Dilemma of Fossil Water Management within Southern Tunisia Oases: Vulnerability to salt under intensive Use context

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Problematic

In southern Tunisia oases, water is the most important natural resource. The survival of those ecosystems is conditioned by the availability of such resource. Under an arid climate, oases inhabitants acquired secular traditions in water management. These cases observed a lightening development.

The improvement in drilling techniques reinforced their capabilities to provide for the expansion of urban water needs and irrigation requirements. Despite being fossils, underground water resources are sustaining an overexploitation that definitely compromises the sustainable development of the whole ecosystem.

Available water resources

In the arid area of the southern country, the only potential water resources available provided from the SASS (System Aquifer of the Sahara Septentrional). It deals with sedimentary basin holding huge underground water volumes and extended over an area of one million km² across three countries; Algeria (700 000 km²), Libya (250 000 km²) and Tunisia (80 000 km²).

During the previous decades, the water mobilization from this basin has considerably enhanced from 0.6 millions km³ in 1970 to a current ratio of 2.5 millions km³.
There are mainly two deep aquifers that are building the SASS: the Complex Terminal (CT) aquifer, with a depth ranging between 100 to 500 m and the Continental Intercalary (CI), with a depth that can reach 2800 m. The mean salinity between the both aquifers, varies between 2.5 to 6 g/l (Prinz and Loeper, 2008).

In Tunisian oases, these two aquifers provide considerable resources for both of agriculture and drinking water supply. Their mobilization assumes a great importance for the development of these regions.

Agriculture consumption

More than 80 % of the water allocation from the SASS aquifers is provided to agriculture purposes. Unfortunately, an efficient water management inside oases is facing several technical and even cultural hindrances. The traditional irrigation methods still widely used within farmers parcels.

The water excess supplies shallow water table that rises to rather unacceptable level and create a water logging context (Prinz et al, 2005). The extension of the irrigated area in the oases is occurring without any assessment of water resources capabilities.

The PHD work is focused to studies the improvement of irrigation efficiency in the oases of Nefzaoua region. Indeed, despite several rehabilitation works undertaken by the development authorities in these regions, the assessment following those interventions revealed very high water consumption inside parcels.

Furthermore, latent conflict situation between farmers remain, concerning water turn and their effective irrigation water allocation. The survey is conducted on the main soil occupation (date palm), monitoring the impacts of several water saving techniques on both soil and crop yields quality evolution.
Prospective studies on the water demand for the tourism in these regions based on a daily ratio of 700l/s per bed forecast an enhancement in water demand in this sector to 27 millions m³ while it approached 10 millions m³ in 2003 (OSS, 2009).

As an example of the main oases tributary to such water resources, the Nefzaoua region’s where the urban water consumption provided from the CI aquifer enhanced from 3,11 millions m³ in 1997 to more than 4,33 millions m³ in 2007. Nearby 42.4 % of the distributed water has a salinity ranging between 1.5 and 2 g/l.

The implementation of three desalination stations had been undertaken and they are planned to be operational in 2010 with a treatment capacity of 6000 m³/day in kebili, 4000 m³/day in Douz and 6000 m³/day in Souk Lahad delegation’s.

Based on the piezometric level and monitoring supervised by the OSS for the whole basin and for the Tunisian case, exploitation scenarios had been modeled until the horizon 2050. It fosters impacts of additional mobilized water volumes on both the piezometric level decrease.

Indeed, for the CT aquifer, the continuous decreases will still occurring until reaching 10-15m depth under chotts levels. Furthermore, the artesianism is expected to considerably decrease in the extreme country south (Mamou, 2009).
The current practices followed to mobilize the fossil water in these regions are enhancing risks of land salinization, their fertility is irreversibly affected. In such context, the abandon of agricultural activities in these oases will condemn any social life over these area and they will be exposed to accurate desertification process.

Obviously, the risks of underground water resources degradation, coupled to the changes resulting from the ecosystems mutations (biodiversity decrease, intensive urbanization inside oases, and progressive decline of the oasis effect on the climate aspects) require urgent assessment of the water mobilization approach in those areas.

Conclusion

Long desired for their natural prosperity, the southern Tunisia oases have been for a long time self reliant ecosystems. Traditional knowledge in water resource management played a key role in their adaptation to the global environmental changes. Now, these oases became real cities where the urbanization advances as well as the irrigated area extend around the habitations.

Under such context, the pressure on water demand increased definitely coupled with un-sustainability factors and risks inherent to fossil water management. Indeed the salt contamination by the chotts stills the main threat that compromises the future of those regions. The water use patterns should be drastically reconsidered within the framework of rational exploitation.

The agricultural sector that consuming more than 80% of these resources is called to enhance irrigation efficiency within farmers parcels where major water losses still occurring. The extension of illegal perimeters around the oases should be further closely supervised.

Furthermore, the multiplication of deep wells in private parcels that use the CT water should be strictly prohibited. The drainage water amounts that are collected downstream these oases should be valorized otherwise risks of their backflow towards the irrigated perimeters remain ultimately imminent.

The urban water sector performance is embedded in these practices, the improvement of the distribution network have been already engaged. It aims to replace the integrity of the old connections. The networks monitoring and the regular water losses detection campaigns conducted will definitely improve the water saving process.

Improving the scientific understanding of local water management practices, capacity building and water saving technology transfer could bring to bear more efficient solutions to face such water problems.

This practices panel requires the commitment of all stakeholders involved in the underground water resources management in southern country. In absence of such awareness, the intensive use of these fossil water, will lead oases inhabitants to experience relevant difficulties in efficiently managing scarcer and less reliable underground water resources.
Southern Tunisia oasis Nefta urbanization

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