



Special Edition  
for World Water Forum 7

Groundwater Governance  
a call for action:

A Shared Global  
Vision for 2030



Groundwater Governance  
A Global Framework for Action

## Foreword

With one-third of humanity totally dependent on groundwater for their daily needs and 99% of the Planet Earth's accessible freshwater found in aquifers, there is a need to understand what would deliver sound governance of this natural resource in the face of its over exploitation and degradation over the past half century. Groundwater is also crucial for irrigated agriculture where surface water of suitable quality is not available. However, most - if not all - of our exploited aquifers are not being managed to conserve and protect these vital freshwater resources, according to experts.

Given the current state of aquifers and the degree of human dependency upon groundwater, in 2011 our respective organizations launched the initiative *"Groundwater Governance: A Global Framework for Action"*, in collaboration with many regional partners and agencies responsible for managing groundwater use and aquifer protection. In the context of this project, groundwater governance *"comprises the enabling framework and guiding principles for responsible collective action to ensure control, protection and socially-sustainable utilisation of groundwater resources for the benefit of humankind and dependent ecosystems"*.

The project has benefited immensely from the contributions of over seven hundred water experts and stakeholder groups throughout the world. It has produced 12 thematic analyses and organized five Regional Consultations resulting in five Regional Diagnostics, and a global expert consultation. It synthesised the findings into a Global Diagnostic and shaped a Shared Global Vision and a Framework of Action, to serve as valuable tools for countries seeking to improve the management of their groundwater resources and aquifers. We believe that these products provide means to face the looming threats to groundwater resources and to close the gap in groundwater and aquifer governance.

The main findings of the project confirm that the world's groundwater resources are falling victim to a lack of effective governance. To a significant extent, the over abstraction of ground water reflects the incentives that users face resulting from both market and policy failures. The available enabling frameworks and guiding principles are in insufficient use and there is a paucity of responsible collective action. This is one of the root causes of groundwater depletion and degradation of aquifers, and urgent call to action is needed if trends in the state of this resource are to be reversed.

The present document provides a synthetic overview of the consultative process and the main achievements. It conveys key messages from the results of the project's analyses, including the finding that governance of the world's groundwater resources is still in infancy. The decision-making processes concerning groundwater use and aquifer management are often poorly informed, leading to patterns of use that cannot be sustained and resulting in entrenched poverty and the loss of environmental and social 'goods' upon which cities and rural communities have come to depend.

Conscious of the need to raise political awareness at global level and to act with urgency to improve groundwater governance, our respective institutions are committed to integrating the recommendations of this project into their work programmes. Our sincere hope is that the initiative will be acted upon by the decision makers who can make a difference in reversing the current trend of groundwater depletion and aquifer pollution and sustaining the goods and services accrued from our valuable groundwater resources.

**Maria-Helena Semedo**  
Deputy Director-General,  
Natural Resources  
Coordinator,  
FAO

**Flavia Schlegel**  
Assistant Director  
General for  
Natural Sciences,  
UNESCO

**Shaminder Puri**  
Secretary General,  
International  
Association of  
Hydrogeologists

**Junaid Kamal Ahmad**  
Senior Director,  
Water Global Practice,  
The World Bank

**Naoko Ishii**  
CEO and Chairperson,  
Global Environment Facility



# A Shared Global Vision for

This is a Vision of the World in 2030 in which countries have taken appropriate and effective action to govern their groundwater in order to reach globally shared goals of social and economic development and avoid irreversible degradation of groundwater resources and their aquifer systems.

There is more freshwater stored underground than anywhere else on the planet. Although not all of this groundwater is readily accessible, groundwater has become a critical element in our lives, settlements, cultures and economies, as a prime source of water and as a factor in environmental health and climate change adaptation.

For all too long now, groundwater has too often been 'abandoned to chance' – despite growing resource utilisation and dependence. Therefore, a Globally Shared Groundwater Governance Vision has been generated through a global process of consultation with groundwater professionals, users and managers. It is an 'urgent call for systematic action', recognising that the 'price of doing nothing' will be especially high, in terms of lost freshwater reserves at a time when groundwater storage is critical for sustaining water security and adapting to climate variability.



# Groundwater Governance 2030

The Vision aims that by 2030

- there are appropriate and implemented legal, regulatory and institutional frameworks for groundwater that establish public guardianship and collective responsibility, permanent engagement of stakeholders and beneficial integration with other sectors, including other uses of the subsurface space and its resources
- all major aquifer systems are properly assessed, and the resulting information and knowledge are available and shared, making use of up-to-date information and communication techniques
- groundwater management plans are prepared and implemented for the priority aquifers
- groundwater management agencies, locally, nationally and internationally, are resourced and their key tasks of capacity building, resource and quality monitoring, and promoting demand management and supply-side measures are secured
- incentive frameworks and investment programmes foster sustainable, efficient groundwater use and adequate groundwater resources protection.



## Why 'groundwater governance' matters now

### Growing dependence

Since earliest history humankind has met much of its needs for good quality water from sources beneath the earth's surface, but for centuries our capability to extract groundwater was tiny by comparison with the available resource. In modern times major advances in water well drilling, pump technology, geological knowledge and rural electrification brought about a 'silent groundwater revolution'. Groundwater withdrawal has more than quadrupled in volume over the last 50 years, a trend that is likely to continue. Today groundwater is estimated globally to provide 36% of potable water, 42% of water for irrigated agriculture and 24% of direct industrial water supply.

The importance of groundwater should not be gauged solely on volumes used. Groundwater brings other major benefits, such as ready local availability, high reliability during droughts, regulating ecosystems and microclimate and generally delivering water of superior quality. The intense development of groundwater formed the cornerstone for the 'green revolution' of Asian agriculture, is providing public water supply for more than 1,000 million urban dwellers worldwide and supports rural livelihoods extensively across the globe. Groundwater is in many areas around the world the only dependable source of freshwater.

### Growing pressures

Groundwater development has brought many miracles, but it has come at a significant collateral cost. In many areas resource depletion caused by excessive abstraction is jeopardizing future water security. The over-abstraction diminishes future supplies and in some cases causes irreversible damage through land subsidence, loss of aquatic ecosystems or increased salinization. Elsewhere – in contrast – very shallow groundwater levels are a source of concern, bringing soil



### Scale and intensity of global groundwater withdrawals

- Global groundwater extraction has increased more than fourfold in the last 50 years – and is estimated to have reached 1000 km<sup>3</sup>/a in 2010, or 26% of all freshwater withdrawn
- Withdrawal intensity varies widely, with the highest levels occurring over large parts of China, India, Pakistan, Bangladesh, Iran, the US, Mexico and Europe
- Under natural conditions, groundwater systems are balancing outflows with average inflows, over longer periods of time. Intensive groundwater abstraction, however, may disrupt this balancing mechanism, which results in progressive groundwater storage depletion (overdraft).
- The groundwater overdraft resulting from excessive withdrawal around the globe is currently estimated to be almost 200 km<sup>3</sup> per annum, thus nearly one-fifth of all groundwater pumped.

Sources: Konikow (2011): Contribution of global groundwater depletion since 1900 to sea-level rise. *Geoph. Res. Let.*, Vol 38; Margat & Van der Gun (2013): *Groundwater around the World - A Geographic Synopsis*, CRC Press/Balkema.

water-logging and ‘groundwater flooding’ that damage property and/or present major health risks.

Another large group of challenges is the rapid growth of pollution pressures on groundwater. There is widespread evidence of deteriorating groundwater quality associated with the leaching of agrochemicals, seepage of urban and industrial effluents, and irresponsible disposal of hazardous waste. Such pollution undermines human well-being and limits the options of groundwater use. Groundwater quality problems tend to be extremely persistent, and often too costly or technically impractical to remediate. There is a growing pressure on the entire ‘subsurface space’. Groundwater withdrawal is part of this pressure and is impacted by the intensive use of the subsurface space for transport and storage, mining exploitation and the development of new energy sources such as shale gas and coal-bed methane.



## The initiative to strengthen groundwater governance

### Governance – from weakness to strength

The concerns above led five international organisations, i.e. the Global Environment Facility, the World Bank, the Food and Agriculture Organization of the United Nations, the UNESCO-International Hydrological Programme and the International Association of Hydrogeologists to launch the Groundwater Governance Project. This global initiative to strengthen groundwater governance commissioned 12 thematic papers and a synthesis by leading experts and convened five regional consultations in different parts of the world and a final high level expert meeting. The outcomes of all these activities were integrated in a Global Diagnostic that became the basis for the Shared Global Vision For Groundwater Governance 2030 and the Global Framework for Action.

In the course of the process it became evident that in most countries the ability to manage groundwater has not kept up with the increased dependence on this resource and with steadily growing pressures. Groundwater governance almost everywhere is insufficient, with the following key deficiencies, as identified in the Global Diagnostic:

#### Groundwater governance – key deficiencies identified in ‘global diagnostic’

- Inadequate Leadership from Government Agencies
- Limited awareness of Long-Term Groundwater Risks
- No Measurement of Groundwater Resource Status
- Non-Performing Legal Systems on Groundwater
- Insufficient Stakeholder Engagement in Groundwater Management
- Limited Integration of Groundwater in Related National Policies



There is hence an urgent need to strengthen groundwater governance – to address the current challenges and future significance of groundwater and to make use of opportunities for protecting and augmenting the groundwater resources. Groundwater governance involves identifying goals and policies, providing institutions and procedures, assigning dedicated personnel and financial resources, promoting stakeholder participation, and taking responsibility for outcomes. Because groundwater is essentially a local resource, effective governance arrangements need to extend down to the local level, but should also be linked to basin-level, national-level or even transboundary level, as appropriate. Good groundwater governance recognizes the value of aquifer systems, and aims at achieving the sustainable provision of freshwater and preventing the degradation of aquifer systems.

### Working principles

A number of principles guide how governance of groundwater translates into practice.

The **first principle** is that groundwater should not be managed in isolation, but conjunctively as appropriate with other water sources to improve water security and assure ecosystem health. Groundwater can often play the vital role of strategic reserve to cover variations in surface-water availability, and is both recharged by and discharging to surface-water bodies

The **second principle** is that groundwater quality and resources should be co-managed, and for this groundwater management needs to be harmonised with land management. Land-use exerts a major influence on how groundwater is recharged, and groundwater recharge zones are thus in urgent need of protection from pollution and degradation



### Groundwater governance – a definition

Groundwater governance comprises the promotion of responsible collective action to ensure control, protection and socially-sustainable utilisation of groundwater resources and aquifer systems for the benefit of humankind and dependent ecosystems. This action is facilitated by an enabling framework and guiding principles.

Groundwater governance has four components:

- An effective and articulate **legal and regulatory framework**
- accurate and widely-shared **knowledge** of the groundwater systems concerned, together with **awareness of the sustainability challenges**
- an **institutional framework** characterized by leadership, sound organizations and sufficient capacity, permanent stakeholder engagement, and working mechanisms to coordinate between groundwater and other sectors
- **policies, plans, finances and incentive structures** aligned with society's goals

The **third principle** is that effective groundwater governance requires co-governance of subsurface space – a concept, which is still in its infancy, but needs to be developed.

The **fourth principle** concerns the need for ‘vertical integration’ between national and local level in the elaboration and implementation of groundwater management and protection plans.

The **fifth principle** is coordination with the macro-policies of other sectors – such as agriculture, energy, health, urban and industrial development and the environment. In many cases policy action in these sectors holds the key to groundwater resource sustainability.



## The framework for action – urgent action is needed

To achieve the goals of the Shared Vision 2030 a Framework for Action has been prepared. It describes the main steps to be taken, provides guidelines and is an urgent call for action to all who can make a difference: national and local governments, international organizations, private sector, civil society, media, educational institutes and professional organisations. What needs to be done in a certain place and on a certain aquifer systems is very much driven by the local context: the hydrogeology, the level of development, the specific challenges but also the capacity of political leadership to deliver, the overall governance and macro-economic interests. From the consultation process it was however clear that almost everywhere much more needs to be done to strengthen groundwater governance. The steps taken need to adapt wisely to what is possible in time and space.

### Create an adequate basis for governance

Political commitment and leadership are essential, with the ability to deliver on identified priorities. Stakeholder awareness and involvement are also needed to motivate all those involved to align their behaviour with the objectives of good groundwater management. Steps to lay the foundations for strengthening governance can include a groundwater governance diagnostic, overcoming policy impediments, data acquisition and management information, awareness raising programmes and institutional mechanisms for effective stakeholder involvement.

### Building effective institutions

Institutions, comprising the legal and regulatory framework, organisations (both governmental and non-governmental) and permanent stakeholder engagement mechanisms, are the core of groundwater governance. However, it is not the formulation of laws and regulations, but their implementation and adoption by all stakeholders that will enable effective management.



Preferably groundwater should be brought under public guardianship, for instance in licensing water well development and controlling localized ‘point’ pollution. Laws and regulations should also impose data sharing and facilitate important processes such as balancing competing or conflicting interests among stakeholders, and coordination with urban and rural land uses and with the management of the entire subsurface space.

Lead organisations are required at both central and local government level. The institutional set-up needs to ensure joint management of both quantity and quality aspects of groundwater and should facilitate conjunctive management. The ideal structure would integrate groundwater management vertically between national and local level, and horizontally at each level with other sectors impacting on groundwater. Local level agencies need particular strengthening and motivation for their front-line management tasks.

Effective groundwater management requires partnership between public agencies and private stakeholders. Permanent stakeholder involvement needs to be recognised by law, which may give legal status to formally-constituted groundwater associations.

Aquifers that cross the boundaries of countries, or of provinces in federal countries, are a special case, requiring cooperation among the jurisdictions involved. Best practice starts with professional collaboration, information exchange and development of shared understanding, which can then lead to joint programmes and ultimately to management agreements.

### **Making essential linkages**

Establishing linkages to other water resources and other sectors is a requisite of governance. Connections to other water sources and other sectors need to be systematically made. At present the linkages often are not incorporated in policies and plans. Within the water sector groundwater needs to be managed ‘conjunctively’ with other



sources of water. Groundwater and surface water in particular supplement and feed each other, hence water allocation plans should be made accordingly. Groundwater governance also needs to take account of key linkages with other sectors. Prime targets are the urban sanitation and waste-water management, land use and land management, energy provision and mining and other sectors that make use of the subsurface space. The key to sustainable groundwater management often lies in the integration in wider policies – from regulating the use of hazardous substances, to infrastructural planning (such as roads and pavements) to trade arrangements.

### Redirecting finances

In many countries, incentive policies and public expenditures at present do little to promote groundwater management, and often do harm. Public finances related to groundwater need to be reviewed critically, and brought in line with policies for sustainable groundwater development. For example, government subsidies and other incentives that encourage excessive abstraction or pollution of groundwater may need to be withdrawn, without penalizing those who have most to lose. Alternative incentive systems could reward recharge, mitigate pollution and reduce water-use.

Groundwater management infrastructure needs to be adequately financed and it is important to ring-fence adequate funding for key functions – such as aquifer monitoring, information dissemination, regulatory procedures, developing stakeholder platforms and promoting user participation. The jobs involved are ‘virtuous’: they safeguard a shared treasure of enormous value to society and economy. Similarly, there needs to be more investment in groundwater management. Portfolios need to be developed for investment in building knowledge, participatory monitoring; landscape improvement, recharge for urban water supply; groundwater substitution; dedicated electric feeder lines and swipe card systems; protection of recharge zones and where unavoidable remediation amongst others.



## Starting the process of planning and management

A key step in putting groundwater governance provisions to work is the establishment of an aquifer management planning process. These structured programmes of action should be established and owned by local agencies and stakeholders under the guidance of the national groundwater agency. The planning process is evidence-based, transparent and contestable – and the resulting plans create a framework of accountability.

## An urgent call-for-action

The current state of, and dependence upon, groundwater resources requires a massive effort to strengthen its governance – locally, nationally and where appropriate trans-boundary. This will require a concerted and coordinated effort from government at different levels, from municipalities and utilities, from private sector, civil society and international organizations, educational institutes, media and professional associations. Fortunately there are some inspiring examples to follow – major cities that have managed to control excessive extraction, islands that have safeguarded groundwater quality, districts that have put in place full monitoring and metering systems for groundwater. We may also take inspiration from these and understand their effective implementation.

The Shared Global Vision for Groundwater Governance 2030 and the Global Framework for Action to Achieve the Vision on Groundwater Governance call for strengthening groundwater governance. This call for action urges countries, districts, communities, companies, organisations and individuals to safeguard the groundwater resource that is essential to meet their common future objectives and Sustainable Development Goals and to set in place the groundwater governance arrangements that will secure this.

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned. The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of FAO.

© FAO 2015

FAO encourages the use, reproduction and dissemination of material in this information product. Except where otherwise indicated, material may be copied, downloaded and printed for private study, research and teaching purposes, or for use in non-commercial products or services, provided that appropriate acknowledgement of FAO as the source and copyright holder is given and that FAO's endorsement of users' views, products or services is not implied in any way.

All requests for translation and adaptation rights, and for resale and other commercial use rights should be made via [www.fao.org/contact-us/licence-request](http://www.fao.org/contact-us/licence-request) or addressed to [copyright@fao.org](mailto:copyright@fao.org).

FAO information products are available on the FAO website ([www.fao.org/publications](http://www.fao.org/publications)) and can be purchased through [publications-sales@fao.org](mailto:publications-sales@fao.org).



Educational

Participation

Incentives

Ecosystems

Institutional Framework

Transparency



[www.groundwatergovernance.org](http://www.groundwatergovernance.org)



United Nations  
Educational, Scientific and  
Cultural Organization



International  
Hydrological  
Programme



[www.theGEF.org](http://www.theGEF.org)



Food and Agriculture  
Organization of the  
United Nations



WORLD BANK GROUP