Part 5

Case studies

Chapter 20

Tablas de Daimiel National Park and groundwater conflicts[1]

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ABSTRACT: Located in the Upper Guadiana basin, the Tablas de Daimiel National Park represents a paradigmatic illustration of the effects of abstractions on a groundwater dependant wetland. The *groundwater silent revolution* of the second part of the 20th century led to the dramatic reduction of flooded area and numerous associated ecological damages, converting the area as a laboratory of policies to both regulate the extractions (for instance, the declaration of over-exploitation in 1994) and to limit the economic and social impacts on the local economy, which relies on irrigated agriculture. This situation leads also to a generalized informal use of groundwater. We focus on the last attempt of regulation, the Special Plan for Upper Guadiana, as an attempt to reorganize the water rights structure and reduce extractions to obtain water for ecological flows to the Tablas de Daimiel. However, its cost has limited its full implementation and only the results of the first phase (up to June 2011) are assessed using the water footprint accounting methodology. A substantial possible reduction of 10% of the extractions and opportunities for a new basis for the management beyond a purely quantitative view are identified. There are new opportunities open like: greater emphasis on quality products, sharpen up monitoring system and sanctioning campaigns, a more diversified economy which also includes other sectors like agritourism, ecotourism and renewable energy.

Keywords: intensive groundwater use, wetlands, water footprint, Tablas de Daimiel, socio-ecological system

1 INTRODUCTION

Tablas de Daimiel is one of the most iconic wetlands in Europe and Spain due to the dramatic changes experienced over the last 40 years, coinciding with the intensive use of the Western Mancha aquifer (WMA), on which the wetland is largely dependent (Llamas & Custodio, 2003; Martínez Cortina *et al*., 2011). Located in the Upper Guadiana basin, Tablas de Daimiel is the best known wetland part of a natural eco-region known as *Mancha Húmeda*, a UNESCO Man and the Biosphere Reserve,

1 Part of this chapter is an abridged version of an article by López-Gunn, Zorrilla & Llamas (2011), published by Stockholm International Water Institute (On the Water Front): [http://www.siwi.org/documents/Resources/Best/2010/2011_OTWF_Elena_Lopez_Gunn.pdf].

which encompasses a series of wetlands of different types, and where it is now estimated that only 20% of the original area remains, with very few of the wetlands functioning naturally (De la Hera, 1998). Although this example reflects a specific case study in Spain, many of the issues raised have echoes in other areas in the world, facing similar development dilemmas over the economic incentives that drive the use of natural resources and how to find opportunities for change in the behaviour of key *water managers* like farmers, who globally are responsible for more than two thirds of global water use. The intensive groundwater use in the 5,000 km^2 WMA has over the last 40 years represented an abstraction of around 20,000[2] hm^3 of which 3,000 hm^3 came from groundwater storage. This fuelled a spectacular socio-economic development of what used to be a poor and backward region, with strong migration to urban areas.

2 THE GROUNDWATER SILENT REVOLUTION AND TABLAS DE DAIMIEL

Tablas de Daimiel National Park (see Figure 1) has a strong symbolic value for a number of reasons. The name of *Daimiel* in Spanish is translated as the land that gives honey. It represented a landmark in a largely arid and poor region, which thanks to natural springs and so called *tablas fluviales*, provided sustenance for the local population from fisheries, crabbing and associated land uses like small orchards. It is also a landmark in Spanish conservation history as a symbol to reverse existing policies. On the same year that the Park was designated (1973), some watercourses were channelled and modified to increase agricultural land. The *Ley Cambó* (Cambó Law) dating back to 1918 was re-vitalized with a new Act in 1956 to facilitate the reclamation of marshland into agricultural land and drain wetlands because of their perception as insalubrious areas full of malaria, wastelands of little value. In parallel, the rationale for incentivizing irrigated agriculture was the depopulation in the area, which in 1981 had regressed to numbers similar to the 1930s. The regional government gave soft

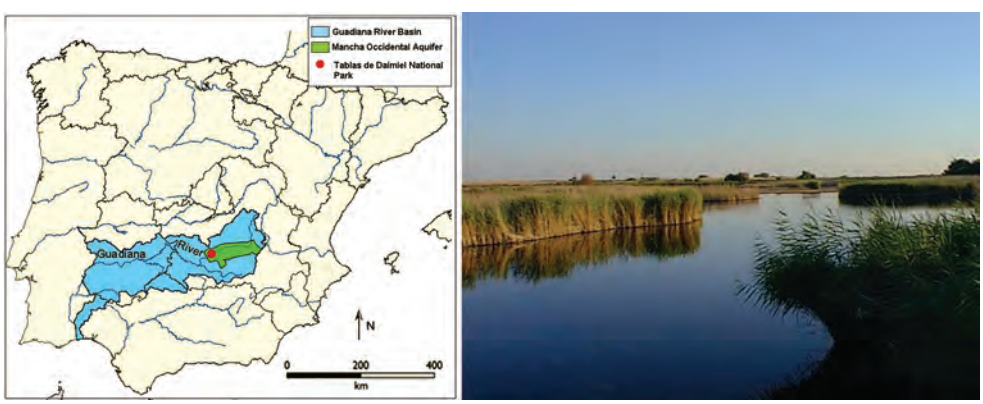

Figure 1 Location Guadiana basin and Tablas de Daimiel National Park. (Source: López-Gunn *et al.* (2011)).

2 hm^3 = cubic hectometre = million m^3 = 10^6 m^3.

loans to farmers to encourage the irrigation of a dry land farming system of vines and cereals. This process of providing funding was based on the belief by many analysts (both academic and political leaders) that saw the role of groundwater as the engine driving regional development, encouraging farmers to tap the *sea beneath their feet*.

Initially a few and eventually thousands of farmers drilled wells to tap groundwater resources which had been inaccessible due to lack of technology and knowledge. Wells were authorized to irrigate maize and barley, replacing a traditional, extensive dry land Mediterranean agriculture of olives, vines and wheat (see Figure 2).

Over a period of a relatively short time the area experienced a deep process of socio-ecological transformation with large environmental externalities, as groundwater stopped overflowing from the Western Mancha Aquifer (WMA) to Tablas de Daimiel. Over a short period between 1974 to 1984 groundwater use grew from a mere 200 hm^3/year to 500 hm^3/year, when the estimated renewable resources were around 260 to 300 hm^3/year. The area under irrigation over the same period almost tripled, from 30,000 ha to 85,000 ha (see Figure 3). The level of abstractions were influenced by three main factors: the rainfall regime, the price of the crops and the associated EU Common Agricultural Policy (CAP) subsidies (direct, e.g. to cereals; or indirect, like alcohol distillation) and more recently, to the costs of pumping, because of a sharp increase in energy costs due to the recent de-regulation of the energy sector (see Chapter 14).

The consequences of this intensive groundwater use were felt particularly from the mid to late 1980s when dry years coincided with the expansion of irrigated land. The drop in aquifer levels reached 40 and 50 meters in some areas, with many farmers deepening their wells and some drying up (the so called *war of the well*).

The Guadiana River Basin Authority declared the WMA legally over-exploited in 1994. The implications of this declaration were a series of tough restrictions: i) the forbidding of drilling of new wells; ii) the compulsory top down formation of Water User Associations; iii) the delimitation of the aquifer perimeter; iv) the ruling

Figure 2 Old and new agriculture. (Photo credits: Zorrilla (2009)).

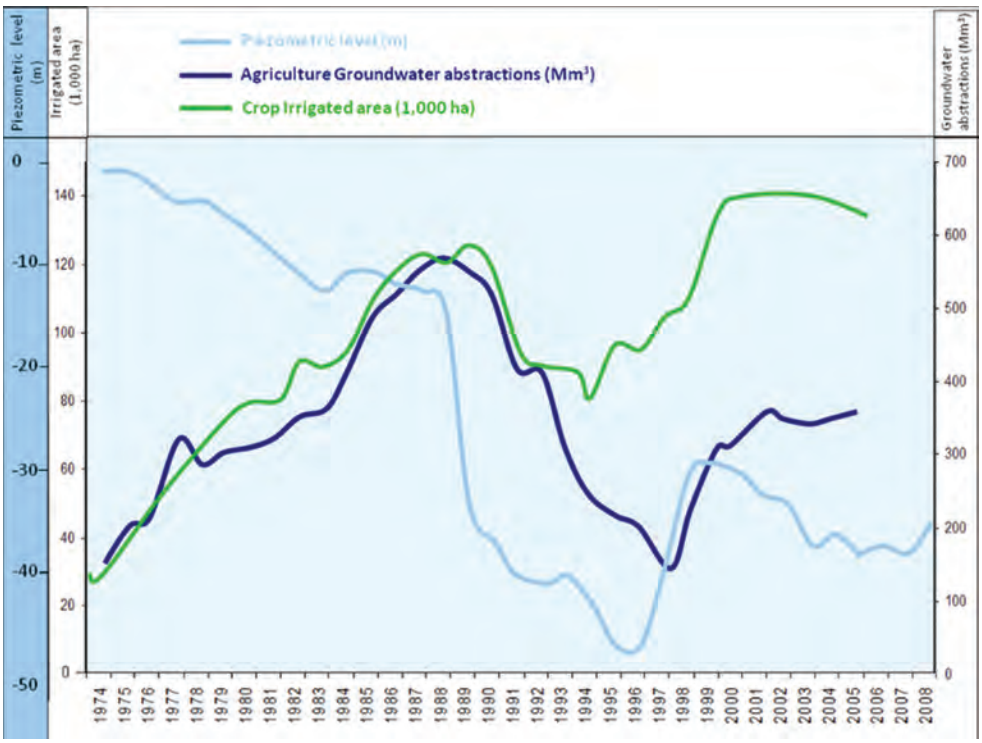

Figure 3 Aquifer levels, groundwater abstractions and irrigated area. (Source: Zorrilla (2009)).

that existing wells could not be deepened; and v) a strict reduction on the water use allowed per hectare (water quotas). These restrictions applied under an annual abstraction regime. However, the Guadiana River Basin Authority did not follow through to ensure compliance due to a lack of capacity and large transaction costs of monitoring an estimated 17,000 farmers. On the other hand, the regional government – responsible for agricultural policy but with no regulatory powers over water use – had calculated that implementing the annual abstraction regime would cost the region 7,700 million pesetas (at 1990 prices) that are equivalent to 46 M€ in income lost (Viladomiu & Rosell, 1996).

3 THE MOST RECENT PUBLIC POLICY: THE SPECIAL PLAN FOR THE UPPER GUADIANA

There have been a number of public policy measures that have been implemented in the area to address the conflict between agriculture and wetland protection (Zorrilla *et al*., 2010). This chapter analyses the most recent public policy initiative: the Special Plan for the Upper Guadiana (or SPUG) (CHG, 2006). The origin of the SPUG was

to address the situation in the Upper Guadiana basin and its structural problem of an over-allocation of water rights by 50%. The SPUG was a legal requirement under the Spanish Water Plan of 2001, which after an estimated 22 versions, was finally passed in 2008. This final Plan reflects a consensual agreement between the main stakeholders in the area, namely farmers, and farming unions, the water user groups, the municipalities, the regional government, the environmental non-governmental organisations and the central administration. The plan was to run from 2008 until 2027 with a budget of 5,000 M€. It was considered the main measure within the Programme of Measures of the future Guadiana Hydrological Plan in order to recover the two groundwater bodies that cover the WMA to good status in accordance with the Water Framework Directive (WFD) (both quantitative and qualitatively) (Barcos *et al*., 2010). It includes a series of agricultural and regulatory measures to reduce groundwater abstractions to 200 hm^3/year. The key action foreseen is the acquisition of groundwater rights, through a Rights Exchange Centre allocating 810 M€ for the purchase of water rights and land in strategically important areas for the National Park.

The Plan can be analysed as a large scale effort for both ecological restoration and distributive justice, by incorporating social aspects since it aims to re-distribute access to water between farmers. The main cornerstone therefore is the purchase of water rights to be re-allocated to small, professional farmers (30% of bought rights) and also for environmental purposes (70% of purchased rights). The water rights would be bought from farmers irrigating cereals and redistributed for the irrigation of economically more productive crops like vine and vegetables. A series of criteria has been defined on social grounds to establish the priority for water rights bought that will be granted to farmers, which are currently using groundwater without formal water rights. The criteria defined have been based on plot size, age and professional status, to grant formal rights to small farms (10 ha on average) belonging to young farmers (up to 40 years old), and which have agriculture as a main source of income. The price of purchase has been fixed to a maximum of 10,000 €/ha. Another important measure of the SPUG is the emphasis on the control of extractions with the use of remote sensing control and metering devices.

By June 2011 only the regularization relative to vine had been implemented (Requena, 2011). Figures 4 and 5 represent the effect of the implementation of the SPUG on the water footprint (WF) of the WMA if fully implemented or as implemented in June 2011, respectively. To understand the effect more clearly, and because there are now strong uncertainties on the implementation of the measure for vegetables due to lack of financing, we only consider the effect of the regularization of the vine WF. It is essential to note that vine regularization only allows a volume of extraction of 700 m^3/ha (i.e. half the right of legal users and up to three times less than estimated illegal water use). This volume would ensure the basic water necessities of the plant rather than boosting yield.

In the case of vine, the regularization almost reached the planned area. However, the allocation of 70% to the environment as planned in the SPUG was not respected, as the big majority of the purchased rights (81%) have been allocated for the regularization of non-authorized users (Requena, 2011). As a consequence, only 2.6 hm^3 have been dedicated directly (i.e. coming directly from bought rights) to the environment and this represents less than 1% of the total WF of the WMA, which could lead to question the efficacy of the SPUG. However, an important point to consider

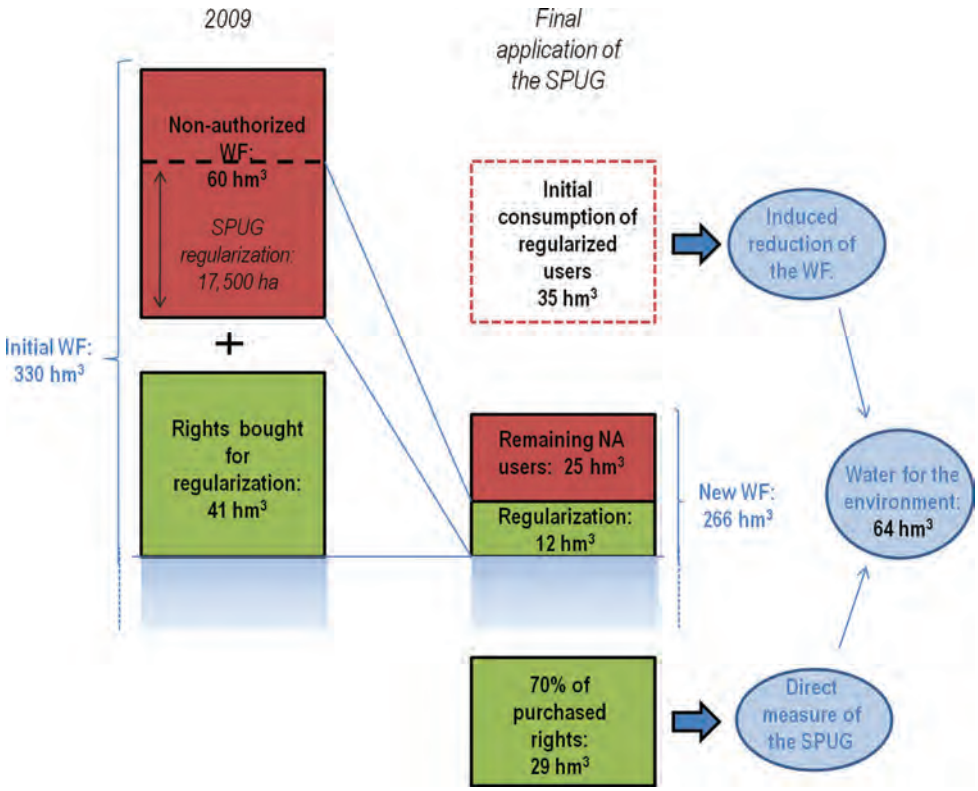

Figure 4 Effect of the SPUG implementation (for vine) on the WF of the WMA.

NA: Non-authorized / If action is taken against remaining non-authorized users after the application of the SPUG, the total WF could reach 240 hm³.

is that regularized users -if monitored effectively- will no longer consume their initial use (since their new WF will correspond to the part of the purchased rights that they received) and therefore this initial WF also goes to the environment. This indirect water saving represents more water than the direct application of the measure of the SPUG and amounts to 31.4 hm³ in June 2011. The total lowering of the WF at this date is therefore of 34 hm³ (10% of the WF of 2009), giving a completely different perspective on the effectiveness of the SPUG. The purchase of the rights to respect the initial distribution between regularization and environment would imply a final reduction of the WF of 64 hm³ (20% of the initial WF).

A basic assessment of the cost-effectiveness of the SPUG as applied in June 2011 shows that the water rights were bought for around 5 €/m³. However, on the basis of the WF accounting and the drop of the WF of 34 hm³, the recuperation of water for the environment was obtained for less than 2 €/m³. Moreover, if we consider that the final objective of the SPUG is not only quantifiable in terms of extraction reduction, but is also to build the basis for a new local governance of the groundwater bodies,

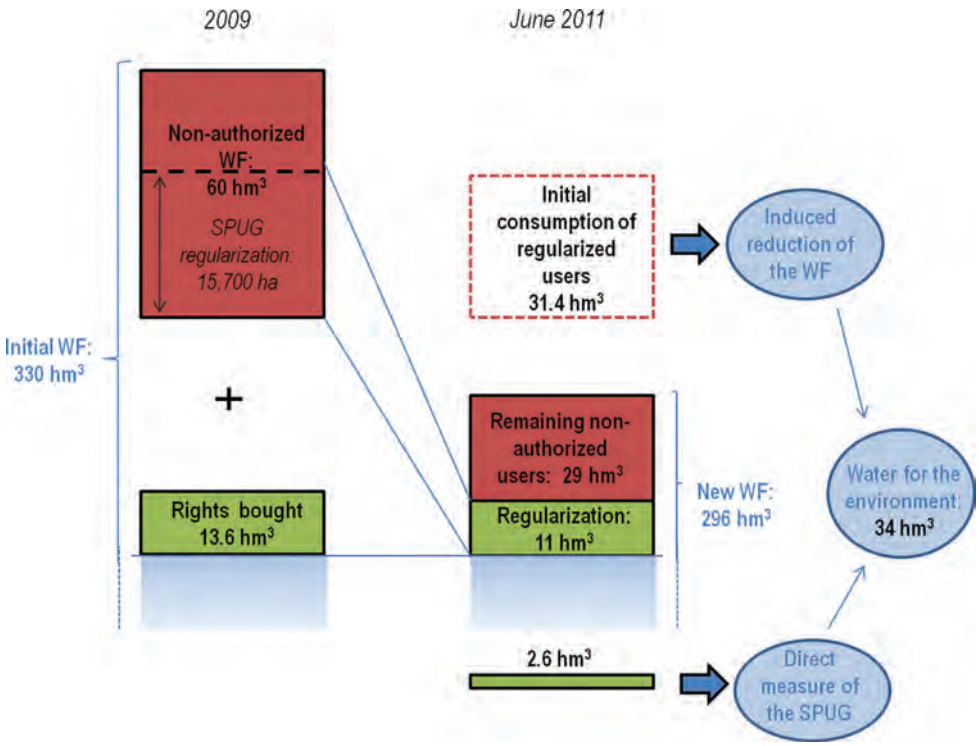

Figure 5 SPUG implementation in June 2011 and its effect on the WF of the WMA.

thanks to the incorporation of the informal irrigators and a possible new cooperation between the stakeholders, the cost of the SPUG is relative including some of the advances in the social consensus achieved.

4 CONCLUSION

In the year 2011 Tablas de Daimiel became a *mirage*, when thanks to two wet years, the Park increased its flooded area from virtually zero ha to 2,000 ha (maximum possible) and aquifer levels recovered by an estimated 17 meters on average. Farmers have abstracted less water, using green water from rain and soil moisture to produce their crops (although rising electricity costs must be kept in mind) and this has created a window of opportunity. At the same time, as explained in the previous section, the water rights purchased by the SPUG have changed a number of important basic conditions and introduced a number of opportunities:

– First, it has in many ways shifted water use, cutting down consumption for cereals, whilst allowing the use of water rights for more productive and labour intensive crops like vineyards (Dumont *et al.*, 2011).

– Second, it has regularized the use of water for vine: most of the informal irrigators (with the exception of informal use for vegetables which is much smaller in number and quantity of water) have now been incorporated into the water rights systems thanks to the purchase and re-allocation of water rights.
– Third, there has been a parallel campaign to sharpen up the monitoring and sanctioning, regime which becomes a ground zero, a clean slate which from this point can ensure the strong collaboration between the regulator (the water authority) and the farming community. The control and monitoring of water use goes hand in hand with a negotiated and agreed abstraction targets to meet the WFD requirements, whilst guaranteeing a viable and thriving agricultural economy and most important avoiding the continued spiralling in informal water use.

The downside is that the cost of the Plan – in the current economic climate with an estimated budget of 5,000 M€ over 2008–2027 for 2% of the land in Spain – is simply unaffordable to the public budget, even when the current serious Spanish economic crisis is overcome. Moreover, the SPUG together with the window of opportunity offered by a series of generous wet years, are only one part of the equation.

A much needed measure is to revisit one of the major drivers in the region for groundwater abstractions, the economic incentives for irrigation. Reform has to go to the heart of the existing payment structure and deep inertias in the incentive structure for farmers to irrigate. The reform of the CAP in 2013 offers an ideal opportunity to decouple the local economy from intensive water use, to help achieve the WFD objectives over time, limiting the impacts on the local economy. Under the concept of Payment for Environmental Services and the Rural development pillar of the CAP the incentive structure could help to change from irrigated agriculture by adding an environmental premium for dry land agriculture in the form of payments for the services derived from soil conservation, and multifunctional agriculture (Wilson, 2010), with a more holistic vision on agriculture to produce not just food but also clean water, the co-production of environmental and agricultural goods, and the re-direction towards a green economy model and, taking into account that the amount of rain-fed land doubles the irrigated area, the training of rain-fed farmers on ecological rain-fed agriculture and green marketing for instance.

In addition, a more diversified economy which also includes other sectors like ecotourism, renewable energy (like thermo-solar, i.e. *growing* kWh *rather than maize*, as farmers in the region acknowledged, even though solar energy is subsidized) and high quality agricultural products would make the local economy more diversified, resilient and less dependent on intensive aquifer exploitation.

The challenge is to change the current agricultural model, where the social system is thriving at the expense of the ecological system, towards a more balanced model which aims to allocate water more equitably than at the moment between all users to include the Biosphere Reserve and the Park itself. In the case of water in arid environments, which face strong competition between users, moving away from the current trade-offs (and stand offs between sectors) requires identifying win-win solutions.

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