

Joint management of a transborder water basin

The Sahara-Sahelian region is a desert area, but it has immense groundwater reserves. Although replenishment of these reserves is very slight, their waters are basic to the survival of people and animals in these regions. The North-Western Sahara Aquifer System (NWSAS) is a cross-border resource of fossil waters that are shared by Algeria, Tunisia and Libya and is a source of livelihood and survival for hundreds of thousands of farmers. Now, overexploitation is jeopardising the future of a major area of the Sahara.

Photo: Trux



Traditional irrigation system «foggara».

Water is a source of life for hundreds of thousands of farmers who practice intensive oasis farming or irrigated farming on e.g. cereal crops and livestock. Further to farming water is being used by the urban population and by industry (especially for oil processing and tourism). But now, the water resources are being jeopardised by overexploitation. Despite considerable potential, exploitation is limited by natural constraints that hold abstraction rates down to 1/10,000th of the potential.

For close to a century, but especially during the last thirty years, pumping operations in the wells, some of which are very deep, has started drawing on the groundwater reserves. Because of growing demands for irrigation and drinking water and for industrial use, between 1970 and 2000 total abstraction rose from 0.6 to 2.5 billion m³/year. The increase in the number of water points, now estimated at 8,800, kept pace with population growth. In 1970 one million people lived of the

NWSAS waters, the only water resource in this part of the Sahara. In 2000 the population had already reached four million, and the estimated eight million for 2050 will seriously aggravate the problem. Inordinate pumping in the two NWSAS aquifers could have serious effects on the future and the economy of the region. Overpumping will imply:

- Artesianism will come to an end and water tables will drop. This will result in

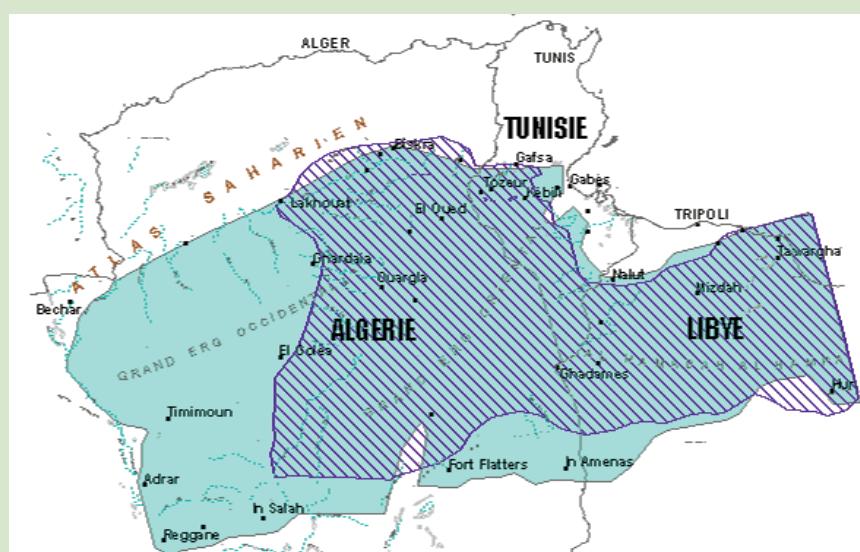
NWSAS: facts and figures

Land area	1 million km ²
Total volume	60,000 billion m ³
Recharge	1 billion m ³ /yr
Annual Abstractions	2.5 billion m ³
Wells	8,800
Population	4 million
Irrigated Lands	200,000 ha

Chedli Fezzani
Djamel Latrech
Ahmed Mamou
Observatoire du Sahara et du Sahel
Tunis, Tunisia

Anneke Trux
GTZ CCD Project
Bonn, Germany
Anneke.Trux@gtz.de

Limits of the NWSAS basin



The fossil water reserves of the North-Western Sahara Aquifer System (NWSAS) amount to 60,000 billion cubic meters (m^3) and are being shared by Algeria, Tunisia and Libya.

rising pumping costs. Example: the Biskra region north of the chotts where 13 deep wells actually provide 45 $hm^3/year$ of water through artesian flows. Future annual costs for pumping would amount to 13.5 million euros.

- Water quality will deteriorate because of increased salinity and soil quality. This will result in lower agricultural productivity.

Information sharing – sensitize political decision-makers

Since the NWSAS is the only water resource in this arid region, the challenge for Algeria, Tunisia and Libya, because of the current level of exploitation of the NWSAS aquifers, will be to decide to

secure the future of the region by carefully controlling abstraction rates together. National leaders in the three countries have become well aware of these risks and decided to carry out a joint large-scale study programme, tasking the Sahara and Sahel Observatory (OSS) with prime responsibility and the search for the necessary financial support. Since 1998, with the help of the three countries, OSS has obtained support from Swiss, German and French development cooperation agencies, as well as from the International Fund for Agricultural Development (IFAD), FAO, and the Global Environment Facility (GEF). The first three-year phase of the programme ended in December 2002. The OSS experts made the decision-makers understand that transparency was a

pre-requisite to finding a mutually beneficial solution. Now, the government services in charge of water resources have a common data base with full information on the whole reservoir. Partnerships of this type were developed during the NWSAS project and gradually led to mutual confidence among the technical teams, recognition that the problems encountered by certain partners could depend on the actions carried out by others, and the conviction that information exchange, which underpins all solidarity, was both feasible and necessary.

More importantly, the combination of all the available information made it possible to construct the NWSAS computer model that is capable of simulating future scenarios on questions such as: What would be the effects of increasing abstractions in one country on the neighbouring country? Could the water tables be made sustainable if the three countries agreed not to increase their current abstraction rates? Where are the most vulnerable areas? Are there unexploited potential abstraction zones, where exploitation would have less effect on the water resources? The experts spent one year designing scenarios, e.g. a reference scenario called the «zero simulation scenario» in which abstraction rates were kept at their 2000 level and the corresponding rates for the year 2050 were calculated, and a simulation scenario based on country projections that tripled abstraction rates in some zones. The results sent a signal to all parties concerned (see figure on page 59).

- The «zero scenario» would cause serious drawdowns: over 40 meters in the Algerian Lower Sahara, about 20 to 40 meters around Chott Fedjej in Tunisia, and about 25 meters in Libya. In Algeria and Tunisia current drawdowns are over 30 meters in the chotts region, in Libya 60 meters. Artesianism in the chotts region of Algeria and Tunisia would disappear completely. There is a serious risk that the waters of the Terminal Complex, (one of the water layers of the SASS) would be infiltrated by saltwater from the chotts. By simply continuing the present pace of abstraction in this region, the consequences would be very serious.
- Provided this scenario holds true, drawdowns would be 300 and 400 meters deep in the Algerian Lower Sahara with total elimination of artesianism. In Tunisia drawdowns would be between 200 and 300 meters with elimination of artesianism and the Tunisian Outlet. This situation would be unacceptable. The possibility that the aquifer would re-

ceive water percolating from the chotts would include a fatal risk of salinization. Under this scenario the economic and environmental implications would be serious. The pumping costs would increase farming costs. This would be a hard blow to the agricultural sector in the south of Tunisia and in Algeria where preparations are underway for association with the EU market in 2008. Salinization is a serious risk: With a salinity rate of 4 to 6 grammes per liter water is unsuitable for irrigation. Another consequence of that major, irreversible soil degradation might be environmental damage comprising the risk for oasis to die. As oases do not only have a high agricultural value but are an attraction for the tourist sector as well, economic impact might be serious. With this scenario in mind, how can the Saharan watertables be exploited without overexploiting them and keeping path with the sustainable development goals?

The OSS expert group came up with the following recommendations:

- Limit abstractions in the risk areas and carry out the necessary depth studies;
- Site future abstractions in zones recognized for their high potential;
- Set up a network for the production and dissemination of reliable indicators on the water resources;
- Give attention to the socio-economic factors in order to find alternative solutions to potential constraints.

Realistic conclusions on the capacity of the NWSAS to provide large volumes of water with minimum risk to the resource can be obtained by using hydrogeological knowledge and the OSS-NWSAS model together. Results have shown the need for joint management of the water resources. To prepare for the joint use of the water resources, the OSS project advocated the development of basin awareness and the implementation of a «consultation mechanism» from the beginning.

The starting point is the need to maintain and develop the common data base and the model. Thereupon, data exchanges

should be used as the basis for water policies and strategies. This explains the need for establishing a permanent, sophisticated institutional mechanism that will be practical to operate and can be implemented step by step.

Prospects for cross-border management of water

Information has been capitalized and countries have developed data exchange systems. This is reflected in the almost consensual position on resource exploitation and sustainable development in the basin. The three Directors General in charge of water resources in the three countries have signed an agreement on standing tripartite consultation mechanisms for joint management of NWSAS.

Results from model simulations have led to two recommendations for the decision-makers, namely:

- maintain abstraction volumes at their present level, even reduce them in certain areas;
- give due consideration to environmental factors which, in some cases, may mean forsaking certain agricultural practices that are harmful to the soils.

These two recommendations might be considered as constraints as they impinge upon national development plans that tend to expand irrigated farmlands to meet the needs of a constantly growing population. Because of this situation, the project went further in its recommendations on the NWSAS sub-basins (Djeffara, Biskra, Western Basin, etc.) to consider a global viewpoint that included socio-economic factors. If alternatives are to be made available to the decision-makers, results based exclusively on hydrological data are not enough, which means that the NWSAS vision of the future will have to include:

- a diagnostic of irrigation practices and their effectiveness;
- data on the profitability of certain farming techniques;
- alternative activities (tourism, crop conversion).

The activities and results of the NWSAS project provide an exemplary approach to cross-border basin study and management.

Through information exchange and consultations, the project can serve as a model for regional cooperation. This project is an example of successful South-South and North-South cooperation.

Drawdowns related to the »zero scenario«

