water governance.

3.8. Weak Scenario-Based Foresight

One of senior management's most important functions is preparing for a future that has not yet occurred. Under deepening climatic uncertainty, planning that assumes a single, most-likely future is fragile; it needs instead to be organised around explicit scenarios — for example, near-average precipitation, continued moderate drought, and severe and prolonged drought — with pre-defined answers, for each scenario, to the questions of how much water can be allocated, what the priority order of uses is, which uses will be curtailed first, when an emergency response plan is activated, and which agency is responsible for each action. This form of anticipatory, scenario-based management is consistent with the adaptive-management literature, which treats planning as an iterative process of monitoring, forecasting and revision rather than a single deterministic exercise (Pahl-Wostl, 2007, 2009).

3.9. Misaligned Performance Evaluation of Managers

Institutional incentives shape managerial behaviour. Where managers are evaluated principally on budget absorption, the number of completed projects, physical progress rates and the number of contracts signed, resource-sustainability outcomes are structurally likely to be marginalised in day-to-day decision-making, because they are not what is being measured or

rewarded. This is not a minor administrative detail: it is the mechanism through which the project-oriented culture described in Section 3.1 is continuously reproduced. Realigning performance evaluation with resource-sustainability outcomes is therefore treated in this paper as a lever with disproportionate influence on the other eight pathologies, and Section 4.1 develops a revised indicator set accordingly.

4. Proposed Governance Framework

The nine pathologies identified above point to a common underlying requirement: a shift from a reactive, project-output-based management style to a proactive, data-informed, basin-based and continuously evaluated governance style (Fig. 1). This section synthesises that shift into five practical instruments — revised performance indicators, a water-security dashboard, an adaptive decision cycle, a five-pillar strategy for regional water companies, and a staged action roadmap — designed to be implementable within an existing regional water authority rather than requiring a new institution.

4.1. Revised Performance Indicators for Water Managers

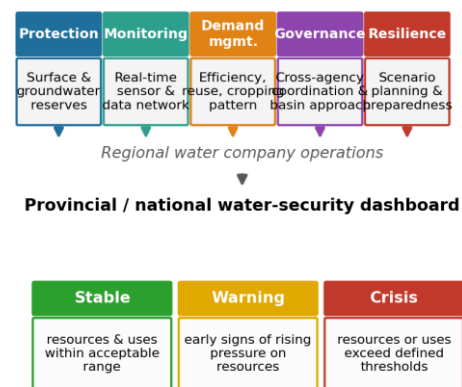
Table 1 proposes a set of performance indicators intended to complement, rather than fully replace, conventional project-delivery metrics, so that resource-sustainability outcomes are explicitly represented in how managerial performance is evaluated (Section 3.9). The indicators are deliberately outcome-based: each is measurable from routinely collected monitoring data and is directly traceable to one of the nine pathologies in Section 3.

Table 1. Proposed performance indicators for the evaluation of regional water managers, complementing conventional project-delivery metrics

Evaluation goal	Proposed indicator
Resource protection	Reduction in the aquifer storage deficit (change in cumulative groundwater deficit)
Consumption control	Reduction in abstraction in excess of licensed and sustainable allocation
Long-term sustainability	Reduction in the rate of groundwater level decline
Demand management	Increase in water-use efficiency (output per unit of water consumed)
Operational efficiency	Reduction in conveyance and distribution losses
Pressure reduction	Increase in the volume of treated wastewater reused
Structural reform	Progress achieved against basin water-balance (equilibrium) programmes
Preparedness	Response time from warning-threshold breach to activation of the emergency plan
Public trust	Transparency of water-status information
Foresight	Extent of implementation of scenario-based resilience programmes

4.2. A Three-Tier Provincial and National Water-Security Dashboard

To make the indicators in Table 1 operationally useful, the paper proposes a water-security dashboard, populated from the same monitoring data described in Section 3.5, that reports the status of each basin or province in one of three tiers (Fig. 3): **stable**, where resources and uses remain within an acceptable range; **warning**, where early signs of rising pressure on resources are detected; and **crisis**, where resources or uses have exceeded pre-defined thresholds. The purpose of the tiered design is explicitly to allow managers to observe and act on the warning tier before a basin crosses into the crisis tier, rather than learning of a crisis only once it has fully materialised; this is the operational core of the shift from reactive to anticipatory governance discussed in Section 3.8.



The dashboard allows managers to observe warning signs before a crisis threshold is crossed.

Figure 3. Proposed five-pillar operational strategy for a regional water company, feeding a three-tier provincial/national water-security dashboard

4.3. A Six-Stage Adaptive Decision-Making Cycle

Underlying the dashboard is a proposed six-stage decision cycle (Fig. 2) intended to structure how monitoring data is converted into action: (1) **monitor** — continuous, real-time collection of surface-water, groundwater and consumption data; (2) **analyse** — interpretation of trends and short-term forecasting; (3) **decide** — translation of the analysis into explicit policy and priority decisions; (4) **implement** — conversion of the decision into operational action; (5) **evaluate** — measurement of the results achieved against the indicators in Table 1; and (6) **revise** — updating of the decision in light of the evaluation. The cycle is deliberately closed rather than linear: stage 6 feeds back into stage 1, so that management is treated as a continuous process of learning and adjustment, consistent with the adaptive-management principle that plans should be revised as new information becomes available rather than executed unchanged (Pahl-Wostl, 2007, 2009).

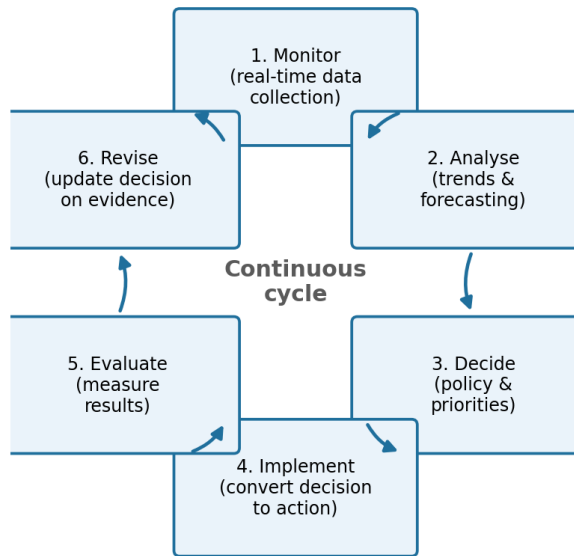


Figure 2. Proposed six-stage adaptive decision-making cycle for water resource governance under crisis conditions

4.4. A Five-Pillar Strategy for Regional Water Companies

At the operational level of an individual regional water company, the framework organises day-to-day activity around five pillars (Fig. 3): **protection** of surface and groundwater reserves; **monitoring** through a precise, real-time sensor and data network; **demand management** to reduce consumption and raise efficiency; **governance**, meaning active coordination with other agencies and stakeholders rather than management confined to the water company's own mandate; and **resilience**, meaning documented preparedness for drought and crisis scenarios. Under the governance pillar, farmers, industry, local organisations, universities and local communities are treated as active participants in decision-making rather than only as recipients of decisions already taken, particularly for groundwater use, where the cooperation of abstractors has a demonstrable influence on the success of demand-management and abstraction-control programmes; this follows the broader evidence that structured stakeholder participation improves both the quality and the legitimacy of environmental and resource-management decisions (Reed, 2008). These five pillars are the operational-level expression of the nine diagnostic themes in Section 3 and are designed to be assigned to existing departments within a regional water company rather than requiring new organisational units.

4.5. Action Roadmap

Table 2 translates the framework into a staged roadmap, distinguishing actions that can begin immediately using existing capacity from those that require sustained investment or institutional and legal reform.

Table 2. Proposed short-, medium- and long-term action roadmap for regional water companies

Horizon	Priority actions
Short term	Establish a real water balance of each basin; identify groundwater hotspots; build a management dashboard; set warning/crisis thresholds; prioritise uses; control excess abstraction
Medium term	Expand smart metering; reform consumption patterns; expand wastewater reuse; adapt cropping patterns; support managed aquifer recharge; develop decision-support systems
Long term	Reform water governance legislation; institutionalise basin-scale, sustainability-based management

4.6. Seven Strategic Shifts for Senior Management

Table 3 summarises the framework as a set of seven paired shifts that senior managers can use as a concise checklist when reviewing existing policy, programmes and evaluation criteria against the diagnostic findings of Section 3.

Table 3. Seven strategic shifts proposed for senior water-resource management

From	To
Water supply	Water security
Project orientation	Problem orientation
Supply-side management	Combined supply- and demand-side management
Experience-based decisions	Data-driven decisions
Administrative management	Basin-scale management
Reacting to crisis	Forecasting and preventing crisis
Evaluating project delivery	Evaluating real effect on water security

5. Discussion

The diagnosis and framework presented here are consistent with, and can be read as a case-level application of, several established strands of the international water governance literature. The distinction drawn in Section 2.3 between legal, technical and sustainable capacity operationalises, for allocation decisions, the broader argument that formal water rights and entitlements are frequently decoupled from the real-time hydrological status of the resource they claim to govern (Foster and Garduño, 2013). The five-pillar strategy and the seven strategic shifts in Table 3 are a compact, practitioner-facing restatement of several OECD (2015) principles of water governance — in particular policy coherence, appropriate scales within basin systems, data and information, and monitoring and evaluation — translated into a form that a provincial water company can apply without waiting for national-level legal reform. The six-stage decision cycle in Fig. 2 is a direct operationalisation of adaptive-management theory (Pahl-Wostl, 2007, 2009) and of resilience

thinking's emphasis on maintaining the capacity to reorganise in response to new information (Folke et al., 2010), applied specifically to the routine business cycle of a water utility rather than to a one-off policy reform.

A further point of contact with the wider literature concerns the relationship between this paper and the data-driven modelling studies elsewhere in this issue. Forecasting models for reservoir storage, groundwater level, streamflow or drought indices — of the kind developed with machine learning, deep learning and metaheuristic-optimised hybrids in the companion papers — are natural technical components of the **monitor** and **analyse** stages of the decision cycle proposed here (Fig. 2), and could in principle supply the quantitative early-warning signals that populate the warning tier of the dashboard in Fig. 3. The governance framework developed in this paper does not compete with such models; it specifies the institutional cycle — decide, implement, evaluate, revise — within which their forecasts would need to be embedded in order to change an actual allocation or abstraction decision. This is consistent with the broader observation in the governance literature that improved monitoring and forecasting capability does not by itself improve outcomes unless it is matched by institutional processes that can act on it (OECD, 2015; Akhmouch and Correia, 2016).

Two limitations should be noted. First, the diagnosis is derived from the operational experience of a single regional water company and from a structured but qualitative reading of the literature; it has not been validated against a systematic, multi-agency survey or against quantitative indicators of governance performance, and the relative importance of the nine pathologies identified in Section 3 may differ across basins with different institutional histories. Second, the proposed indicators, dashboard thresholds and roadmap are presented as a design template rather than as calibrated, basin-specific values; before operational use, the thresholds in Fig. 3 and the indicators in Table 1 would need to be set against the measured water balance, recharge rate and socio-economic context of each basin, following the ten-building-block assessment logic proposed by van Rijswick et al. (2014) for evaluating water governance systems. Future work should couple this qualitative framework with the quantitative forecasting tools demonstrated elsewhere in this issue — for example using a validated groundwater-level or reservoir-storage forecasting model to populate the dashboard's warning tier with a lead time sufficient for pre-emptive action — and should test the framework's applicability in other basins under comparable water stress, including transboundary settings such as the Hirmand/Helmand basin discussed in Section 2.2 (Madani et al., 2016).

6. Conclusions

Iran's water crisis, and by extension the crises facing many arid and semi-arid regions under similar hydro-climatic and institutional pressure, cannot be adequately explained, or addressed, as a problem of physical water scarcity alone. The diagnostic review presented here identified nine recurring, mutually reinforcing pathologies in water resource management — project rather than problem orientation, weak demand management, groundwater over-abstraction, a gap between legal and sustainable allocation capacity, weak data-driven decision-making, administrative rather than basin-scale governance, fragmented inter-agency coordination, weak scenario-based foresight, and performance-evaluation criteria misaligned with resource sustainability — all of which are consistent with, and situated within, the established international literature on water governance. In response, this paper proposed an integrated framework comprising revised manager performance indicators, a three-tier water-security dashboard, a six-stage adaptive decision cycle, a five-pillar operational strategy for regional water companies, and a staged short-, medium- and long-term action roadmap. The unifying argument is that future water security will not be created by an unending expansion of supply, but by the intelligent management of limits: protecting resources, reforming consumption patterns and improving the quality of water governance. From this perspective, the most valuable assets of a regional water company are not only its dams, networks and transmission infrastructure, but also accurate data, skilled personnel, stakeholder trust, healthy aquifers and an efficient decision-making system. A national or provincial water-security evaluation system, in which the performance of managers and agencies is judged by resource protection, deficit reduction, abstraction control, efficiency gains and resilience outcomes rather than by project delivery alone, is proposed as the single most consequential institutional reform for moving water resource management from routine crisis response towards sustainable, preventive governance.

7. Data Availability

This paper is a qualitative policy and governance analysis and does not use a proprietary numerical dataset. The diagnostic material is drawn from the operational and policy experience of the Sistan and Baluchestan Regional Water Company (south-eastern Iran) and from the publicly available sources cited in the reference list, including OECD water governance publications (www.oecd.org/water) and Global Water Partnership technical background papers (www.gwp.org).

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