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ET DÉFIS DU MONDE  
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Éditions Quæ  
RD 10, 78026 Versailles Cedex  
[www.quae.com](http://www.quae.com)

© Éditions Quæ, 2017

ISBN: 978-2-7592-2731-0

Version française : « Des territoires vivants pour transformer le monde »

© Éditions Quæ, 2017

ISBN : 978-2-7592-2654-2

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## Sustainability of groundwater exploitation in the Mediterranean region

*Marcel Kuper and François Molle*

Groundwater exploitation is often an extractive activity and therefore unsustainable. In this chapter, we use some examples from the Mediterranean region to illustrate that the sustainability of groundwater is generally subordinated to other socio-political imperatives. These unsustainable practices raise the question of how compatible is the rate of this resource's depletion with the socio-economic transition of the societies concerned, which usually depends, at least partially, on this very resource.

### **A FATALISTIC DISCOURSE ON GROUNDWATER OVEREXPLOITATION**

Beginning in the 1970s, groundwater use took centre stage, gradually at first and then massively, in different regions around the Mediterranean. The development of technology to pump water without constraints from wells and tube-wells close to farming plots triggered agricultural and territorial transformations. Groundwater began to be widely exploited, mainly through individual initiatives of millions of farmers but also through support by governments in the form of various incentives. Entire agricultural economies based on the exploitation of groundwater sprang up around the world. It is now estimated that 113 out of 300 million hectares of irrigated land in the world use groundwater, consuming about 700 km<sup>3</sup> of water in 2010, which represented 70% of total water withdrawals (Margat and van der Gun, 2013). Approximately 10% of global groundwater used for irrigation is pumped in the Mediterranean region.

Groundwater, stored in the subsoil, has gradually become 'visible' in Mediterranean territories, both within and on the periphery of public irrigation systems and on agricultural frontiers. Its use has led to and become the basis of the introduction of new methods of coordination to derive value from resources (water, land), the adoption of new farming systems and the growth of agricultural markets. These rapid agricultural and territorial transformations are accompanied by strong inequalities in access to water and exclusions. The resulting social fragility is exacerbated by a general decline in groundwater levels (typically about one meter per year) and by frequent



degradation of water quality (salinization, nitrates). Faced with this situation, various countries have adopted water policies for the conservation of groundwater resources, often inspired by the international paradigm of Integrated Water Resources Management (IWRM)<sup>1</sup>.

Usually referred to as ‘overexploitation’, the use of groundwater is often, *de facto*, extractive and therefore unsustainable, with withdrawals continuing until the resource is exhausted. Even though these processes may appear to be the consequence of decisions by individuals, they are, in fact, the result of a coalition of users, managers and policymakers, with the State, too, thus playing a role (Allan, 2007). The coexistence of the rhetoric on the sustainable management of groundwater with these extractive practices therefore raises a fundamental question about the attitude of States. Can it be that the governments grant more importance to other concerns?

## **SUBORDINATION OF THE SUSTAINABILITY OF GROUNDWATER TO OTHER IMPERATIVES**

The issue of groundwater use and overuse and the sustainability of its exploitation are usually subordinated to other imperatives. This not only explains the continuing lowering of water tables around the world and the lack of application of the principles inspired by Integrated Water Resources Management, but also provides key insights into the territorial evolution of irrigated territories. For the sake of illustration, we discuss the cases of the highlands of Jordan, the plain of Saiss (Morocco) and the district of Biskra (Algeria).

In Jordan, irrigated agriculture accounts for 46% of groundwater withdrawals. This form of agriculture has spread mainly on the highland plateaus since the 1970s and 1980s, stimulated by export opportunities for agricultural produce, subsidized energy, availability of cheap semi-desert lands, accessible water of good quality, and the transfer of agricultural know-how from the Jordan River valley. While the resulting agricultural growth has been robust, groundwater resources have been severely impacted. In the early 1990s, the government acknowledged the extent of the problem and attempted to strengthen licensing procedures, prohibited the drilling of agricultural wells (1992), introduced water meters (mid-1990s) and imposed a volumetric tariff system (2002). Nevertheless, agriculture continued to expand relentlessly, to 71,000 hectares of irrigated land on the highlands in 2013, compared to just 42,000 hectares in 2000. Despite the very critical situation of its water resources and difficulties in meeting the priority needs of domestic water supply, the State has so far failed to curb

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1. According to a common definition of the Global Water Partnership, IWRM is a ‘process which promotes the coordinated development and management of water, land and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.’ According to Molle (2008), IWRM – like other ‘nirvana’ concepts – faces two difficulties: ‘it is an attractive yet woolly and consensual concept (nobody is against nirvana). Such concepts typically: a) obscure the political nature of natural resources management; and b) are easily hijacked by groups seeking to legitimize their own agendas. The definition [of IWRM] focuses on the desired three E’s (Efficiency, Equity and Environmental sustainability) but implies that they can be achieved concomitantly if – as the word ‘maximize’ suggests – problem-solving can be informed by neutral and rational approaches, good science and expert knowledge.’



or even stabilize the expansion of irrigated agriculture, and thus the amount of water this activity consumes. This situation may be explained by the economic and political issues involved. First, the political balance of the country is largely dependent on a tribal policy through which the Hashemite regime maintains a give-and-take relationship with the tribes, a key factor in the regime's stability. Second, many wealthy and influential high-level government officials and investors have invested in irrigated farming on the highlands and are loathe to take any decision inimical to their own interests. These interests concern not only agricultural incomes but also land speculation, since land values shoot up once it is developed through agriculture and its ownership eventually regularized. This mechanism also benefits the Bedouins, who are monetizing access, even illegally, to land they claim as their traditional territory (Al Naber and Molle, 2016a). Third, some small farmers are suffering in the current economic climate, and it would be politically unsound to put them under further stress, especially in a post-Arab Spring context (Al Naber and Molle, 2017). Nevertheless, since 2013, the government has been tightening regulations, carrying out awareness campaigns in all concerned sectors and sanctioning numerous offenses, expressing a rare but fragile political will to change the status quo in order to avoid an imminent crisis.

In Morocco, the Saiss plain is located near the imperial cities of Fez and Meknes. This rich agricultural plain has been undergoing a rapid transformation that started in the 1980s, from a predominantly rainfed agriculture (cereals, vines, fodder) to a groundwater-based irrigated agriculture. Nearly 25% of the plain (about 50,000 ha) is currently irrigated with groundwater from the phreatic or captive aquifers, whose levels have been declining for several years. The plain is experiencing major agrarian transformations with the advent of investors who take long-term leases of government land or buy land from former beneficiaries of land reforms, usually to grow fruit trees (apples, plums, etc.). Field vegetable cultivation, mainly of onions and potatoes, has also expanded considerably. These cash crops attract lessees who cultivate up to 100 ha per farm. Field and post-harvest labour requirements have led to widespread employment. The strong growth in fruit and vegetable production in the Saiss is well in line with the country's ambitious Green Morocco Plan, which encourages the intensification of agriculture through subsidies and the easing of regulatory hurdles to access to land and water, which are seen as brakes on production (Fofack *et al.*, 2015). This agricultural dynamic is also essential to maintaining a certain social peace by allowing farmers to continue producing even in the event of drought. Given the political importance of rural territories, groundwater can be seen as a strategic resource whose use in the short to medium term prevails over the issues of its long-term sustainability. To this must be added another factor: the very high profitability of this groundwater-based agriculture benefits investors who have the political and administrative means to protect their incomes.

The Biskra district in the Algerian Sahara is an agricultural frontier in which a rapid expansion of irrigated agriculture has taken place around existing oases since the 1980s thanks to the exploitation of deep groundwater. These groundwater aquifers constitute substantial reserves but are hardly renewable in this hyperarid environment. In Biskra, the area under irrigation increased fivefold, from 16,615 ha in 1969



to 83,350 ha in 2008, with 94% of irrigation water sourced from groundwater (Kuper *et al.*, 2016). The main crops are the date palm (primarily the famous *Deglet Noor* variety), greenhouse and open field vegetables, fruits, and cereals. The State has played a very important role in the rapid development of this agriculture, first by drilling deep boreholes to provide additional water to farmers during the droughts of the late 1970s and then by providing substantial subsidies for drilling boreholes or planting crops. It has also created infrastructure – roads, markets, electricity grids, public utilities – to support this agricultural system (Amichi *et al.*, 2015). Finally, the State has chosen not to implement regulations concerning tube-wells very strictly. Indeed, some tube-wells in use are not registered. An impressive development followed with a population growth rate of about 5% between 1987 and 2008, unlike most other rural areas in Algeria. This territory is thus a good illustration of the State's goals to integrate Saharan areas with national territories in order to make the Sahara a 'hinterland vehicle and vector for economic development' (Kouzmine *et al.*, 2009). Groundwater is considered here in the same way as oil reserves, as a resource useful for the development of the country's Great South region, which is happening at the expense of, but also because of, these essentially non-renewable resources.

## **THE CHALLENGES OF COLLECTIVE MANAGEMENT OF THE GROUNDWATER RESOURCE**

These three case studies (which could be supplemented by similar examples from Tunisia, Egypt or Yemen) show the social, economic and political importance of groundwater use in the Mediterranean, thus complicating the key issue of this resource's sustainability and exploitation. Groundwater management is not perceived as a crucial issue by the actors of the territories we have described in this chapter. It is therefore not surprising that they do not address it explicitly. Some observers believe that the use of groundwater in this unsustainable way by a determined coalition of users, managers and policymakers will ultimately be short-lived, even if groundwater would have by then facilitated a socio-economic transition (Allan, 2007). However, this raises the question of how compatible is the rate of this resource's depletion with the rate of socio-economic transition of the societies concerned. Some researchers, such as Tushaar Shah (2009), are optimistic. He posits that in India groundwater will generate a surplus needed to educate the children of irrigating farmers, allowing them to make a living elsewhere. At a more regional level, this also raises the question of the quantitative sufficiency of food production and the induced impact on the prices of these commodities. Finally, the current decline of the groundwater resource often leads to exclusionary processes and a concentration of the resource on capital-intensive farms.

While the processes underway in Mediterranean rural areas are of global concern, they must be analyzed on a case-by-case basis since hydrological conditions and social realities vary from one context to the other. The territory seems to be a suitable scale for finding a balance between a legal framework inspired by 'good' international norms and current unsustainable practices via a process of negotiation involving public and private actors. This is what is being attempted in several countries by



some recent initiatives that emphasize collective and concerted access to resources, in particular through management by associations of groundwater users (for example, in Tunisia, see Frija *et al.*, 2016) or by irrigation cooperatives (in Turkey), or through aquifer contracts (for example, in Morocco). These initiatives deserve to be studied and supported in order to highlight the common-property nature of groundwater resources and to bring about change in current dynamics.

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