

# MODULE



## GROUNDWATER REGULATION, LICENSING, ALLOCATION AND INSTITUTIONS



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## MODULE 6

### Groundwater regulation, licensing, allocation and institutions

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## Imprint

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ANBO – African Network of Basin Organisations

BGR – Federal institute for geosciences and natural resources

UNDP-Cap-Net

BMZ – Federal Ministry for Economic Cooperation and Development

GWP – Global Water Partnership

IGRAC – International Groundwater Resources Assessment Centre

imawesa – Improved Management of Agricultural Water in Eastern and Southern Africa

IWMI - International Water Management Insitute

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# GROUNDWATER REGULATION, LICENSING, ALLOCATION AND INSTITUTIONS

## LEARNING OBJECTIVES

- To appreciate the need for regulation of groundwater within the framework of river basin organizations;
- To create awareness about the benefits of a groundwater licensing and allocation system;
- To understand how groundwater licensing and allocation systems may be implemented and;
- To consider the institutional arrangements for groundwater management.

## 6.1 Introduction

Groundwater regulation is required in order to control groundwater development and activities that might compromise groundwater availability and quality; to address increasing competition and conflict between groundwater users; and to control the increasing threat of groundwater pollution. Water regulation is an important groundwater management strategy that is implemented through development and implementation of a licensing and water allocation system. Groundwater regulation has provisions for issuance of water rights or water permits with accompanying conditions to any activity that may affect the quantity and quality of groundwater. Anybody granted a right or permit has therefore to ensure that his/her groundwater development or other activities that might compromise groundwater availability conforms to the permit conditions or else he/she is penalized. These standards are set and enforced by the groundwater regulatory agencies.

## 6.2 Regulation of groundwater within a river basin framework

### Overview

It is increasingly recognized that groundwater and surface water impact on each other and that greater integration of their management is essential. However, although groundwater is recognized as being closely linked to surface water, integrated management of groundwater and surface water within the framework of river basin management has not yet been fully realized in Africa. This deficiency can be partially addressed through groundwater regulations that provide mechanisms for sustainable management of groundwater and surface water through:

- Guidelines for, and limitations to, the exercise of public powers
- Provision for the quantification, planning, allocation and conservation of groundwater resources, including water abstraction and use rights
- A system of wastewater discharge licenses, helping to protect groundwater against pollution
- Definition of the rights and duties of groundwater users
- Protection of user rights, of the rights of third parties and of the environment
- Requirements for the registration of well drillers based on the qualification and experience of well drillers



- Possible administrative intervention in critical situations (aquifer depletion, drought or pollution)
- Provision for cooperative interaction between groundwater administrators and groundwater users.

### **Groundwater regulation process**

Many countries in Africa now require permits or licenses for abstraction of groundwater, discharge of wastewater and well construction activities. Catchment planning, aquifer resource planning and land surface zoning are then all subject to their meeting the requirements stipulated in those permits for groundwater conservation and protection. Any establishment that is involved in groundwater development and in activities that might compromise groundwater availability and quality has to obtain a permit or license in order not to contravene the law. The permit is issued upon application to the regulatory body that takes into account the conditions of the groundwater system and the intensity and nature of proposed groundwater abstraction or activity.

Modern groundwater regulation tends to be flexible, enabling and enforceable through the following actions:

#### **a) Regulation of groundwater abstraction and issuance of water use rights or permits**

Regulation of groundwater abstraction through issuance of groundwater abstraction/use permits serves as the basis for charging abstraction fees. In many countries in Africa this is flat rate for any motorized groundwater abstraction while in a few countries it is based on the volume of water abstracted.

#### **b) Regulation of groundwater pollution and issuance of wastewater discharge permits**

Licensing for the discharge of wastewater into the ground provides for conditions on the mode of discharge and the level of treatment required, and is designed to protect groundwater against pollution. The 'polluter-pays-principle' is normally embodied in the regulatory framework where charges are related to the pollution load discharged to the ground.

#### **c) Instituting sanctions for non-compliance**

Sanctions in form of penalties are instituted for those who constantly refuse to comply with the provisions of the laws and permit conditions. These penalties may range from fines to imprisonment terms, depending upon the severity of impacts and the persistence of the offence.

#### **d) Controlling well construction activities**

Control of water well construction activities by drilling contractors is done to ensure high standards of well construction, improved reporting on the hydrogeological conditions encountered, and reduced likelihood of illegal well construction. This is normally done through issuance of drilling permits.

#### **e) Catchment or aquifer level resource planning**

Provision for water resources planning with reference to surface water basins and/





or aquifer systems is sometimes done based on an inventory of water resources and of existing uses identified either as part of specific water use assessments or as part of environmental impact assessments. Such plans provide an integrated basis for the assessment of individual applications for water rights or permits and may be legally binding. All decisions on applications must be consistent with their provisions.

**f) Conjunctive use of groundwater and surface water**

Recognizing the role of conjunctive water use, it may be advantageous in some circumstances to have a single permit that covers, for example, both groundwater abstraction and discharge of effluent of an acceptable quality to a surface water-course; or a single permit for surface water diversion and use coupled with re-charge of an effluent of acceptable quality to the ground.

**g) Land surface zoning for groundwater conservation and protection**

In some countries, legislation provides for the water administrators to declare 'special control areas', where exceptional measures (such as restrictions on new water well drilling and/or groundwater abstraction rates) become possible in the interest of avoiding further aquifer deterioration. Land surface zoning may also be targeted to serve the purpose of protecting vulnerable aquifer recharge areas and/or ground-water supply sources.

In the defined zones, restrictions can be applied in relation to potentially polluting activities (such as certain types of urbanization, landfill solid waste disposal, hazardous chemical storage and handling facilities, mining and quarrying, etc.). For the prevention of diffuse pollution from agricultural land use, it is more normal to introduce bans or import control mechanisms on certain pesticides and to promote the adoption of codes of good agricultural practices.

**h) Facilitating water-user and stakeholder participation**

The participation of groundwater users and other stakeholders in groundwater management has become increasingly acknowledged and appreciated due to the realization that legal provisions are more likely to be implemented when stakeholders have a say and are actively involved. In addition to local water-user associations, more widely constituted 'aquifer management organizations' may be needed for large aquifers:

- to discuss implementation of measures across user sectors and between water-user associations
- to agree on priority actions in areas with a critical groundwater situation
- to assist the water resource regulator generally in the administration of groundwater abstraction.

These organizations however need to be given legal status and to be integrated into broader institutional mechanisms for groundwater resource management and protection.

**i) Provisions for Groundwater Monitoring**

Groundwater regulation normally provides for the monitoring of the status of groundwater in terms of quantity and quality and the use of water by the users



themselves, but with regular oversight compliance monitoring by the groundwater regulatory institutions at various levels.

## 6.3 Groundwater Licensing

Water resources have traditionally been allocated on the basis of social criteria, ensuring that water for human consumption, for sanitation, and for the production of food is given first priority.

Population growth has made water scarcity a major problem in many countries, and pollution is more widespread today with degrading water quality resulting in less fresh water available. As a consequence there is greater competition between water for drinking, irrigation, industry, environment etc.

Most countries in Africa have their water resources in public ownership, with government having the overall responsibility for resource management. The right or permit to abstract (or divert) and use water (including groundwater) can be granted to individuals, public entities or private corporations, under certain terms or conditions, and such rights are generally issued by the water resources regulatory authority. A 'water right' or a "water permit" usually constitutes the right to use (but not ownership of) the water itself. Authorizations to abstract and use groundwater are instrumented through permits, licenses, concessions or authorizations, generally called here 'water rights' or "water permits".

### Need for a groundwater licensing system

A licensing system for groundwater (through issuance of permits to abstract and to use groundwater) is aimed at regulating interdependencies among water users. It is introduced as a means to:

- Reduce interference between abstraction wells;
- Avoid counterproductive conflicts that may arise, and;
- Resolve emerging disputes between neighboring abstractors.

However the development of a comprehensive licensing system has wider benefits, since it provides a sound foundation for the development and protection of water resources and for the conservation of aquatic ecosystems. Certain other steps towards more integrated water resources management can only be effectively tackled when a groundwater licensing system has been effectively established:

- Fostering the participation of water users in groundwater management;
- Improving economic efficiency;
- Implementing demand management programs to reduce groundwater abstraction;
- Systematic collection of abstraction charges to raise revenue for resource management;
- Possible subsequent trading of abstraction rights to promote more efficient water use;
- Developing conjunctive use of surface water and groundwater resources.

Although the existence of groundwater licensing systems do not guarantee water supply of a given quantity and quality, they offer water users greater supply security for investment purposes and a valuable asset as bank collateral to obtain development credits.



## BOX 6.1 AN EXAMPLE OF A PERMIT (FROM UGANDA)

### GROUNDWATER ABSTRACTION PERMIT

(The Water Statute, No. 9 of 1995, and the Water Resources Regulations, 1998)

In exercise of the powers conferred upon the Director by sections 5, 18 and 29 of the Water Statute, 1995; and in accordance with regulation 16 of the Water Resources Regulations, 1998, this is to grant a Groundwater Abstraction Permit

**Number:**

**To :**

To abstract water in accordance with the terms and conditions of this permit  
The permit is granted in the terms and conditions set here in the Annex, which is part of this Permit, and under all other terms and conditions set in the Water Statute, 1995 and the Water Resources Regulations, 1998

This permit is granted for a period not exceeding 5 year(s), which come into force on

**Monday, November 21, 2005 until Wednesday, November 24, 2010.**

**Issuance Date: Monday, November 21, 2005**

.....  
**DIRECTOR OF WATER RESOURCES MANAGEMENT**

### Setting conditions for water permits

All water permits must be issued with conditions. The set conditions fall into two categories namely: standard conditions and special conditions. Standard conditions are derived from the law and apply to all permit holders irrespective of their location and the nature of activity. Special conditions are specific to the applicant and depend on the type of activity to be regulated, the amount of groundwater to be abstracted, the nature and size of the aquifer or area and the special interests to be protected. An example of a Groundwater Abstraction Permit is indicated in Box 6.1 above.





**Table 6.1: Terms and conditions usually specified in groundwater abstraction and use permits (modified from GW-Mate Briefing note 5)**

TERM OR CONDITION	COMMENTS
■ duration of right/permit	This requires flexibility but ranges between 1 to 5 years
■ points of abstraction and use	These need to be specified as they may vary
■ purpose of use	Important to distinguish consumptive and non-consumptive use
■ rate of abstraction	This needs to be specified as it is the basis of compliance monitoring and also charging fees
■ specification of works	Details of depth, diameter, completion, sanitary protection, etc need to be stated.
■ environmental requirements	These deal with any provisions needed to protect the resource or ensure no adverse environmental impacts are caused by groundwater use under the permit
■ permit fees	Fee are usually paid for using the water under the permit
■ record of transactions	Obligation to declare and submit information on groundwater use and any other information collected as part of the permit
■ loss or reduction of right	Forfeiture without compensation for non-use or non-compliance
■ suspension or cancellation of right or permit	Indicates the circumstances under which the permit may be suspended or cancelled as a penalty or in emergency without compensation
■ review of right/permit	States the needed periodic adjustment with compensation according to supply/demand
■ renewal of right/permit	States requirements and conditions for renewal of the permit

### Implications of a groundwater licensing system

Water abstraction and use rights/permit systems should be a comprehensive and unified system covering groundwater and surface water together. Part of the system should be made in sufficient detail to minimize conflict between users, and should specify the condition under which groundwater is abstracted, which may include time, the rate, the volume and the priority that applies in case of scarcity.

However, water users should be entitled to reasonable security in their continuing right to abstract and to use groundwater in the interest of stability and to encourage investments. Appropriate judicial or review mechanisms should be in place to enable groundwater users and others affected by the impacts to question and to challenge decisions.

The table 6.1 summarizes the main conditions that are usually specified in groundwater abstraction and use rights/permits.

## 6.4 Groundwater allocation

### Main criteria of allocation

Water allocation objectives normally include economic, social and environmental factors. Appropriate means of resource allocation are necessary to achieve optimal allocation of the resource. There are several criteria used in water allocation:

- Flexibility in the allocation of water, so that the resource can be reallocated from user to user, place to place, for more social benefits, economic and ecological uses through periodic review, and avoiding perpetuity in allocation;
- Security of tenure for established users, so that they will take necessary measures to use the resource efficiently; security does not conflict with flexibility as long as there is a reserve of the resource available to meet unexpected demands.



- Predictability of the outcome of the allocation process, so that the best allocation can be materialized and uncertainty (especially for transaction costs) is minimized.
- Equality in the allocation process is important. Prospective users should perceive that the allocation process provides equal opportunity gains from utilizing the resource to every potential user.
- Political and public acceptability, so that the allocation serves publicly approved values and objectives, and is therefore accepted by all segments in society.
- Efficacy, so that the form of allocation changes existing undesirable situations such as depletion of groundwater and water pollution, and moves towards achieving desired policy goals.
- Administrative feasibility and sustainability, to be able to implement the allocation mechanism, and to allow a continuing and growing effect of the policy.

### **Administering a groundwater allocation system**

Groundwater allocation should be handled together with surface water allocation under a single water allocation system. Where administration systems are separate for various reasons, attempts should be undertaken to integrate them, or if necessary, to introduce coordinating mechanisms. In this way physical interactions between the two water bodies are taken into account in water allocation.

River basin organizations need to introduce this 'conjunctive' practice of allocating water, taking into account both surface and groundwater resources. To be effective, the responsibilities of the RBO require both understanding and management of groundwater and aquifer recharge events and linked actions.



**Table 6.2: Special considerations related to groundwater licensing (modified from GW-Mate)**

CONSIDERATION	COMMENTS
<i>Technical</i>	
■ groundwater quality concerns	Possible effect of new abstraction and impact of wastewater discharge have to be considered
■ level of surface water connection	Connection between groundwater and surface water varies widely and needs to be considered when evaluating effects on third parties and environment
■ resource replenishment	Some aquifers have limited present-day recharge and use of 'fossil groundwater' requires special criteria
■ dual purpose of some wells	Investigation boreholes may have to be used as production water wells since exploratory drilling is too costly
<i>Managerial</i>	
■ well-drilling business	Parallel regulation required in view of special skills needed and pollution hazard caused by improperly constructed wells
■ flexibility in water allocation	Has to be provided for when dealing with hydrogeological uncertainty and need to prioritize resource reallocation for potable use
■ groundwater conservation areas	May need to be designated to mitigate degradation due to excessive abstraction or pollution threat
■ transboundary aquifers	Can lead to disagreements between neighbouring states/nations over resource behaviour and use priorities

Conjunctive use of groundwater and surface water should be encouraged, and administration systems should ensure that:

- The limits to acceptable use of groundwater are clearly specified, usually by specifying a maximum drawdown level in the aquifer; and
- The order of priority of use by conjunctive users (i.e. of both sources) is determined with regard to other users who have only one source.

The table 6.2 summarizes main points to be considered when administering a licensing and water allocation system. The level of surface water connection should be assessed in terms of effects on third parties (users downstream), and to ensure watercourse baseflow, protection of environmental ecosystems, and sustainability of springs. This therefore requires consideration of both surface water and groundwater during groundwater allocation.



## BOX 6.2 CRITICAL CONSIDERATIONS DURING GROUNDWATER ALLOCATION

Complexities and obstacles in implementation:

- Many historical, social, ecological, economic and political circumstances influence the exploitation of groundwater resources
- The complex challenge of monitoring the compliance of groundwater users, paying attention to existing institutional capacity and the essential role that users themselves have to play.

‘Enabling environment’ for implementation by:

- Recognizing that water licensing and allocation must be tailored to the specific local circumstances
- Ensuring political support at the highest level, since strong economic interests are usually affected when allocating/reallocating water resources
- Thinking twice before calling for legal amendments, to make sure that any identified shortcomings could not be better overcome without the lengthy process of legal reform
- Starting with definition of water resources policy, which includes the rationale for amended/new water legislation and an outline of how existing water-use rights will be handled
- Admitting that “good” comes before “perfect”, and that a groundwater rights system does not have to be comprehensive but does have to be workable
- Being convinced that there will always be room for incremental improvement; it is not necessary to await the perfect law and ideal institution before starting action
- Accepting that the task cannot be achieved overnight; international experience has shown the design and implementation of water rights systems always to be a lengthy endeavour
- Involving all actors from the outset to ensure wide ownership of the system introduced; both water-user sectors and government personnel administering the system should participate
- Stressing that regulatory instruments alone are not enough and that water rights administration requires a finely-tuned balance of regulatory, economic and participatory instruments.

**Source:** *Batu, 1998*

To ensure better compliance of groundwater users, stakeholder participation should be enhanced in parallel with information management to give transparency to the allocation process. Monitoring of water use and water resources is also critical for better water allocation enforcement.



A number of implementation tools are required, which should be kept as simple as possible:

- **Planning Instruments:** spreadsheets of water users and polluter populations, and aquifer quantity/quality models for prioritization of areas to be controlled;
- **Managerial Guidelines:** procedures for receiving, assessing and monitoring of applications;
- **Information System:** based on adequate software to manage applications, permit issuance, monitor user compliance, carry out operational quality control and deliver easily understood information to water users;
- **Public Education:** for raising political and public awareness in general.

Critical aspects that need to be considered in implementing groundwater allocation (Box 6.2) include the complexity of the implementation process, and the enabling environment that may facilitate user compliance.

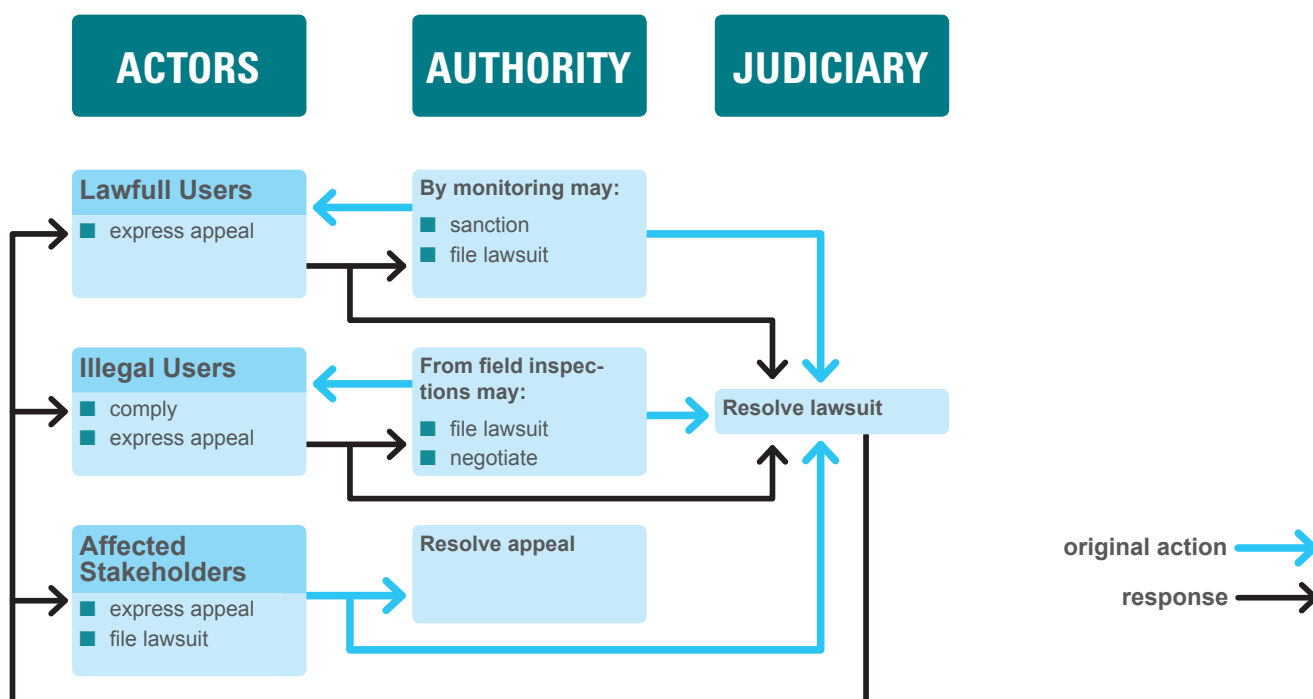


Figure 6.1: Main interactions on the introduction or consolidation of a groundwater rights system (adopted from GW Mate Briefing note 5)





In order to ensure that there is an effective groundwater licensing and allocation system, regulatory and enforcement agencies need to pay special attention to key issues as highlighted in Box 6.3 below.

### BOX 6.3. KEY PRIORITIES ISSUES FOR REGULATORY AND ENFORCEMENT AGENCIES

- Sufficient staff of adequate capability to enforce regulations and make appropriate assessments;
- Laws which are practical, enforceable and are based on accurate knowledge of resource management and environmental impacts
- Staff who are knowledgeable about good management practices and have appropriate scientific knowledge
- A sense of ownership on the part of stakeholders so that they accept the monitoring, enforcement and regulation procedures; ownership can be built through use of awareness raising techniques and participatory management
- Adequate financial resources to support the staff and operations, and transparency in financial management, to minimize regulatory failure;
- Selecting meaningful indicators for technical, economic and social issues and appropriate benchmarks;
- Designing and implementing a program of legal education and awareness building – for the regulating parties and public at large. This contributes to putting legal instruments into practice and ensuring that the use of regulatory instruments is not limited to specialists.

## 6.5 Main interactions in groundwater licensing and allocation system

In managing a groundwater licensing and allocation system, the most important actor is the applicant or holder of a water-use permit (Figure 6.1). But other users in the same aquifer and its dependent surface water may also be involved. Other stakeholders (not only water users but those whose interests might be affected) may also want to express an opinion regarding an application for a new water right, to file a complaint or lawsuit against an existing user, or to appeal against decisions.

The water resource authority can deny the applicant a new water right, or may grant and register it. Once the application is granted, the applicant becomes a lawful user who will often have to pay fees and charges according to the terms and conditions attached to the right. The water resource authority should keep records and monitor compliance through field inspections and other means. On discovery of non-compliance, the authority can impose a warning, or a sanction, or seek prosecution by the judiciary if a criminal offence has been committed. In addition, the judiciary may hear appeals from the water-right holder or from affected third parties. In order to ease the burden on the judiciary, appeals may be addressed in the first instance to the highest ranking officer of the water resource authority.



Management style is as important as management process, because users prefer a water authority to work with (rather than against) them. This can be achieved by ensuring that:

- Conflict resolution mechanisms are well-accepted, economic and rapid;
- Sanctions are balanced to discourage non-compliance but not to cripple water users;
- Monitoring is realistic and commensurate with institutional capacity;
- Record-keeping procedures ensure complete copies are available for public scrutiny;
- Water authority discretion is limited to discourage corruption but reduce bureaucracy;
- User bribery and administrator corruption is dealt with decisively.

When water legislation is updated or new laws adopted, difficulties arise because of pressures from existing users and their political associates to concede exceptions. No universal rules are applicable, but the following guidelines should be useful.

- Existing uses should be effective and beneficial to qualify for automatic recognition. If it is not possible to compute an accurate groundwater balance, all users should be given permits of short duration, which can be revised in the light of more reliable information.
- Customary rights should be dealt with comprehensively, either formally recognized or appropriately compensated.
- Not only unlawful users are to blame for the unsatisfactory current status of groundwater resources; past water administrations may also be responsible because of lack of capacity or corrupt tendencies.
- No exceptions should be tolerated; all existing groundwater users, including public water-supply utilities, must be brought into the fold of the law.
- Specification of abstraction rate thresholds by water use should be a dynamic process. Certain minor uses may be exempted from water rights bureaucracy, but simple declaration of existence will prove useful to recognize such lawful users, should more stringent measures eventually be needed.

## 6.6 Allocation of non-renewable groundwater resources

In the case of non-renewable aquifer systems, implementation of a groundwater abstraction rights system is a high priority. It must be consistent with the hydrogeological reality of continuously declining groundwater levels, potentially decreasing well yields and possibly deteriorating groundwater quality. Thus the permits (for specified rates of abstraction at given locations) will need to be time-limited in the long term, but also subject to an initial review and then modification after 5–10 years. At this time more will be known about the aquifer response to abstraction through operational monitoring. It is possible that use rules set by appropriately empowered communal organizations could take the place of more legally formalized abstraction permits.

Many major aquifers containing large reserves of non-renewable groundwater are transboundary, either in a national sense or between autonomous provinces or states within a single nation. In such circumstances there will much to be mutually gained through harmonization of relevant groundwater legislation and regulations, particularly the groundwater rights systems.



The water allocation system should take special consideration of:

- The impacts of new water allocation on traditional groundwater users (some compensations may be provided);
- Ensuring that sufficient reserves of extractable groundwater of acceptable quality are left in the aquifer system;
- The difficulties in estimating the impacts of drawdown on a given ecosystem;
- Considering “what happens after?” and then identifying and costing the probable “exit strategy”, and;
- Envisaging re-use of urban, industrial and mining water supplies, and carefully controlled agricultural irrigation.

## 6.7 Institutional framework for groundwater management

An enabling environment is required for effective management of water resources, including groundwater. The institutional arrangements for management of groundwater resources will bring clarity to the roles and responsibilities of the national and/or provincial institutions responsible for groundwater resources and define ways of confronting potential constraints to the management process such as inadequate groundwater management boundaries, weak regulatory enforcement, lack of social consensus, poor inter-institutional coordination.

Given the problems created by growing water scarcity and pollution, regulatory systems vest all water resources in the state, or recognize the state’s superior right to the management of water resources. Thus groundwater has been declared as a ‘public good’ thereby turning the former owners of groundwater into users, who must apply to the state for a water abstraction and use rights/permits. Since the state is the guardian or trustee of groundwater resources, it may (in addition to granting water rights) introduce measures to prevent aquifer depletion and groundwater pollution. Current legislation tends now to require water resources planning at the level of an entire aquifer or river basin.

An idealized structure and functions for a government agency acting as a groundwater guardian is suggested in figure 6.2. A separate management organization that deviates for the idealized structure may however be established for management of very large aquifers. In most cases groundwater management will be fully integrated into organizations with responsibility for both surface and groundwater. The historical problem that groundwater management receives inadequate attention under this arrangement needs to be addressed.

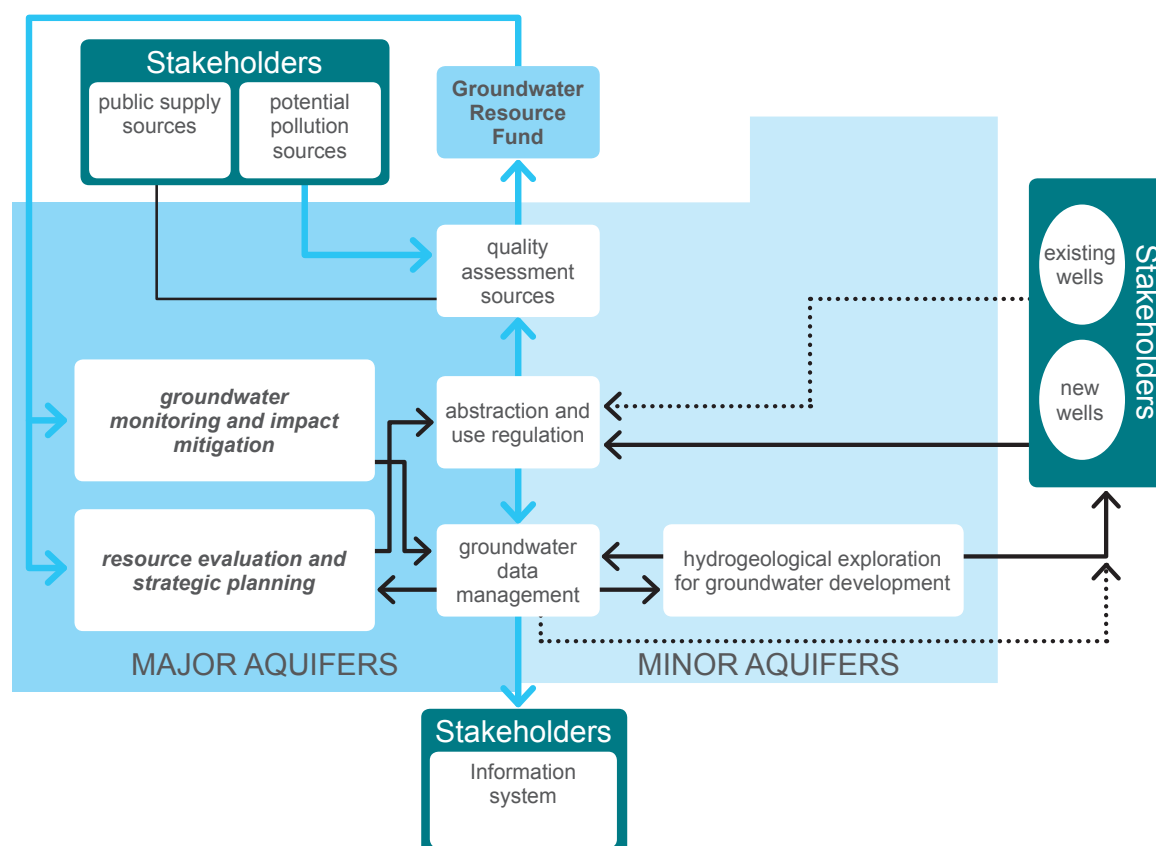


Figure 6.2: Idealised structure and functions for a government agency acting as groundwater guardian. (Foster & Kemper, 2002-06)

## 6.8 Implementing a groundwater regulatory system

Successful implementation of groundwater regulatory system (table 6.3) depends on a number of factors including:

- The administrative set-up and the level of training of water administrators
- A clear understanding of the institutional roles and functions at all relevant levels
- An adequate level of public awareness and acceptance of legal provisions
- Political willingness to promote and attain sustainable groundwater management.

An administrative set-up suited to national or state conditions should support groundwater regulation:

- At national level: management functions (covering both quantity and quality aspects) should be vested in a single authority or ministry or (where this is not considered appropriate) clear institutional mechanisms for coordination between the competent bodies must be established
- At river basin or regional level: the specific situation may warrant the establishment of river basin agencies, especially for the performance of some planning and coordination functions
- At intermediate or local level: it is important to pay careful attention to local institutional arrangements for water administration; ie. the role of the local authorities in water resources management (since they represent local interest); the establishment of intermediate institutions (aquifer management organizations) that have legal power in relation to specified aquifers and with adequate representation of different water-user associations, various water-use sectors and a clear-cut relationship with the local water authority.



**Table 6.3: Key Water Management Function and Institutional roles (modified after GW-Mate, Briefing note 4)**

Key Function	Main Activity	Institutional Roles			
		National Water Authority/ RBO	Local Regulatory Agency	Sub-basin/ Aquifer Management Offices	Water Users Associations
<b>POLICY MAKING &amp; STRATEGIC PLANNING</b>					
	Resource assessment	•	×	×	
	Use Assessment and Socio-Economic Survey		•	×	×
	Strategic long-term Planning	•	×	×	
	International agreements	•			
<b>RESOURCE MANAGEMENT/ REGULATION</b>					
Stakeholder participation	Develop and maintain an active stakeholder participation process through regular consultation activities. Provide specialist advice and technical assistance to local authorities and other stakeholders in IWRM.	•	• •	×	
Pollution control	Wastewater Discharge Licenses	•	•	×	×
	Identify major pollution problems.	•	•	×	×
	Definition of Protected Areas	•	•	×	×
Water allocation	Water Rights Administration/ License of water uses including enforcement of these.	•	•	×	×
	Licensing of development implementers, e.g. well drillers	•	×		
Information management	Define the information outputs required by the water managers and different stakeholder groups in a river basin.	•	•	×	×
	Organise, co-ordinate and manage the information management activities.	•	•	×	
Setting economic & financial tools	Set fees and charges for water use and pollution	•	•	×	



Key Function	Main Activity	Institutional Roles			
		National Water Authority/ RBO	Local Regulatory Agency	Sub-basin/ Aquifer Management Offices	Water Users Associations
Basin Action Plans	Conduct situation analysis with stakeholders.	•	•	×	
	Assess future developments in the basin.	•			
Emergency Situations	Structural/ non-structural measures for flood/drought mitigation	•	×	×	×
	Disaster preparedness		•	•	×
Monitoring & Enforcement	Water Status survey/ database (quantity/quality/ socio-economic)	•	•	×	×
	Water Use and pollution	•	•	×	×
	Conflict resolution	•	•	×	
<b>MONITORING AND EVALUATION</b>					
	data collection activities of multiple agencies	•	×	×	×
	Regular stakeholder communication	•			
	Packaging information in a way that is readily understandable to the target group and that addresses their needs or concerns.	•			

•, × indicate respectively responsibility for, and participation in, the corresponding management function, but the situation will vary somewhat from country to country depending upon their geographical size and political structure.



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## 6.10 Exercises

To promote good discussion to consider what elements of the legislation, regulation and allocation could be undertaken at regional TBO level and what at national BO level. Is the regional level useful to agree common policies/ frameworks and the country level BOs where the application will take place?

### EXERCISE 1

#### IMPLEMENTING GROUNDWATER REGULATORY AND ALLOCATION SYSTEMS

##### *Purpose*

To share experience in implementation of groundwater regulatory and allocation systems at national and transboundary levels

##### *Activity: break into two groups and discuss:*

1. Regulation of groundwater at national and transboundary levels highlighting differences and similarities
2. Key considerations during development and implementation of an allocation system for transboundary groundwater resources

*Duration: 45 minutes*

### EXERCISE 2

#### ENFORCEMENT OF GROUNDWATER REGULATIONS AND PERMIT CONDITIONS

##### *Purpose*

To share experiences in enforcement of groundwater regulations and permit conditions

##### *Activity: break into two groups and discuss:*

Enforcement of groundwater regulations and permit conditions at national and transboundary levels highlighting possible enforcement mechanisms to employ, challenges expected at each of the levels and how can they be addressed.

*Duration: 45 minutes*









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