
Is self-regulation a myth? Case study on Spanish groundwater user associations and the role of higher-level authorities

E. Lopez-Gunn · Luis Martinez Cortina

Abstract Self-regulation of groundwater users offers tremendous potential for effective groundwater management. The attributes of higher-level authorities that are more likely to facilitate the beneficial management of groundwater in economic, social and environmental terms are discussed. For this purpose, eight groundwater user associations in Spain have been compared. Factors that support institutional change were analyzed, namely: salience, common understanding, trust and reciprocity, autonomy, prior organizational experience and local leadership. These factors are complemented by features that strengthen actions by higher-level authorities that oversee self-regulation by water users (clear boundaries, legitimate recognition of appropriators, facilitating roles, trust in cross-scale linkages, clear division of responsibilities, institutional culture and co-management model choices). Self-regulation includes the creation of reflexive organizations that are capable of learning, provided first, the administration itself is modernized to meet the challenges of self-regulation, and second, that 'regulatory capture' is avoided by external organizations, ensuring that the regulator and the regulated are not so close in their relationship as to be detrimental to effectiveness.

Résumé L'auto-régulation des utilisateurs d'eau souterraine offre un potentiel formidable pour la gestion efficace de l'eau souterraine. Les attributs des plus hautes autorités qui sont à même de faciliter la gestion bénéfique de l'eau souterraine en terme économique, social et environnemental, est présenté. Pour cela, huit associations d'utilisateurs d'eau souterraine en Espagne ont été comparées. Les facteurs des changements institutionnels

ont été analysés: revenus, compréhension commune, confiance et réciprocité, autonomie, expériences organisationnelles majeures, gouvernance locale. Ces facteurs sont complétés par les aspects qui contraignent les actions par les plus hautes autorités couvrant l'auto-régulation par les usagers (frontières nettes, reconnaissance législative des propriétaires, moyens de faciliter les rôles, confiance dans les liens croisant diverses échelles organisationnelles, division claire des responsabilités, culture institutionnelle et choix des modèles de cogestion). L'auto-régulation inclut la création d'organisations réfléchies capables d'apprendre, à condition que, premièrement, l'administration elle-même soit modernisée pour rencontrer les défis de l'auto-régulation, et que deuxièmement, la 'régulation capture' soit évitée par les organisations externes, là où le régulateur et le régulé sont suffisamment indépendant dans leurs relations de manière à assurer que l'arrangement du travail reste efficace.

Resumen La autorregulación de usuarios de agua subterránea ofrece un potencial tremendo para la gestión efectiva de agua subterránea. Se discuten los atributos de las autoridades de alto nivel que son más probables de facilitar la gestión benéfica del agua subterránea en términos económicos, sociales y ambientales. Con este objetivo, se han comparado ocho asociaciones de usuarios de agua subterránea en España. Se analizaron factores que apoyan el cambio institucional tal como: prominencia, entendimiento común, confianza y reciprocidad, autonomía, previa experiencia organizacional y liderazgo local. Estos factores se complementan con elementos que fortalecen acciones de autoridades de alto nivel que supervisan autorregulación por usuarios de agua (aclarar límites, legitimar el reconocimiento de apropiadores, medios para facilitar roles, confianza en vínculos de jerarquía cruzada, aclarar división de responsabilidades, cultura institucional y selección de modelos de gestión compartida). La autorregulación incluye primero la creación de organizaciones reflexivas que son capaces de aprender media vez se ha modernizado la administración misma para alcanzar los desafíos de autorregulación, y segundo, que se evite la 'captura regulatoria' por organizaciones externas mediante la cual el regulador y el regulado son suficientemente independientes en su relación para asegurar que los convenios alcanzados permanezcan efectivos.

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Introduction

This paper will focus on analyzing issues related to the self-regulation of groundwater users and attributes of higher-level authorities, that are more likely to lead to the sound management of a renewable resource, preventing groundwater mining. In order to do this, eight groundwater user associations in Spain will be compared. These will be analyzed with reference to Elinor Ostrom's (Ostrom 2000) attributes that support institutional change: namely salience, common understanding, low discount rate, trust and reciprocity, autonomy, prior organizational experience and local leadership. Institutional change is also facilitated by other factors that strengthen collaborative actions with higher-level authorities that oversee self-regulation by water users (which, in turn, rely on clear boundaries, legitimate recognition of appropriators, means to facilitate roles, trust in cross-scale linkages, clear division of responsibilities, institutional culture and co-management model choices).

First, a brief introduction is given on the concept of self-regulation and why it is crucial for groundwater management; second, the eight groundwater user associations (GWUAs) are introduced; and third, Ostrom's attributes for institutional change are discussed, as well as the role of higher-level authorities, applied to the case study areas.

Self-regulation in groundwater management

Self-regulation in many cases has been hailed as the answer to the regulatory crisis that occurs in parts of the world, including Spain. This crisis is exemplified in the problem of implementing legislation designed for the management of aquifers, and the ensuing juridification (development of juridical proceedings) that arise as a result of lack of regulatory implementation. That is, the fact that laws exist to manage water yet are often not complied with. This often ends in a conflictive situation between regulator and regulated, in our case between water authorities and generally farmers, who are the main groundwater users in Spain. This, for example has been the case in the Campo de Montiel aquifer (Anon 1987). Self-regulation can be defined as 'the notion that compliance with general regulatory goals is primarily achieved by agreement between the regulator and those regulated, in a collaborative agreement' (modified from Ogus 1998). It is based on consultation, negotiation and, in cases where there has been a previous history of conflict or juridification, conciliation.

According to Teubner (1998) the problem of juridification shows that 'different legal systems operate according to their own logic, which cannot be easily harmonized with the logic of other systems' (p. 421). In this case the logic of the authorities, which may center on control, clashes with

the logic of water users, which may focus on returns. The proposed solution now turns to introducing legal frameworks for self-regulation, i.e. to encourage 'social systems capable of learning' (as quoted in Witholter 1982, p. 544 Teubner 1998).

Furthermore, according to Ogus (1998) there are three main reasons that justify self-regulation. First self-regulation can be particularly effective in positively impacting on activities afflicted by market failure or by externalities (otherwise unrelated factors). For example in the case of aquifer over-use, externalities are often felt in the degradation of both groundwater quantity and quality and the impact on, e.g., local wetlands relying on groundwater like the cases of Tablas de Daimiel or Doñana National Parks. Second, self-regulation can ensure the implementation of legal systems, which help to prevent these externalities, e.g. due to information asymmetry between, for example, water users and water authorities. Finally, self-regulation can become a cheaper and easier alternative to regulation by laws (which are often not implemented). For water users self-regulation can be attractive due to the autonomy granted and speed of action. It can also prevent sanctions by the authorities and has the added advantage that solutions designed by users are better tailored by those closer to the ground and ownership also implies a higher likelihood of compliance.

To introduce self-regulation effectively means putting three elements in place:

- Safeguarding social autonomy, by creating an external institution. This, in effect, is the case of the case studies presented later, where water authorities are safeguarding the operation and relative autonomy of groundwater user associations (GWUAs).
- Frameworks for effective self-regulation in terms of decentralization e.g. responsibility for certain tasks and internal reflection on the importance of auto-compliance. For example, an inventory of water rights has been undertaken by some GWUAs. Some GWUAs have a relatively impressive level of autonomy in terms of imposing sanctions.
- Systems for channeling potential conflicts, e.g. through negotiation. Those GWUAs that are most sophisticated have complex systems in place to prevent conflict, through regular meetings, information and participation, backed by a clear sanctioning system.

Therefore, in self-regulation the emphasis is on semi-autonomous organizations, such as water user associations, which have an internal capacity for learning, and can play a crucial management role if supported by an external framework provided by higher-level authorities. It also stresses the interaction between these associations and these higher-level authorities in terms of allocation of responsibilities and rights. In a self-regulatory system, legislation may lay down general goals, but the water user associations sort the specifics internally.

The idea is therefore based on creating the right procedures and institutions that lead to flexible, cooperative solutions—in this case geared to the sustainable

management of aquifers—as opposed to rigid, authoritative solutions that often escalate in terms of conflict between the authorities and water users. In self-regulation the focus is to turn a system away from a negative system, based on sanctions to a positive system of reflexive negotiation (capable of learning) and self-governance. As Teubner (1998, p. 424) states: ‘social contract is the term used to define a trend in which the role of the law is transformed from one of direct regulation of behavior to a more indirect regulation of procedures’, in effect a neo-corporatist arrangement.

It is a form of voluntary cooperation between the authorities and water users, where the authorities give up part of their power and water users part of their freedom, their behavior no longer conditioned by prohibitions but based on incentives.

As a result of these binding agreements, a large number of social problems arising from the coordination of interests, the build up of legitimation and the implementation of the policies worked out in the negotiation are shifted to the inside of the organization itself (Teubner 1998).

The main advantages of self-regulation according to Ogus (1998) lie in the fact that those agencies, bodies or organizations—in our case water user associations—can command a great degree of expertise and/or knowledge, because even if their knowledge is not technical, rather it is indigenous, contextual knowledge, it is nevertheless extremely valuable. In addition, their opportunities for collecting information, for monitoring and even for enforcing regulations or self-imposed norms are normally greater. In addition, the resulting norms derived by water users themselves can be better tailored to local circumstances, with the right system of incentives and penalties.

However, one has to have a healthy skepticism on self-regulation, since it has to be underpinned by a number of elements and even then, critics raise their voices on the myth of self-regulation. For example, one element is the crucial need to develop systems to make these self-regulated organizations externally accountable, and also avoiding the potential for ‘regulatory capture’ between the regulated and the regulator, which is a state in which the relationship between the regulator and the regulated is too close and threatens effectiveness. As Kay (1988) states: ‘with self-regulation, regulatory capture is there from the outset’ (p. 34). It could be argued that there is a modern wave of neo-corporatism, which can be open to abuse since it might lack democratic legitimacy or exclude possible effects on third parties, external to the organization. Furthermore, if these self-regulatory water user associations ‘cover policy formulation, interpretation of the rules, adjudication and enforcement (including the imposition of sanctions) as well as rule making, there is a fundamental breach of the separation of powers’ (Ogus 1988). This can be of particular concern when there are substantial externalities and social costs, and water user associations are ‘ill-informed, ill-organized’ (or worse), ‘ill-intentioned’ (modified from Ogus, 1998, p. 379). In these cases a return might be necessary to strict public regulation, and strict compliance with externally imposed rules.

However, those more optimistic about the role of self-regulation argue that self-regulation itself is a process that evolves with time, e.g., in the case of companies evolving from profit orientation to growth orientation and then to include other goals, like ecological issues, a case of learning by the organization, based on the logic of reflexive and participatory democracy. This takes an organization further along the way from a hierarchic control system based on sanctions, to a communication system capable of social learning. This is also based on Barber’s concepts of strong democracy (Barber 1984), where co-ordination in society is achieved through direct participation and self-regulation; i.e. ‘at the heart of strong democracy lies process’ (Richardson 1994 p. 127). In strong democracy there is no clear line between the individual and the state. However there is an aspect of subtle but crucial importance—in this idea of strong democracy water users would participate not to defend their substantive interests but to ensure the fairness of decisions and fair process. This is in contrast with liberal pluralism where participation is to ensure protection of the public interest, i.e. participation is not an end in itself but a means to protecting the public interest.

Ostrom (2000), following on her long research experience on crafting institutions for self-governance, has identified a series of attributes in appropriators that favour self-governance. In our case groundwater is a particularly interesting resource because often water users are highly dependent on aquifers for their subsistence, and the cost of obtaining a resource to substitute for groundwater can prove prohibitive. The second feature, that of having a common understanding or shared image on how the resource system operates is slightly more complicated in the case of groundwater as compared to, for example, surface water because groundwater is a classic example of a common pool resource and the problem of the “tragedy of the commons” (Hardin 1962), where the rational actions of individuals can lead to an irrational use of a (limited) resource. Ostrom also identified the key importance for self-governance of the discount rate on the possible benefits to be accrued in the future thus introducing the time factor on rational decisions. In this case water users benefit if they use a sufficiently low discount rate in relation to future benefits to be achieved from groundwater. The collective aspect of self-governance is also highlighted in the next factor, that of trust and reciprocity, i.e. self-governance is underpinned by strong social capital i.e. bonding and bridging trust in and across institutions. Equally, groundwater uses have to have sufficient independence and legitimacy to be able to act with relative autonomy and self-rule. Yet, as will be discussed below in the context of a series of case studies, a key ingredient to catalyse this potential for self-governance is leadership.

The next sections of this paper attempt to apply this new logic of self-regulation to eight water user associations¹ in

¹ For reasons of international convention, this paper generally refers to water user associations although as it will be seen in this paper, this in Spain has a special legal connotation, to be distinguished from other types of organizations, like communities, societies and cooperatives.

Spain. One of the aims will be to assess the extent of self-regulation in terms of autonomy developed by each water user association in terms of degree of legislative constraints, participation in rule formulation and/or enforcement, external control and accountability (Ogus 1998). For example, in some cases, rules between farmers may be voluntary, whereas in others they might be binding.

Introduction to case study areas

The paper will analyze and compare eight groundwater user groups, which belong to an umbrella organization: the Spanish Association of Groundwater Users (*Asociación Española de Usuarios de Aguas Subterráneas*—AEUAS). The information used in this paper is based on documentary sources, as well as interviews with each of the organizations discussed below.

The Spanish Association of Groundwater Users was created in the year 2000, and as a private law organization, it aims to secure sound aquifer management, whilst working towards greater participation in the decision-making bodies of the water administration (Codina-Roig 2003). The main aims of this association, in theory (AEUAS 2005), are to

- coordinate the use criteria on groundwater use in the Spanish territory
- encourage user participation in the different organizations in the water administration
- propose and coordinate actions geared to the protection, defense and knowledge on groundwater use in the Spanish territory
- obtain help from the Spanish administration or any other body to protect aquifers in the Spanish territory
- promote, organize, participate and undertake all kinds of activities, courses and seminars, outreach programmes, training, and specialization on groundwater, and any other relevant collaboration with different public administrations.

In interviews with some of the key figures in this Association it was stressed that one of their main roles *internally* is to develop networks between groundwater users so each can learn from each other's experience. This is reflected in a series of rotating seminars held each year by a different groundwater user association (GWUA) to discuss key topics. Equally, *externally* it also plays a key strategic role in developing a clear reference point for the administration in groundwater issues.

Organizationally, the AEUAS is ruled by a General Assembly, with a Management Board and a President, and it has the advice of a Technical/Legal Commission made up of lawyers from the different members that form part of the Association (Fig. 1).

The AEUAS has eight members,² which are spread out across the whole of the peninsula (shown in Fig. 2 and

² The groundwater user associations are named according to their main geographical area of operation, e.g. the *Asociación de Usuarios de Aguas Subterráneas de Castilla La Mancha* becomes AUAS Castilla La-Mancha (or MAN in Fig. 2), the *Comunidad de Usuarios del Acuífero del Campo de Montiel* becomes CUA Campo de Montiel

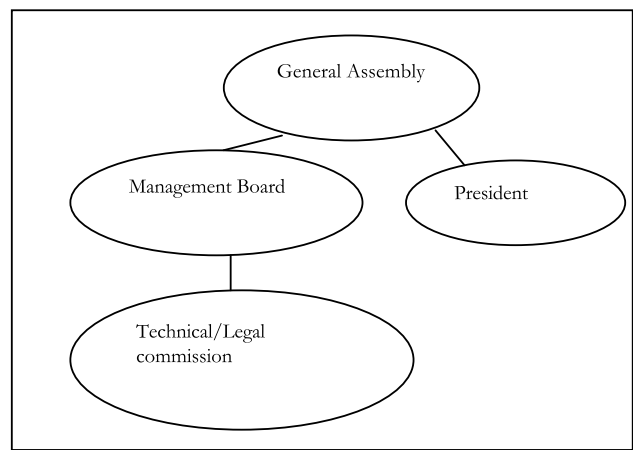


Fig. 1 Organizational diagram for Spanish Association of Groundwater Users

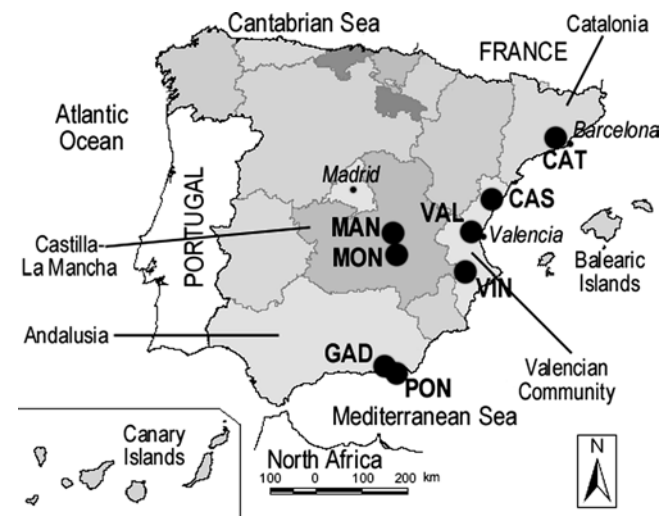


Fig. 2 Location map of case study areas. The groundwater user associations are named according to their main geographical area of operation, e.g. the *Asociación de Usuarios de Aguas Subterráneas de Castilla La Mancha* becomes “MAN”. For the full names of the associations, refer to Table 1

listed in Table 1) and vary widely in terms of size and main water use. It includes organizations that cover one aquifer (like Campo de Montiel) or a number of aquifers (like Alto Vinalopó). However, the organization might have to revise their boundaries in view of the new European Union (EU) Water Framework Directive and the new definition of ‘water body’, to be provisionally designated by 2005 and finally by 2008 (Sanchez-Gonzalez 2003). This Water Framework Directive simplifies and modernizes the whole regulatory framework related to water in the EU, including groundwater. A brief comparative description of the groundwater user associations can be found in Table 2.

Before undertaking a comparative analysis of these eight organizations from the point of view of self-regulation and groundwater management, it is important to briefly analyse

(or MON in Fig. 2) and so on. For the full names of the associations, refer to Table 1.

Table 1 Comparative table of key data on case study groundwater user associations (GWUAs)

Name of groundwater user association (GWUA)	Date GWUA was set up	Aquifers in use	Total area (km ²)	Members belonging to GWUA	No. wells (2003)	Main water use	Amount of water used (Million m ³ per year)	Cost of water (€/m ³) (2004)	Budget (2005)
Asociación de Usuarios de Aguas Subterráneas de Castilla-La Mancha (MAN)	1988	Western Mancha	5,022	7 Irrigation communities; 7,000 farmers		Irrigation (47,000 ha)	–	0.08 €	–
Comunidad de Usuarios del Acuífero del Campo de Montiel (MON)	1988 (private association); 2001 as Public Irrigation Community	Campo de Montiel	2,610	101 water users	205	Irrigation (max 8,730 ha); (2003: 3,000 ha)	12–10	Public Water Supply 0.05 €; Irrigation 0.04 €	50,000 € (2003)
Asociació Catalana de Comunitats d'Usuaris d'Aigües Subterrànies ^{b,c, f} (CAT)	First initiatives in the 1980s but officially set up in 1995	Baix Llobregat; Carme-Capellades and Tordera Baixa	–	4 User Communities (1,500 water users)	3,000	90% (Industrial and Public Water Supply in Sant Andreu 34,000 inhabitants)	50–60 in Delta de Llobregat; 10 in Cubetta de San Andreu	–	–
Agrupación Provincial de Pozos de Riego de Castellón (CAS)	First initiatives in the 1940s, officially set up in 1998	Aquifers located in the province of Castellón	–	–	–	Irrigation	–	–	–
Asociación de Pozos de Riego de la Comunidad Valenciana ⁷ (VAL)	1999	20 aquifers	13,739	520 members (444 Irrigation Societies, 51 private users and 25 businesses); (approx. 30,000 to 40,000 individuals)	1,000	Irrigation (750 Mm ³ and Public Water Supply (150 Mm ³)	960	Public Water Supply 0.04–0.08 €; Irrigation 0.06–0.14 €	36,000 € (2004)

Table 1 Continued

Name of groundwater user association (GWUA)	Date GWUA was set up	Aquifers in use	Total area (km ²)	Members belonging to GWUA	No. wells (2003)	Main water use	Amount of water used (Million m ³ per year)	Cost of water (€/m ³) (2004)	Budget (2005)
Comunidad general de Usuarios de Alto Vinalopó ^{b,c} (VIN)	1996	6 aquifers	–	60 members (27 irrigation entities, 20 private users and 13 town councils)	–	Irrigation	15–20	0.11 €	2,400,000 €
Junta Central de Usuarios del Acuífero del Poniente Almeriense ^{b,d} (PON)	1991	Campo de Dalías	374	166 users (7 townhalls, 112 irrigation communities, 3 businesses and 11 individual users) (20,000 comuneros)	102 Mm ³ for irrigation; 30 Mm ³ for Public Water Supply	Irrigation (17,000 ha)	27.5	0.18 €	–
Comunidad de Usuarios del Acuífero de la Sierra de Gador (GAD)	2000	Sierra de Gador	1,248	–	–	Irrigation	–	–	–

Source: Based on data from interviews (February 2005)

^aData from self-completed questionnaire by organizations for the AEUAS (2005)

^bData from Codina-Roig (2003)

^cData from Galofre (2001)

^dData from Lopez-Galvez and Losada (2001)

^eData from Rico Amoros and Olcina Cantos (2001)

^fData from CUADLL (2005)

^gData from Avasaja (2005)

Table 2 Comparative table of key internal factors in GWUA Internal Organization and Management

Name of groundwater user association	Why/how was it set up?	Main role(s)	Leadership	Prior organizational experience	Capacity (technical, financial, human, . . .)
Castilla La Mancha	Bottom up: originally set up by users themselves, in opposition to official (public) water user association	Advise, negotiate with the administration and other organizations	Strong local leader; links well with all water users and deep knowledge of agricultural-related issues	Through previous activities in farming unions	Technical: advice from a hydrogeologists; Financial resources: from members quotas; Human: shared office with Farming Union and have 1 administrator and have 1 administrator
Campo de Montiel	Bottom up: created in 1988 as a private user organization and in 2001 top-down encouraged by the Water Authority to change to a public body	Management and organization of water use; protection of water rights (both to defend them from the administration and for the users themselves)	Strong local charismatic leader since its creation; his death triggered elections held in Feb 2005	Experience e.g. through farming organizations (cooperatives, unions, agricultural businesses, etc.,)	Technical: contracted out when needed through consultants; Financial: quotas from members; Human: 1 full-time administrator and in the future a university placement student
Catalana	Bottom up: first actions by the users themselves, in the mid 1980s, due to the problems of aquifer over-draft	Management of the aquifer, working with the water administration through <i>comenios</i> or agreements between water users and the water authority to deliver specific technical goals	Functional, transformative leadership: with a large pool of people from which to draw to undertake official roles (from industrial, individual or town council users)	One of the oldest organizations, it first started operating informally in the mid 1970s and approached the water authority in the mid 1980s	Technical: 2 permanent Hydrogeologists; Financial: quota from members and <i>Comenios</i> with administration on an <i>ad hoc</i> basis; Human: 3 administrators and 2–3 placement students
Castellón	Bottom up: first initiatives in the 1940s as a provincial organization, it slowly evolved to cover all wells in the province (except northern part)	To provide advice and information on wells and their operation and legal issues, and to control quality of groundwater and water levels	Functional, transformative leadership, with regular rotation approx. every 8 years (i.e. most posts repeat at least once)	One of the oldest organizations, dating back to the 1940s	Technical: each individual organization through their ' <i>regador</i> '; Financial: quotas; Human resources: 2 administrators, 2 lawyers to advise when necessary
Valenciana	Bottom up: born out of a professional sectoral organization on controlling wells, one of 30 belonging to an umbrella agricultural professional body, and developing into its own separate organization yet sharing advice and occasionally resources from umbrella group	To provide advice, to deal with the administration in the legalization of groundwater rights	Well-respected leadership	Benefits from links to professional organization, who triggered the association being set up	Technical: access to a geologist, lawyers and agricultural engineers; Financial: quotas; Human: 3 administrators

Table 2 Continued

Name of groundwater user association	Why/how was it set up?	Main role(s)	Leadership	Prior organizational experience	Capacity (technical, financial, human, . . .)
Alto Vinalopó	Bottom up but encouraged by the water authority	To undertake a rational management of the aquifer, to assess the possibility of recharging the aquifer and manage its current deficit	Transformative leadership, as shown with a presidency and 4 vice-presidents	Developed on the encouragement from the administration and benefits from experience of some of its member organizations	Technical: 2 engineers; Financial: quotas; Human: 3–4 administrators
Sierra de Gador	Bottom up: created quite recently, despite activities of individual farmers from 1960s	Manage groundwater, promoting its rational use, improve water quality, provide administrative and legal advice; facilitate communication amongst Irrigation Communities belonging to it	Too recent to comment	Not much previous collective experience, except through individual Irrigation Communities	Technical: legal advisor every week; technical advice from a technical company on geological issues, wells and new infrastructure; Financial: quotas; Human: 1 administrator

Source: As in Table 1

their very different internal nature and legal structure, since this in itself can have consequences on their own self-regulation.

In Spain ‘Irrigation Communities’ have been traditional institutions for surface water management, some dating back to the XII century (Gavarró i Castellfort 1984). However, groundwater has traditionally been managed in a very individualistic manner. Until 1985 groundwater abstraction was mainly a private initiative, to be undertaken mainly (although not solely) by landowners lying above the aquifer to be exploited. This means that inherently groundwater management has been fairly individualistic, with little tradition for collective management. However, the 1985 Water Law in Spain updated traditional Irrigation Communities to be now denominated ‘User Communities,’ to make way for two big changes in water management; first, the fact that users did not necessarily have to be farmers and second, to integrate and allow groundwater users to create their own organizations.

Thus, in Spain as a continental law system, User Communities fall under public law (Codina-Roig 2003), which are ascribed to the water administration and of which there are three main types: first, second and third order (Table 3). First order User Communities are characterized by being composed exclusively of individual users, independent of the main type of use; if however, the main use is irrigation, then they can be called Irrigation Communities (an example amongst the Groundwater User Associations studied here is *CUA Campo de Montiel*, since its main use tends to be agriculture); second order User Communities have a federal structure, with a General Community, and underneath, individual Irrigation Communities and other users, for example town councils—this is the case of the *Comunidad General de Usuarios de Alto Vinalopó*; third-order User Communities are the most sophisticated, to include both user communities and individual users abstracting water from the same hydrological mass, and include both Irrigation Communities and individual users, like the *Junta Central de Usuarios del Acuífero del Poniente Almeriense* (Codina-Roig 2003) (Table 3).

However, co-existing with public law institutions are Associations under private law, which groups individual users with their own private wells, financed mainly by private initiative. There is a huge diversity of institutions that had thrived under the Roman Civic Code, which gave pre-eminence to individual rights. For example there are *Sociedades Agrarias de Transformación* (Agricultural Change Societies or SATs), *Sociedades Civiles de Pozos* (or Well Societies), *Comunidades de Bienes* (or Goods Communities), *Sociedades Civiles* (Civil Societies), Irrigation Cooperatives, Water Communities (Genoves et al. 2001; Rico Amoros and Olcina Cantos 2001). There were key differences to surface water Irrigation Communities: many institutions are regulated under private Act and water was not necessarily tied to the land (Perez Perez 1988). In Spain, there are, however, two levels within Associations created under Private law; the first is *AUAS Castilla-La Mancha*, which is a *Sociedad Civil* and effectively is like an Irrigation Community, which encompasses farmers with their

Table 3 Typology of groundwater user communities in Spain

	Public law		Private law
Third order	Junta Central de Usuarios del Acuífero del Poniente Almeriense	Association	Asociació Catalana de Comunitats d'Usuaris d'Aigües Subterrànies
Second order	Comunidad general de Usuarios de Alto Vinalopó;	Well Associations (Asociaciones de Pozos or Regional)	Agrupación Provincial de Pozos de Riego de Castellón; Asociación de Pozos de Riego de la Comunidad Valenciana
First order	Comunidad de Usuarios del Acuífero del Campo de Montiel;	Civil Society (Sociedad civil)	Asociación de Usuarios de Aguas Subterráneas de Castilla La Mancha;

individual wells, in this case also arranged per village, in Irrigation Communities but operating under private law; second, there is an Association of wells, an association that encompasses SATs, *Sociedades de Pozos*, Irrigation Communities; and although they act collectively the main decision making and management occurs at the level of individual organizations; this is the case of *APPR Castellón* and the *APRC Valenciana*. Meanwhile the case of the *Catalana CUAS* is more sophisticated since although it includes a range of uses (industrial, agricultural public water supply), the operations of the association itself in terms of coordinating and organizational capacity is very developed.

Discussion of attributes of appropriators in case study areas

This section will discuss the attributes of appropriators identified by Elinor Ostrom (Ostrom 2000) as crucial for self-organization. The aim is to compare how the different organizations have fared in achieving attributes that favour self-governance. The assumption is that institutions with strong self-governance will fare better in ensuring the sound management of aquifers. Thus the importance of understanding under what set of conditions appropriators perform better, which can occur when they have been granted devolved management powers. In particular, she has suggested a set of conditions that support the emergence of cooperation to devise or revise institutional arrangements (see Table 4 above).

Before discussing Ostrom's attributes it is important to briefly discuss the choice of private or public law institutions. The choice has often been due to historical and cultural reasons, where in some areas, like the east of Spain private institutions predominate (García Vizcaino 2005). However, with the introduction of a Water law in 1985, public institutions were also created. Although in legal terms in theory there is no difference between private and public institutions, the administration traditionally has preferred public law institutions, in cases refusing to acknowledge the legitimacy of rival private institutions. The arguments are based on two accounts; those against private

Table 4 Attributes of appropriators to favour self-governance

Attributes of appropriators	
1	<i>Saliency</i> : Appropriators are dependent on the resource system for a major portion of their livelihood or other important activity.
2	<i>Common understanding</i> : Appropriators have a shared image of how the resource system operates and how their actions affect each other and the resource system.
3	<i>Low discount rate</i> : Appropriators use a sufficiently low discount rate in relation to future benefits to be achieved from the resource.
4	<i>Trust and reciprocity</i> : Appropriators trust one another to keep promises and relate to one another with reciprocity.
5	<i>Autonomy</i> : Appropriators are able to determine access and harvesting rules without external authorities countermanding them.
6	<i>Prior organizational experience and local leadership</i> : Appropriators have learned at least minimal skills of organization and leadership through participation in other local associations or studying ways that neighboring groups have organized.

Source: Ostrom (2000) reproduced in Schlager and Lopez-Gunn (2005)

law organizations argue that often these organizations are inherently created to defend the interest of its members, which in this case is often the protection of private water rights³ listed, or in the process of being listed, in the Catalogue of private water rights. On the other hand, those that argue for public law organizations argue that, if their role

³ In Spain, in the case of groundwater, private water rights at present co-exist with public water rights. Those water users that were abstracting groundwater before 1985 had the option to register those rights as private water rights in the *Catalogo de Aguas Privadas* (or Private Water catalogue) or to register for a permit listed in the Water Register. Those users that started abstracting groundwater after 1985 only have the option of registering their water rights in the (public) Water Register. This co-existence of private and water rights has however proved very difficult to implement in practice and almost 20 years later most private and public water rights are still uncertain.

is to manage water, then they should be in some way integrated into the water administration. The water authorities prefer public bodies where users act as devolved agents of the administration, which can dictate public acts (e.g. sanctions). In reality User Communities have a hybrid nature, both in the (public interest) aspect of managing groundwater, and the (private) protection of their vested interests (Moreu-Ballonga 2003). Yet some argue that inherently groundwater has a different nature to surface water and in groundwater there is a strong tradition of the individuality of managing a well compared to managing a canal. Under the National Hydrological Plan Law (Art. 29), the creation of Groundwater User Communities is to be encouraged (AEUAS 2004). In fact, under Art 79 Law 46/1999 the creation of User Organizations is made compulsory in aquifers declared in overdraft (Moreu-Ballonga 2003), like in the case of Castilla-La Mancha and Campo de Montiel.

Yet, one can be critical of this top down approach when it can turn into paternalism; for example, in these two cases Abstractions Plans (or *Planes de Ordenación*) have had to be approved annually since 1994 and 1989 in Castilla La Mancha and Campo de Montiel respectively by each *Junta de Explotación* made up of the main water users in each aquifer and the administration. These plans reduce the level of individual abstractions, without any right to compensation (as clarified in the Law reform 46/1999 and different court rulings) (Sanchez-Gonzalez 2003). This brings us to the first factor identified by Ostrom for self-governance: salience.

The first factor to discuss is salience, i.e. whether appropriators are dependent on the resource system for a major portion of their livelihood or other important activity. For example, in the case of the *Asociació Catalana* approximately 48% of water is used for industrial purposes, whilst only 3% goes to agriculture, meanwhile in the case of the CGU Alto Vinalopó, water supply is the predominant use, and at present it is expected it could be the recipient of the Júcar Vinalopó water transfer to compensate for the over-draft in some of its aquifers. This is in contrast with most of the other groundwater user associations (GWUAs), where irrigation tends to be the main use. Therefore the use of groundwater varies across the different GWUAs; however, all those interviewed coincided in the tremendous salience that groundwater holds for these users; in the case of the GWUA Catalana, key industrial processes rely on groundwater.

It was less clear after the interviews undertaken whether users share a common understanding or a shared image of how the resource system operates and how their actions affect each other and the resource system. It was much more on a case-by-case basis, and it partly depended on the size of the organization and/or the aquifer. For example, in the case of groundwater users of Alto Vinalopó, users are trying to minimize their use in order to minimize their impact on an already heavily used aquifer. This was also the feeling from the president of farmers in Castellón, who stated that farmers do have a concept that users owe respect to the aquifer, both in terms of water quality and quantity. Equally,

in cases like Castellón and Castilla La Mancha farmers are also aware of the potential to artificially recharge aquifers.

Probably one of the most positive characteristics identified is the relatively high *level of trust and reciprocity* that has developed amongst appropriators: Appropriators trust one another to keep promises and relate to one another with reciprocity. Internally, bonding social capital seems to be fairly strong in the organizations interviewed; this can be measured indirectly in different ways like for example, in the case of Campo de Montiel, with a very small number of groundwater users (101), it was described how users have a perception of collectivity and need one another to succeed in the management of the aquifer. In the case of the GWUA Catalana, a very different type of GWUA, where public water supply and industrial uses predominate, users generally delegate their responsibilities yet when key issues are at stake attendance to meetings is very large.

An interesting characteristic has been the question of *autonomy of Appropriators*, i.e. the extent to which groundwater users have been able to determine access and harvesting rules without external authorities countermanning them. This is probably one of the most interesting aspects because, despite the fact that the same regulatory system applies to all GWUAs, setting the same constraints and opportunities for autonomy, the outcomes have been very different.

The most noticeable case is that of the GWUA Catalana where many responsibilities in day to day management have been delegated to the GWUA, although ultimate control and responsibility lies with the administration. Equally, the GWUA in Sierra de Gador was also positive with its decision-making powers, acknowledging that the administration now values their voice, although also recognizing their dependency on the Water Authority. Since both these GWUAs and their aquifers are located within the perimeters of a single regional authority, water functions have been devolved to regional water agencies. It is difficult to prove but in both of these cases a possible factor is that the water administration coincides with the regional government.

Meanwhile, in other cases the administrations to be accountable to are Water Authorities created in the early 1920s. Although subject to some changes—like the creation of public state corporations and the potential to create water markets with public water rights⁴—these have remained largely unreformed, particularly in the last 20 years. Therefore other GWUAs deal mainly with *Confederaciones Hidrográficas* or Water Authorities. In the case of groundwater users of Castilla-La Mancha there was no devolution of power to the GWUA, no evidence of co-management or collaboration. Equally, in the case of Campo de Montiel the situation is similar; both these groundwater associations operate under the aegis of the Guadiana Water Authority. In the case of Castellón the relationship is described as distant, where groundwater users are left to their own devices, although farmers are

⁴ Note however that this excludes a lot of groundwater being used in Spain since it is registered as private water rights and therefore excluded from this potential water trading.

Fig. 3 a, b Relationship between administration and groundwater user groups

Relationship between administration and groundwater user groups

Gradient of relationship between groundwater users and the administration				
←—————→				
Very positive	Positive	Neutral	Negative	Very negative
Catalana	Sierra Gador Valenciana	Castellón Poniente Almeriense	Alto Vinalopó	Castilla La Mancha Campo de Montiel

(a)

Autonomy	Great autonomy	Some autonomy	Limited autonomy	No Autonomy
Collaboration	Catalana			
High level collaboration				
Some collaboration	Sierra de Gador	Alto Vinalopó Valenciana Poniente Almeriense		
Little collaboration	Castellón	Campo de Montiel		
No collaboration		Castilla La Mancha		

(b)

now allowed to change the conditions of their water rights (Garcia-Vizcaino 2003; Moreu-Ballonga 2003). Equally, Alto Vinalopó comments how the administration has missed an opportunity to collaborate with groundwater users, which would make groundwater management much more efficient. Actions that take the administration a long time and effort without user cooperation, would take much less time and effort with user collaboration. Garcia-Vizcaino (2003 p. 7) echoes this view when she states ‘users, and their associations are essential to know resources and aquifers currently in use’.

Indeed, and relevant to the section below discussing higher level authorities, the nature and type of administration can in itself be a factor in favoring self-governance or hindering it. The water administration in Spain in some ways is organized hierarchically, coordinated at the top by the Ministry of Environment located centrally in Madrid, and Water Authorities organized by catchment. These organizations date back to the 1920s as some of the first basin authorities in the world. With the onset of a regional system, those basins, which only extend within one region are now devolved to new, Regional Water Authorities, whilst local authorities in Spain in all cases only tend to operate in public water supply. In terms of resource management Spain has a head start since it is useful to be organized on a basin level, however, evidence from this paper indicates that the administrative culture in many water authorities can at times be anachronistic, whilst the new Water Agencies, where water management is devolved to the regions are proving much more dynamic and sensitive to the potential offered by self-management.

Therefore the level of autonomy granted to groundwater users varies tremendously as a direct result of their relationship with the water administration (see Fig. 3a and b). In general terms the relationship can be very positive, like in the case of the GWUA Catalana, which is translated in a high degree of both autonomy *and* collaboration to a situation like Castilla la Mancha where collaboration is limited and even autonomy is questioned by the Water Authority, who challenges the creation of the groundwater organization.

The last factor identified by Ostrom (2000) in appropriate attributes refers to prior organizational experience and local leadership. For example, some GWUAs date back informally to the 1900s, like the case of Castellón, where in the 1940s a provincial association was created to improve the management and administration of private wells in Vilarreal. Slowly it grew to encompass most of the region (except the northern part). In the case of the GWUA Catalana the first initiatives date back to the 1970s, when a town council—Prat de Llobregat—led initiatives to declare a Special regime for the aquifer. Yet Sierra de Gador only dates officially to the year 2000, yet describes a relatively successful organization. Most of the case study areas analyzed in this paper have been formally created in the last 15–20 years; however, two things have to be pointed out; although some did benefit from prior organizational experience—like in the case of Castellón dating back to the 1940s and in the case of the GWUA Catalana to the mid-1970s—this does not necessarily imply greater success in groundwater management. Although it does help, there is no direct correlation between success and prior

Table 5 Attributes in case study areas

Name of groundwater user association	Saliency i.e. how dependent are resource users on the resource for their livelihood (Schlager 2005, personal (written) communication, School of Public Administration and Policy, University of Arizona)	Common understanding i.e. Type, quality and availability of information relating to the aquifer and pumping (Schlager 2005, personal (written) communication, School of Public Administration and Policy, University of Arizona)	Discount rate	Trust and reciprocity	Autonomy	Prior organizational experience and local leadership
Castilla La Mancha	Medium	Low to Medium	High discount rate	Low	Low	Low
Campo de Montiel	High	High	High discount rate	High	Medium	Medium
Catalana	High	High	Low discount rate	High	High	High
Castellón	High	Medium	Medium discount rate	Medium	Medium	Medium
Valenciana	High	Medium	Medium discount rate	Medium	Medium	Medium
Alto Vinalopó	Medium	Medium to high	Medium discount rate	Medium to high	Medium to high	Medium to high
Sierra de Gador	High	Low to medium	Medium to high discount rate	Medium	Medium	Medium

organizational experience; i.e. it is not a deciding factor. What is however very important internally—from the point of view of legitimacy of these organizations—is that all were created bottom up at the initiative of groundwater users themselves. The added combination of strong local leadership probably is a stronger determining factor than prior organizational experience. As will be discussed below, if this internal legitimacy is rubberstamped by external authorities, which also grants a level of both autonomy and collaboration with groundwater users, then the best ingredients are in place for success of the groundwater user institutions in their attempts to management groundwater. Yet evidence from these case studies—as stated above and summarized in Table 5—suggests that leadership can often be a substitute for prior organizational experience. In most cases interviewees stressed the key relevance of local leaders as catalysts for action.

What is common to all the GWUAs studied in this paper is the key relevance of leadership. Leadership is not a homogenous phenomenon, because evidence was found of both charismatic and transformational leadership (Purdue 2001). Charismatic leadership as its name suggests, are one-off individuals who lead organizations. Meanwhile transactional leadership is based on competence not necessarily on charisma. For example, in the case of Castellón since the 1940s there have been five different Presidents. This provides evidence on a pool of people able to exercise leadership. Meanwhile the cases of Castilla La Mancha and Campo de Montiel are clear examples of charismatic leaders. In the case of the latter, the recent death of the president has triggered elections. This is in contrast with the GWUA Catalana where the stock of potential presidents and candidates for the different posts is plentiful. In the case of charismatic leaders the organization is much more dependent on the appearance from time to time of local key leaders who can trigger organizational changes. This leader is the spark that often challenges the inertia of existing institutions, organizations and institutional cultures in the management of groundwater in Spain.

Attributes of higher-level authorities

However, analyzing and discussing appropriators is only one side of the coin, equally fundamental for groundwater management are the attributes of higher-level authorities and their interactions with groundwater users. This section will discuss these key attributes as identified in Schlager and Lopez-Gunn (2005). This is justified in the fact that design principles traditionally applied internally to organizations can also be applied to evaluate and assess the soundness and strength of cross-scale linkages, since increasingly institutions are becoming more complex and networks (and their linkages) are key to self-governance, since organizations do not operate in a vacuum. It is therefore the design of institutions internally and externally that underpins successful self-governance, measured in our case by delivering sound and sustainable groundwater management.

One of the first attributes, which coincides with the first design principle identified by Ostrom (1990) for self-governance is the clear definition of boundaries. However, what cannot be ignored in this design principle is the role played actively or passively by higher-level authorities in facilitating, halting or simply remaining neutral or inactive in this process. Schlager and Lopez-Gunn (2005) comment how: 'it is essential that as far as practicable higher-level authorities facilitate the clear definition of property rights in water. Ideally, this should be undertaken in joint collaboration with water users, who have the benefit of local knowledge'.

The situations in the eight case study areas are very diverse; but perhaps what can be learnt most clearly is that at least in these case study areas it is impossible to clarify water rights without the collaboration of groundwater users, whereas even in cases where the relationship between the Water Authority and groundwater users is very deteriorated (like in the case of Campo de Montiel) it has been possible through sheer perseverance of water users to determine 98% of water rights.

There have been some initiatives coming from the administration to break the deadlock over the registration of both private and public groundwater rights, like the Plan ALBERCA (Sanchez-Gonzalez 2003; Fornes et al. 2004), particularly strong in the Júcar catchment, where they hope to finalize registration of water rights in 4 years, or the *Plan del Alto Guadiana*, the latter specific to the Upper Guadiana catchment, which includes measures like water banking, a water fund, buying up rights and water trading (Garcia-Vizcaino 2003).

In most cases water rights are still not finalized (see Table 6). Yet often the main impetus and initiative to finalize the Water Rights Registry has been at the request of users themselves, who are increasingly aware of the legal uncertainty under which they operate unless water rights are clear (i.e. who can and who cannot abstract water, how much and when). Sometimes groundwater users, in order to compensate for the lack of certainty in their water rights, have undertaken out of their own initiative water rights Inventories, like in the case of Castilla La Mancha, Alto Vinalopó and Catalana.

Most important is the evolution in the awareness of groundwater users on the need for monitoring as highlighted in the case of Campo de Montiel; at first, there was great reluctance on the part of farmers to the installation of water meters, which farmers perceived as an intrusion on their private rights to use groundwater; yet 5–6 years later, it is farmers themselves who come directly to the GWUA when their water meter breaks down. This is important, since the 1999 Law reform has now made compulsory the installation of water meters under Article 53-4. This is also re-enforced by the EU Water Framework Directive and its requirements for establishing control measures in water abstractions (Garcia-Vizcaino 2003).

Equally the potential for self-regulation for groundwater management fills the gap left by the sclerosis of the administration (in terms of lack of action). This resourcefulness can also be seen in actions to first, monitor their

water use through water meters or traditional figures like the 'regador'. The *regador* is an employee who works in a local irrigation district and becomes familiar with all the activities in the area; acting by allocating water, providing technical advice whilst also acting informally as a monitor, and in cases, as a witness for official complaints. Indeed monitoring is one of the areas where groundwater users can be particularly active, sending reports to the *Junta de Explotación* of the relevant aquifer (Sanchez-Gonzalez 2003).

However cases where the whole continuum of issuing an inventory, defining water rights, monitoring and sanctioning is most sophisticated is where the groundwater users and the administration work closely together, rather than against each other. Then the synergy created is particularly strong and provides a solid foundation for long-term water management. In particular many so called *Convenios* or agreements (as allowed under the 1999 Law reform, Art 97.3) (Garcia-Vizcaino 2003) have been signed between users and the administration. The best example is Catalana, where through *Convenios* certain discrete activities like undertaking the inventory are devolved to groundwater users, financed by the administration, yet on the understanding (or trust) that it will be properly undertaken. This highlights another key factor in the attributes of higher-level authorities—their role in *facilitating and providing support to the initiatives of appropriators*. As Mukherji (University of Cambridge, UK (personal communication) 2005) comments 'positive internal attributes of appropriators is in itself not enough to promote self sustainable Groundwater User Associations'. The supporting role of higher-level authorities is equally important. In some cases of the Groundwater User Associations studied here, there are increasing examples where the Water Authority has been supportive and facilitated initiatives or has collaborated directly with water users in *Convenios*. This is the case of those undertaken in Catalana with the IGME (the Instituto Geológico y Minero de España) and the *Universidad Politecnica de Catalunya*. Some of the groups studied are either in the process of creating *Convenios* or have already set them up. For example, the Alto Vinalopó association is setting up *convenios* with the regional university to study the aquifer, with local town councils to promote rational water use and with the central administration, for an inter-basin Júcar Vinalopó transfer. Equally Sierra de Gador is also in discussion with the administration to establish a well monitoring network, financed 30–70% by users and the administration. Similarly, the central National Groundwater User Association, i.e. AEUAS itself has also set up *Convenios* with both the IGME and the Ministry of Environment.

Nevertheless a necessary condition for the possibility of *Convenios* is the fact that the administration has to recognize the legitimacy of the GWUAs. This legitimacy of appropriators was already identified by Ostrom (1992) as a factor, i.e. the key importance of the recognition of the *right to organize*. Local organizations cannot operate in a vacuum, and in the long term it is essential that legitimization is granted to local organizations from higher-level authorities. Local organization can be legitimate yet have no support

Table 6 Water rights, monitoring and sanctioning

Name of groundwater user groups	Co-management model	Inventory		Water Rights	Monitoring		Sanctioning	
		By users	By the authorities		By users	By the authorities	Internally	Externally with the authorities
Castilla La Mancha	No supervision since legitimacy of organization (see text) is questioned by Guadiana Water Authority	100% Undertaken for biggest municipality	Undertaken but data lost or not used	Not finalized; awaiting decision on <i>Plan Alto Guadiana</i> (see text)	No	Yes but limited	No	Yes but through litigation
Campo de Montiel	Some devolution of responsibilities (e.g. reading of water meters)	–	–	Finalized in 98% of cases due to the perseverance of lawyers in the user association	All users have water meters and are closely monitored by the Groundwater User Association (GWUA)	One guard from the Guadiana Water Authority to monitor water use in the whole aquifer	In the future it is possible it will happen, i.e. some form of internal sanction	Complaints lodged as requested by the Groundwater Association Statutes
Catalana	Large devolution of responsibilities; on occasion it acts as adviser to the administration	Inventory undertaken with the authorities	Inventory undertaken in a <i>Convenio</i>	<i>Plan de Ordenación</i> prepared and water rights were to be finalized by July 2005	Yes; each user undertakes a self-completed declaration on groundwater use	Yes	Yes, the GWUA puts official complaints on basis of internal decisions the Groundwater Users Junta	The regional Water Authority acts on basis of complaints from GWUA
Castellón	Devolved in the management of private waters, however cannot modify the conditions of the well (pump, depth. . .) or area to be irrigated	–	–	80% water rights registered in Private Water Catalogue. Rest to be finalized	No water meters installed; however 'regador' (see text) oversees water use	–	Complaints normally resolved internally	–
Valenciana	Collaboration in relation to legalizing water rights	No inventory	No inventory	Most in the process of being registered either in the Catalogue of Private Waters or in the Public Register	Each Association, Irrigation Community undertakes its own monitoring in different ways (meters, records, guards. . .)	No water meters installed by the authorities; guards from the Confederación	Internal dissuasive measures like e.g. paying a higher rate if above a certain level	–

Table 6 Continued

Name of groundwater user groups	Co-management model	Inventory		Water Rights	Monitoring		Sanctioning	
		By users	By the authorities		By users	By the authorities	Internally	By users
Alto Vinalopó	Not as large as groundwater users would like	Inventory in the process of being undertaken	-	Pressure on the administration to sort out Registry and Water catalogue. Out of 1,700 cases only 200–300 finalized	Water meters installed	-	Internally they prevent those users that have over-abstracted from using water	Complaints lodged with the authorities by the groundwater users
Sierra de Gador	Some <i>convenios</i> are being discussed e.g. on water meters	-	-	Collaborating with the administration to resolve all water rights queries not finalized	At the moment, no water meters but plan to set up a <i>Convenio</i> with the administration to install water meters	-	Internally, impose own sanctions e.g. in cases where water users do not pay or through lodging complaints to Water Authority	Externally Complaints sent to the authorities

from higher-level authorities. In these eight case study areas organizations were created bottom up, yet legitimation by higher-level authorities cannot be taken as a given. It might be for different reasons that the authorities might want to question these organizations. Amongst the cases presented here, this was the case in Campo de Montiel. Until the late 1990s, the legal form adopted was not that preferred by the administration, i.e., a private organization instead of a public irrigation community, attached to the administration. Equally, in the case of Castilla-La Mancha, the Water Authority is still questioning this organization legally through the courts since the administration prefers to deal only with a parallel public Irrigation Community, which was created at the instigation of the Water Authority in the mid 1990s. Yet, despite this questioning of their legitimacy externally by the Water Authority, internally it has to be stressed that the water users perceive Castilla-La Mancha as legitimate, whereas the official parallel institution (created top–bottom in Castilla-La Mancha) was either little known or not accepted by some water users. This indicates the inherent contradiction that external and internal legitimacy do not necessarily coincide, and that ownership of the organization by users themselves is a characteristic that has to be developed internally, not externally. Again this calls attention to the inherently dependent relationship that regulator and the regulated share.

This leads directly to another key factor in higher-level authorities, *the importance of building trust across cross-scale linkages*. Often there has been a lack of trust between the administration and water users (Garcia-Vizcaino 2003). Trust cannot be assumed, and the examples mentioned above prove this. In some cases higher-level authorities, have questioned the existence of GWUAs, whilst in others the authorities facilitated and acknowledged the legitimacy of water users, and supported their development. For example, one of the members belonging to the *Asociación* in Catalonia (the *Comunidad de Usuarios de la Cubeta de Sant Andreu de la Barca*) was the first to be created in Spain under the 1985 Water Law (Codina-Roig 2003), due to public awareness on the problems the aquifer was experiencing. Furthermore this initiative was backed by the authorities (Galofre 2001). The key difference is the presence (or not) of bridging trust or social capital cementing cross-scale linkages. It is important to stress the dynamic nature of social capital, i.e. it can be eroded and it can be created. In the case of the GWUA Catalana, it is clear that third party trust was created between the GWUAs and higher-level authorities.

Yet the end result of collaboration between the administration and groundwater users is collective action for the sound management of aquifers. In this case another key factor is essential, the *clear division of responsibilities*: However, echoing Young (2002), it does not necessarily mean just finding the right scale but rather clarity in the interplay of increasing functional dependencies. For example, in many occasions, it might be relevant to “combine the strength of government level and local level resource management, to mitigate the weaknesses in each” (Berkes 2002, p. 301). Self-governance, like participation

can be perceived along a continuum leading, in the first instance to partnership agreements, at a later stage to co-management and eventually (if desired by both sides) to self-governance. The National Hydrological Plan Law of 2001 itself does introduce the concept of co-management and the concept of collective management of an aquifer (Moreu-Ballonga 2003).

In other words, a process where higher-level authorities evolve in their role: from supervisory control, to co-management to self-regulation (from extrinsic reward to intrinsic motivation). In many cases this process can be quite pragmatic and gradual; picking and choosing areas for devolution, e.g., issues related to access, use, management, exclusion and transferability of water resources, and the rules that might (or might not) be up for negotiation. It is interesting that the more sophisticated organization studied amongst the case study areas—that of the GWUA Catalana—stressed that even if many powers were devolved, final responsibility should lie with the authorities and that groundwater users should always, as a last resort be accountable to the authorities. However, this organization also pointed out that it is also crucial for both the regulated and regulator to avoid capture since each can play their role best through close collaboration but remaining independent; i.e., legitimacy and autonomy should not be confused.

The final section analyses one of the key remaining factors in higher-level authorities, by also looking at the main drawbacks and limitations raised theoretically in relation to self-regulation.

The limits of self-regulation

This section will discuss three key things; the relevance of the underlying institutional culture, the problem of regulatory capture and the potential for reflexive learning in these GWUAs.

The previous section discussed the key role that higher-level authorities need to undertake to support and facilitate the activities of groundwater user groups. One of the issues pointed out repeatedly by users is the underlying institutional culture in many water authorities in Spain and how this can either help or hinder the potential for self-regulation. The right institutional culture when faced with the increasing pattern of decentralization—like self-regulation would “seek to harness rather than override the local knowledge and creativity of a multiplicity of designers” (Lowndes and Wilson 2003, p. 287). Institutional culture should as far as possible, be receptive, flexible and robust. Yet this is in stark contrast with the *dominant institutional culture* in higher-level water authorities, which at present are often paralyzed, and/or rarely support positive patterns of behavior (such as community leadership). This often means that it is difficult to eradicate negative traditions (such as departmentalism, paternalism, and social exclusion) (Lowndes and Wilson 2003).

For example, certain administrations were accused of being ‘slow’, ‘distant’, ‘un-interested’, ‘secretive’, and ‘hav-

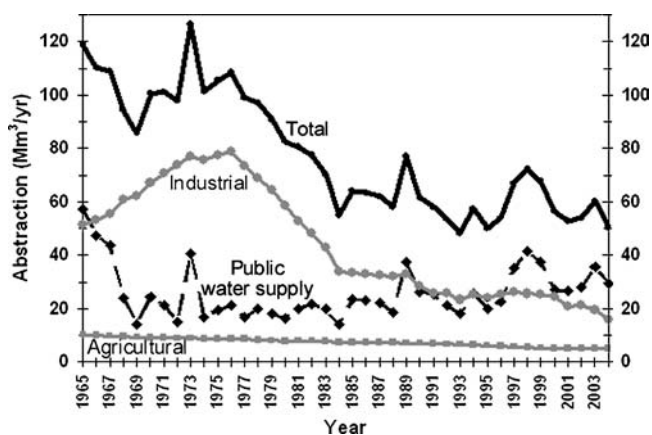


Fig. 4 Evolution of abstractions in the Vall Baix aquifer and deep aquifer of the Delta del Llobregat, Catalonia [modified from CUADLL 2005]

ing lack of capacity’. Many also stressed that the water administration often does not fully appreciate the potential that users themselves can provide in terms of facilitating water management. Yet the problem that most of the users perceived on lack of capacity (e.g. as shown in the fact that water rights have been pending resolution since 1988) could in theory be solved through closer collaboration with groundwater users themselves.

This lack of capacity in cases was perceived as due to lack of resources (financial, human, etc.). In other cases rather than lack of resources it was actually described more as a lack of continuity (Garcia-Vizcaino 2003). This is because most senior water appointments in Spain, like the President of the Water Authority and the Water Commissariat (in charge of water resource management and, e.g., water rights) are political appointments, subject to change with national elections. This means that continuity only exists in the lower levels, who have little decision-making power. This is compounded by the fact that increasingly Water Authorities are relying on the use of external consultants, which again do not necessarily offer continuity or build the internal capacity in the administration. However, in cases like the GWUA Catalana there was a close and effective relationship between groundwater users and the *Agencia Catalana del Agua*, the regional body responsible for water management in Catalonia. This is already evident in a more sustainable management of the aquifer, with increasingly decreased abstraction, as can be appreciated in Fig. 4.

This close relationship then brings us back to one of the main criticisms raised against self-regulation; the problem of regulatory capture. Interestingly in Spain, there was no evidence of regulatory capture between the regulated and the regulator.

Most often in the literature regulatory capture is thought of as private groups capturing the public agency that has to regulate them (Schlager E., 2005 Personal (written) communication, School of Public Administration and Policy, University of Arizona). However the evidence in case studies presented here, is that it is the reverse that is most crucial for self-governance: the attempt by private groups to remain independent of the regulator. This confirms the

rational choice belief that public agencies themselves will pursue their own agenda, which might not necessarily be what is most suitable for sound aquifer management. In the case of the GWUA Catalana, the GWUA is often aware of the importance of keeping their independence, despite close collaboration with the authorities in some cases. Furthermore, the GWUA Catalana—by far the most developed in terms of self-regulation of the groundwater user groups studied here—showed clear reflexive elements. For example, the GWUA Catalana was very critical of the administration since it is the administration itself that sometimes poses the greatest danger to the aquifer through careless land-use planning, which is now recognized as key to sound groundwater management (Custodio 2003). For example, in the GWUA Catalana aquifers are threatened by new roads, the port expansion, river diversions, high-speed trains, underground transport expansion, and how all these changes in land use can potentially threaten both aquifer recharge and also groundwater quality. Thus increasingly the Association is setting itself as the champion of the aquifers in which it operates.

It is also relevant to comment in the context of institutional culture that groundwater user groups were not critical of all administration; in general relationships with regional authorities and particularly with local authorities were perceived as good, if not very good. This therefore points to a possible area of reform. An interviewee, Codina Roig (2005), pointed out that although water authorities were born with a democratic base, there was a slow shift after the 1930s towards a focus on water infrastructure. This needs to come back full circle back to water management and participation. This calls for greater collaboration with users and also greater openness and transparency with civil society (Lopez-Gunn 2003a,b).

Other GWUAs showed reflexive elements, like for example, the initiative in Sierra de Gador to stimulate a change of mentality in its private groundwater users, away from an individualist mentality to a more collective frame of mind, by, e.g., taking greater care of common infrastructure. Equally, there are some initiatives to improve efficiency by removing a number of individual wells and converting them to common wells.

Yet, returning to the problem of regulatory capture; is specter is never far away but not how the literature portrays it; it appears indirectly through the strong politicisation of the water environment along party lines and the GWUAs efforts to remain neutral or a-political. This for example is reflected in the example of how many GWUAs like Sierra de Gador, Alto Vinalopó and Castellón want to remain independent of agricultural unions, which traditionally can be highly politicized. However, even in the case of GWUAs which have strong traditional links with the main farming union—like Castilla-La Mancha, Campo de Montiel and particularly in Valenciana—which was an offspring of ASAJA- the main agricultural union- there is increased awareness that their roles are and should be different; i.e. farming unions are lobbying organizations whilst GWUAs are set up for the management of groundwater; two very distinct activities. It is difficult in this paper to reach clear

conclusions as to why some organizations are more politicized than others without further research. What, however, comes out clearly from the research already undertaken is that politicisation in groundwater management is *not* a desirable feature, whereas neutrality and independence are advantageous for sound and resilient management.

Conclusion

This paper has posed the question of whether self-regulation is in reality a practical way forward for groundwater management. Self-regulation, understood as the 'decentralized collective management of groundwater resources by water users'—as pointed out by van Steenbergen and Shah (2003)—is often discussed as '*the alternative option*' (p. 242). The case studies analyzed here—eight groundwater user associations with very different composition, histories, interest and activities—have been compared in order to evaluate the potential for self-regulation. In order to do so it has analyzed both key characteristics of appropriators that facilitate self-governance and, equally key factors in higher-level authorities to maximize this potential and halt the main pitfalls of self-regulation.

Some very positive examples have been described like the cases in the Catalana GWUA where co-management is a reality. Readers of this paper are referred to the website of this organizations as good practice on a transparent, informative and detailed internet site, and includes a range of data, including comprehensive technical reports (CUADLL 2005). Furthermore, in the GWUA Catalana the reflexive aspects of self-regulation are also starting to develop. Groundwater users are increasingly acting to protect the aquifer not only understood as for their own immediate use but also its social and environmental interests, with the awareness of the long term aspects of aquifer management, like the key importance of careful land-use planning (Codina-Roig 2003). It is probably the case that it is the successful relationship between regulator and the regulated that is at the heart of this reflexive evolution, where autonomy, legitimacy and collaboration co-exist in the day-to-day groundwater management.

At present, the paradox lies in the need for a strong political will (Codina-Roig 2003; Garcia-Vizcaino 2003), and the parallel de-politicisation of water management. One of the obstacles in the way of self-regulation is the need to modernize the water administration in Spain. This in some ways is now encouraged externally under the pressures from the new Water Framework Directive 2000/60/EC and its requirements for a new, modern administration. Some of the working principles in the Water Framework Directive request participation, information, responsibility, delegation and co-management. It also has specific requests for groundwater to meet both 'good qualitative and quantitative status for groundwater' (Annex 5, Chapter 2). In the case of qualitative status it will have to be coordinated with requirements under the new draft groundwater directive (Custodio 2003). The innovation is that this good quantitative status refers not only to the concept already included in Spanish

water law of over-draft but it also refers to negative ecological impacts, thus widening its scope (Sanchez-Gonzalez 2003). It also establishes the need to identify protected zones (under Art. 6), in aquifers, which are particularly important for public water supply, like in the case of areas of the Alto Vinalopó and the Catalana GWUA. The Directive establishes tight deadlines, like eight years to define environmental criteria, 15 to reach this criteria, which can be extended in some case an extra 12 years (Garcia-Vizcaino 2003).

Yet specific to the Spanish case is the need to make associations more hermetic towards politisation. This requires a slow shift in institutional culture where groundwater users are perceived as potential co-managers and not solely as users safeguarding their own, private individualistic use, as had often been the case in the past. Both groundwater users and the administration are increasingly tied in a symbiotic relationship where groundwater users need a strong and efficient administration, in order to provide the security of water rights. Equally the administration needs the back up of users to develop the strong monitoring and sanctioning systems needed to underpin successful groundwater management. Higher-level water authorities can benefit from the information, knowledge and legitimacy that local and regional organizations have with the water users and which can evolve into collaborative arrangements. The *Convenios* described earlier are an example of clearly divided or devolved responsibilities, overseen and always answerable as a last resort to the administration. Although it is clear that cooperation between higher level authorities and water users is a necessary factor for the smooth management of groundwater at this stage it is difficult to provide a blueprint on how this is to be achieved. This paper hints that there are some elements like path dependency, i.e., a history of good relation or the appearance of leaders. However, more research needs to be undertaken to identify this blueprint.

In conclusion a shift is to be encouraged towards self-regulation and particularly the development of reflexive management systems, however, one cannot be blinded by self-regulation, since it still needs to be backed up by a strong and clear regulatory regime, should self-regulation fail.

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