Case Study Transboundary Management SASS

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See also the **Hydrogeology of Algeria**, **Hydrogeology of Tunisia** and **Hydrogeology of Libya** pages.

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Transboundary management of the North-Western Sahara Aquifer System / Système Aquifère du Sahara Septentrional (SASS)

The SASS aquifer system

The Système Aquifère du Sahara Septentrional (SASS) is a deep sedimentary aquifer system that extends over an area of 1.03 million km^2 beneath the northern African countries of Libya, Algeria and Tunisia. The aquifer has two layers: the Intercalary Continental (Continental Intercalaire: CI) and the Terminal Complex (Complexe Terminal: CT).

Outline of the area of the two layers of the SASS – solid blue: Intercalary Continental (CI); hatched blue: Terminal Complex (CT). Image credit: OSS 2014

Changing use and conditions of groundwater in the SASS

Historically, each country managed its area of the aquifer independently, with little knowledge or account of what was being done in the other countries (OSS 2008). In the second part of the 20th century, exploitation of the aquifer increased significantly, driven by an expansion of the area of irrigated agriculture in all three countries, driven by post-colonial policies that promoted internal food security and a reduction in food imports (Siegfried & Kinzelbach 2003). Traditionally, agriculture in this region was based around arboriculture, e.g. of date palms, using foggarra irrigation technology in and around oases. Foggaras, or qanats, are underground conduits that carry water from springs or wells to villages and agricultural areas. Under the new policies, crop production, irrigated by groundwater abstracted from deep drilled boreholes, became more important in all areas. Populations and groundwater use from the aquifer increased, as agriculture became the largest user of groundwater from the aquifer (OSS 2008).

In the current desert or arid conditions of the Sahara, with annual rainfall everywhere less than 200 mm and annual evapotranspiration more than 2000 mm, recharge rates to the SASS aquifer are negligible (Siegfried & Kinzelbach 2003). Groundwater in the aquifer is dominantly ‘fossil’ water, recharged thousands of years ago during the last ice age, when the climate here was wetter. Current recharge is too low to replace the increased groundwater abstractions, and so groundwater (piezometric) levels began to fall. Aquifer zones that had been artesian lost artesian pressure. The effects of enhanced evapotranspiration of irrigation water also led to water quality degradation due to salinization (OSS 2014).

Managing groundwater degradation

Some bilateral agreements between the three countries involved were made in the 1980s and 1990s, such as a research-based management plan agreed between Algeria and Tunisia in 1982-3, while Libya simultaneously drew up its own plan based on different data. In 1999 it was agreed between all three countries that there was a need for more holistic, tripartite management. This required the establishment of a mechanism of communication and organisation between the three countries.

The SASS projects and consultative mechanism

The first SASS project was partially funded by FAO, and ran from 1999–2002. The aim was to start a loose technical collaboration and establishing a joint groundwater database and hydrogeological model. A key element was the involvement of the Observatoire du Sahara et Sahel (OSS), an independent organisation already set up with the intention of halting desertification in Northern Africa. The OSS acted as an organiser and intermediary for the SASS project. Ministers of relevant bodies from each country were also involved (Mechlem 2014).

The first SASS project culminated in a verbal agreement between the three countries to cooperate in maintaining research and sharing results.

The second SASS project, from 2002–2006, led to a ministerial declaration formalising the verbal agreement. The countries resolved to collaborate on monitoring, maintenance of a groundwater database, and use of co-produced hydrogeological models to inform decision making.

The third SASS project culminated in a formalisation of the consultative mechanism. This included: a council of ministers from each country; a permanent joint technical committee; a national committee in each country; national and regional working groups; and an international coordination unit.

The advantages of this consultative mechanism are that it is flexible enough to accepted by all countries, and it is heavily weighted towards information generation and management. This allows for some scientific basis for management decisions, and that management decisions made in and by the individual countries are based on information about the whole aquifer. An additional output from the third SASS project was recommendations for the operation of irrigation, recognising that agriculture is the largest user of groundwater in the region (OSS 2018).

Disadvantages of the mechanism include that it is not prescriptive about each stakeholder's rights and responsibilities, and it does not include any mention of ecological protection or principles of international water law. There is no protection of recharge and discharge zones or pollution control measures (Mechlem 2014, Mechlem undated).

The future

The consultative mechanism began with a technical objective rather than a political one, and that less controversial focus has been a factor in its success so far, along with facilitation by a neutral body, the OSS. Building on the 14 years of collaboration so far between the countries concerned, there may be a need to move towards a more regulatory approach in future, to tackle the unsustainable (because of low recharge rates) levels of groundwater abstraction indicated by the hydrogeological models developed based on the data collected by the technical projects. Socio-economic models indicate that water demand will continue to increase, including for low-value activities such as field agriculture. Although it plays an important socio-economic role, there is now a political drive to limit water use for this type of agriculture and instead promote higher value activities, such as greenhouse cultivation, arboriculture and tourism (OSS 2008). The consultative mechanism achieved at the end of the third SASS project may be a foundation for a more regulatory approach that could start to deliver this, by delineating responsibilities and future limits to extraction.

Linked to this, the price of water is also contentious, as it varies widely between the three countries, including being subsidised in Algeria (OSS 2014a). There are likely to be future drives towards harmonising water prices across the SASS aquifer, and towards making them better reflect groundwater abstraction costs.

Beyond modelling the use of groundwater, there is now a recognised need for more efficient use of water in general, and alternative sources of water including recycling wastewater (OSS 2008).

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