

# Challenges Facing the Management of Shared Aquifers

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## ABSTRACT

Libya enjoys a wide experience in dealing with shared aquifer systems and has cooperated in good faith with neighboring countries, regional and international organizations in this domain long before the UN General Assembly's resolution 63/124 on the Law of Transboundary Aquifers has been enacted. Since the early seventies of last century, bilateral and multilateral committees have been formed mostly with Libyan initiatives to exchange acquired information on the geometry, extent, and properties of the Transboundary aquifer systems as well as the level of development, water abstraction, water quality, type of use and rates of depletion. Such dialogues were later developed into permanent bodies in the form of joint commissions and consultation mechanisms whose duties were clearly defined by the countries aiming at achieving an acceptable level of sustainable development.

These concerted efforts made by all concerned parties and their continuous cooperation have led to the implementation of regional hydrogeological studies and the establishment of shared data bases and monitoring networks with the support and guidance of several international organizations. These efforts did not always proceed smoothly, however; several challenges were faced throughout this evolutionary period, although they were never serious enough to interrupt or stop the coordination process among countries. Among these challenges was the lack of a defined legal framework that specifies the relationship between sharing states when action is needed to overcome negative phenomena resulting from overexploitation and/or contamination, the effect of which propagates beyond national boundaries. Other difficulties/challenges are closely related to financial, administrative and technical inputs by the parties.

This paper is intended to identify the major challenges facing the management of shared aquifer systems with a special focus on those states depending on groundwater as the main source of water supply for all fields of their socioeconomic development. To this end, recommendations are made to overcome these challenges individually by each state and collectively by all sharing states with the ultimate objective of achieving sustainable management of the shared aquifers.

## BACKGROUND

Libya is one of very few countries in the world that depend almost entirely on groundwater for their agricultural, industrial and domestic supply. The country encompasses large sedimentary basins of multi aquifer systems characterized by relatively good quality waters. Due to its uneven population distribution, over exploitation is taking place in the coastal aquifers which led in recent decades to the evolution of serious problems in the form of a continuous drop in the water table and increasing salinity. Although coastal aquifers are receiving annual recharge, their water budget deficit is becoming wider every year, threatening national development schemes. The coastal aquifers are mostly local in nature with negligible effect beyond national borders.

In the north-central and south-eastern parts of Libya, two major groundwater systems exist, namely the Hamada basin, regionally known as the North Sahara Aquifer System and the Kufra – Sarir basin regionally known as the Nubian Sandstone Aquifer System. Both aquifer systems are transboundary in nature with considerable storage capacity. Apart from being the source of fresh water supply for local use, they represent the primary source for an inter-basin water conveyance system to the north known as the Great Man-made River Project (GMRP). In the south western

part of Libya, a major aquifer system known as the Murzuq basin is classified as a local inland basin and is extensively tapped for water supply to local communities as well as the second phase of the GMRP.

Since the early sixties of the last century, bilateral and multi-lateral cooperation with neighboring states was initiated. Accordingly, joint technical committees were formed aiming at the realization of an efficient exchange of information on the conditions of the shared aquifers with emphasis on the rate of groundwater extraction, aquifer geometry, water levels, water quality and hydraulic parameters.

Financial and technical assistance from international organizations resulted in the realization of regional hydrogeological studies for the entire basins with data bases and mathematical models being produced.

#### INSTITUTIONAL ARRANGEMENTS

A joint authority for the study and management of the Nubian Sandstone Aquifer System (NSAS) was formed in Tripoli in 1989 between Libya and Egypt and was later extended to include Sudan and Chad. The mandate of this Joint Authority was initially defined to include the following duties;

- Collection, analysis, integration and dissemination of data
- Conducting complementary hydrogeological studies
- Planning and implementing water resources development schemes at national and regional levels.
- Training and capacity building
- Rational use of water
- Assessing the environmental impact of water development
- Organization of workshops
- Coordination with regional and international organizations

On the other hand, a trilateral committee between Libya, Algeria and Tunisia was formed in 1999 to coordinate efforts during the early stages of the regional hydrogeological study of the North Sahara Aquifer System (*Systeme Aquifere du Sahara Septentrional*) (SASS). In 2002 a permanent body known as the “the consultation mechanism” was created to undertake the following tasks:

- Manage the data base and mathematical model developed under the regional hydrogeological study
- Develop and follow up a reference observation network
- Process, analyze, and validate data
- Develop data bases on socio-economic activities
- Develop and publish indicators on the resource and its use

- Promote and facilitate joint studies and research
- Formulate and implement training programmes
- Update the regional model on a regular basis

Both the Joint Commission of the NSAS and the Consultation Mechanism of the SASS are chaired on a rotational basis and are jointly financed by the member countries.

## CHALLENGES AND SETBACKS

The technical aspects of the management exercise of the shared groundwater aquifer systems have to a certain extent been addressed despite the scarcity and irregularity of information. Enormous extensions of these aquifers under barren deserts within the riparian states render them inaccessible without appropriate and often costly means. Desert storms and moving sand dunes could halt movement and activities for days. Such conditions have serious implications on the drilling activities and data collection campaigns .

The areal distribution of the water extraction zones and observation wells is often limited to very few scattered plots or oases. For economic and technical reasons, the bulk of water withdrawal comes from the shallow and intermediate aquifers. Deeper aquifers are rarely tapped or monitored which minimizes the value and validity of groundwater models. However, results generated from oil exploration campaigns are invaluable in providing geological, geophysical and hydrogeological data.

These problems reflect the magnitude of uncertainty encountered during the development of groundwater models for the two transboundary aquifer systems.

Other challenges that still need to be properly addressed include the securing of necessary funds needed to carry out technical tasks by the established mechanisms and the training of competent individuals to enable them to plan, execute and implement the pre-defined duties.

An equally important challenge is the lack of a legal and institutional framework. National water legislation defines priorities for water use in view of available alternatives. In Libya, for example, water scarcity led to the adoption of the mining process as a transitory solution to close the gap between supply and demand. The Tripoli statement issued at the end of the International Conference on Regional Aquifer Systems in Arid Zones – Managing Non-Renewable Resources held in Tripoli in November 1999 indicated that *"In many arid countries, however, the mining of non-renewable groundwater resources could provide an opportunity and a challenge, and allow water supply sustainability within foreseeable time-frames that can be progressively modified as water related technology advances."*

This approach implies that whenever water demand grows much beyond any country's supply capabilities, groundwater mining can be accepted at least on a short term basis.

It is therefore imperative to account for the possible transboundary effect of groundwater extraction, a matter that is not properly addressed under the existing coordination mechanisms.

The growing rate of groundwater use, particularly in arid and semi-arid regions, and the possible harmful effects that could propagate beyond national borders have motivated the issuing of the law of transboundary aquifers.

This law, subject of the UN General Assembly Resolution No. 63/124, could form a solid base for cooperation between countries. It is suitable of addressing practically all issues that may emanate as a result of over use or misuse of the resource. It urges countries to cooperate in good faith through an agreed mechanism and calls for equitable and reasonable utilization of water taking into account present and future needs and alternative water sources for the aquifer states with special regard given to vital human needs.

Libya and its partners are in an advanced stage of cooperation in managing their shared aquifer systems both technically and institutionally. The newly introduced law will complement the ongoing process by adding a legal dimension. This dimension may or may not be utilized in the near future but it forms a set of principles that can realize the preservation and protection of this scarce and vital resource.

#### REFERENCES

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