Illegal water use in Spain

Causes, effects and solutions

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Contents

1 Introduction

According to the Spanish Ministry for the Environment, there are 510,000 illegal wells in Spain[1]. This figure implies that at least 3,600 hm^3 of groundwater is extracted illegally each year, which equals the average water consumption of 58 million people. This probably underestimated volume, is in contrast with the volume that is legally extracted, which is estimated at 4,500 hm^3/year[2]. This means that at least 45% of all water pumped from aquifers each year is extracted without regard to legal constraints. This water is used for the irrigation of about one sixth of the total irrigated land in Spain, plus numerous golf courses, and for the supply of a disproportionate urban development.

In many cases, unauthorized water extraction is linked to other illegal practices, such as unauthorized transformation of protected areas or common lands into irrigated arable land. In Murcia, the Public Prosecutor's Office is investigating 'black market' sales of illegally abstracted water for housing developments on the coast, illegal irrigation farmers or legal ones who have run out of water – often as a result of the illegal abstractions.

Undoubtedly, illegal water use has very little to do with meeting individuals' 'basic' needs, and, in most cases, it supports businesses related with agriculture and disproportionate urban development, at the expense of the legal users and the environment.

Illegal water use is a problem that affects, above all, the environment and the legal users – suppliers, irrigators, industries and individuals abstracting water for domestic use –, who run out of water while others make a considerable profit by breaking the law. In many cases, the decrease in quantity goes hand in hand with a decrease in quality – crops 'burnt' by excessive salts in water, and towns whose domestic water is polluted with fertilizers and pesticides.

It is society as a whole that suffers the consequences of this illegal use, since the uncontrolled exploitation of water resources also results in nature's deterioration. On the other hand, many hydraulic infrastructures which are paid for with public money (dams, canals, interbasin water transfers) help to reduce the effect of illegal water use in certain areas: for instance, the Júcar-Vinalopó transfer (231,5000,000 euros) will contribute to refill an aquifer that is overexploited by illegal wells; the Ebro transfer (approx. 380 million euros), now repealed, was going to give water to areas where there are thousands of hectares of illegally irrigated land (about 100,000 in the Segura river basin, according to a study of the University of Castilla La Mancha[3]).

The River Basin Authorities[4] in charge of water management have numerous instruments to enforce the Water Law, but so far they have been unable to stop the continuous increase in illegal water use. In aquifers 23 and 24 of La Mancha, officially declared overexploited for the last 20 years, it is estimated that ten new wells are drilled every day[5]. It is also estimated that in

[1] In this estimate, only those wells abstracting more than 7,000 hm^3/year were taken into account. This equals the annual volume required to irrigate 1 ha of corn.

[2] D. Jesús Yagüe Córdova, Subdirector General de Gestión Integrada del Dominio Público Hidráulico. "Las aguas subterráneas en la Directiva Marco del Agua". 40 Curso Internacional de Hidrología Subterránea.

[3] Instituto de Desarrollo Regional Universidad de Castilla La Mancha (2005). Informe-Resumen. Estudio de evolución del Regadío en la Cuenca del río Segura (IDR-UCLM). Grupo de Teledetección y SIG. Instituto de Desarrollo Regional Universidad de Castilla La Mancha.

[4] "Confederaciones Hidrográficas" (River Basin Authority) deal with inter-regional river basins, while the "Agencias del Agua" (Water Agencies) deal with intra-regional river basins.

[5] Pedro Arrojo Agudo (2001). Análisis económico del Plan Hidrológico Nacional: de la inconsistencia a la prevaricación técnica. Informe sobre el Proyecto del Plan Hidrológico Nacional.

the Segura river basin about 6,500 ha. are turned into irrigated farmland each year[6]; in La Mancha Oriental (Júcar river basin) 'up to 12 new wells are drilled on the banks of the Júcar river on any given day'[7].

The Water Authorities' inability to stop this activity is due to lack of instruments for water management and law enforcement. In some cases, there is also a lack of political willingness to allow the strict application of the law, which would discourage the ever-increasing illegal use. Nevertheless, the main reason that water is abstracted illegally lies in the huge profits that are derived from its use (irrigation farming, urban development, tourism). Because of this, river basin authorities are under great economic and political pressure, especially in those areas where the problem is more severe (Andalusia, Castilla-La Mancha, Murcia, Valencia) resulting in illegal water use not being effectively tackled.

On the other hand, the Autonomous Communities (federal regions) have an important role to play in solving this problem. Since they have jurisdiction over territorial planning, the Autonomous Communities have to control land use (including, for example, the illicit transformation of protected land with the purpose of irrigating with illegally abstracted water) and are responsible for the removal of incentives for illegal water use. They can do this through their policies on agriculture and urban development. Several Autonomous Communities insist that they should be given the powers over water management. Thus they should show their willingness and capacity to tackle the problem of illegal water use in their regions.

2 What is meant by 'illegal water use'

On 1st January 1986 all surface and ground waters went from private to public ownership. As of that date, any new water extraction exceeding 7,000 m^3/year must have a "concession" (administrative authorisation), which is granted by the corresponding River Basin Authority and specifies the location and characteristics of said extraction, as well as the maximum volume that can be abstracted plus the use to which it will be put.

In addition, users who have been taking water before 1986 were given three years to register their water rights. After the deadline, they would need an authorization from their River Basin Authority to change the characteristics of their water exploitation, especially if that meant increasing the volume of water abstracted.

Since 1986, there has been an increase in the number of uses of water that fall outside the limits established by the Water Law:

1. ***Wells and surface water intakes that are exploited without previously applying for authorization from the River Basin Authority***. This situation is typical in areas where water resources, especially aquifers, are overexploited (the River Basin Authority not being able to grant new concessions for lack of resources) and/or in cases of unauthorized land use (eg. illegal transformation of public land or protected areas for irrigation farming).

2. ***Users abstracting greater volumes of water***. Abstraction licence holders can only use the volume assigned by their River Basin Authority. However, many users extract amounts exceeding this limit.

[6] A study of the Ministerio de Fomento (Ministry for Public Works) estimates that the irrigated farmland in Segura river basin experienced an increase of 65.400 ha. between 1990 and 2000, despite the fact that since December 1986 the law forbids to grant new water concessions for irrigation. The results of that study can be found in Annex II of the report "*Informe de Sostenibilidad Ambiental. Actuaciones Urgentes del Programa Agua en las cuencas mediterráneas*" (Ministerio de Medio Ambiente, 2005).

[7] Source: D. Enrique Cabrera, Catedrático de Mecánica de Fluidos, Universidad Politécnica de Valencia (UPV). Levante. 15-Octubre-2004.

3. ***Abstractions with pending licences***. In many cases River Basin Authorities are behind schedule with the procedures of granting new concessions. Many applicants start abstracting water illegally before the Authority replies to their application.

There are other cases of non-compliance with the law, such as the replacement of an authorized well that has become unusable with another one of similar characteristics and depth.

What instruments do River Basin Authorities have for the control of illegal use?

According to the Water Law, River Basin Authorities have jurisdiction to detect and prosecute illegal water use in the following ways:

- ***Identification of illegal water use.*** This procedure includes detecting unauthorized wells and surface water intakes and identifying farms where a greater volume of water is used than had been assigned to them. This type of check is especially important in those aquifers that have been declared 'overexploited'; their users must observe the restrictions established by the River Basin Authorities ('*control del régimen de explotación*').
- ***Penalties for illegal water use***. Penalties for illegal water use are derived from the disciplinary proceedings that the River Basin Authorities' guards initiate on the spot (eg. in the Guadiana river basin there are two pairs of river guards for every 2,500 km^2) or by SEPRONA patrols (a Civil Guard body).
- ***Closing of wells.*** From the onset of legal proceedings until their completion, the presumed offender must refrain from using the well. In addition, the River Basin Authority can seal it as a precautionary measure. When there is a firm resolution on the proceedings, the owner must close the borehole (this is normally done by the River Basin Authority, but the owner pays the expenses).

The amount that an owner can be fined varies considerably between cases (ranging, for example, from 240 to 39,180 euros in the Inner Basins of Catalonia, during the 2002-2005 period).

Between 2002 and 2005, the Ebro River Basin Water Authority initiated 488 disciplinary proceedings for unauthorized water abstraction, the fines totalling about 88,600 euros. In the same period, the Douro River Basin Water Authority instigated 482 proceedings for the same type of offence, and imposed fines totalling 433,000 euros, while the Catalan Water Agency instigated proceedings whose fines amounted to 412,000 euros.

The table below summarises the judicial proceedings for illegal abstraction of water initiated between 1996 and 2005 by the River Basin Authorities (depending from the Ministry of Environment).

River Basin Authority	Number of proceedings	Data published in
Duero	5,568	Levante 27/03/06 and ABC 27/03/06[8]
Ebro	2,318	Levante 27/03/06 and ABC 27/03/06
Guadiana	434	ABC 27/03/06
Guadalquivir	3,207	Levante 27/03/06 and ABC 27/03/06
Júcar	704	Levante 27/03/06
Norte	489	Levante 27/03/06 and ABC 27/03/06
Tajo	44	Levante 27/03/06 and ABC 27/03/06
Segura	12 or 565[9]	ABC 27/03/06 / Europa Press 28-03-06

Table 1. Summary of judicial proceedings for illegal abstraction of water initiated between 1996 and 2005 by the River Basin Authorities (depending from the Ministry of Environment).

[8] These data have been provided to the press agency Europa Press by the Spanish Presidency Ministry (*Ministerio de Presidencia*). For Duero, proceedings refer also to other infringements of the Water Law.
[9] This figure has been provided to the press agency Europa Press by the former President of the Júcar River Basin Authority to complement the data issued by the Presidency Ministry and refer to the period 2000-2004.

3 Some figures on illegal water use

The data available to the public on illegal water use are fragmented, and they are normally estimates. This is a first indication of how difficult it is for the Hydraulic Administration to tackle such a complex problem. However, we can offer some figures that show the magnitude of the problem.

Between 2002 and 2005 SEPRONA annually initiated 1,545 proceedings (on average) for offences connected with water use in Spain[10].

In the Upper Guadiana River Basin, the Ministry for the Environment[11] admits there are around 22,000 illegal wells, in contrast with 16,000 authorized ones. The inspections carried out in 2005 on 70% of the irrigation farms in aquifer 23 (declared overexploited since 1987) have helped discover that abstractions were being made of 54,1 hm^3 above the amount authorized by the River Basin Authority that year (viz. 170 hm^3)[12].

In the Guadalquivir River Basin, the River Basin Authority reckons[13] that 10% of the existing 100,000 wells are illegal, and states that illegal water use affects even areas of great ecological importance. A study of 68 farms in the neighbourhood of Doñana National Park showed that none of the exploitations which were analyzed was completely in compliance with the law[14].

In the Segura river basin, where the granting of new concessions has been forbidden by Royal Decree since 1986 due to the lack of water resources, irrigated areas grew – illegally – between 1990 and 2000 at a rate of 6,500 ha/year[15]. In the most severely overexploited areas of the Segura basin, such as the Águilas region, the University of Murcia reckons that 40% of the irrigated lands are illegal; in Campo de Dalias (Almería) the number of hectares farmed under plastic has tripled in the last 25 years, even though drilling new wells is prohibited[16].

The Tagus River Basin Authority estimates there are 18,600 wells in the Comunidad de Madrid, while there are only 4,400 authorized extractions. With these illegal wells, about 70 hm^3 are abstracted each year, which amounts to 12% of the total annual consumption in the region (600 hm^3/year) [17].

The Catalan Water Agency gives an approximate figure of 300,000 groundwater abstractions in Catalonia, while legal abstractions total about 80,000[18].

[10] Source: SEPRONA, on written request by WWF/Adena.
[11] Confederación Hidrográfica del Guadiana (2005. Plan del Alto Guadiana del Alto Guadina (PEAG). Borrador Documento de Directrices 4.07.2005. p.42.
[12] Posicionamiento de las organizaciones agrarias Unión de Pequeños Agricultores (UPA) y Coordinadora de Agricultores y Ganaderos-Iniciativa Rural (COAG-IR) de Castilla-La Mancha sobre el Plan Especial del Alto Guadiana (2006).
[13] Source: conversation with officials of the Guadalquivir River Basin Authority.
[14] Confederación Hidrográfica del Guadalquivir (2004). Análisis de las extracciones de aguas subterráneas en la cabecera de la cuenca del Arroyo de la Rocina.
[15] See footnote 6.
[16] Pedro Arrojo Agudo (2001). Análisis económico del Plan Hidrológico Nacional: de la inconsistencia a la prevaricación técnica. Informe sobre el Proyecto de Plan Hidrológico Nacional.
[17] El País. 20-09-2005.
[18] El Periódico de Catalunya, 18-2-2006.

Access to Information

In making this report the following information was requested of all River Basin Authorities (except those of the Canaries, Ceuta and Melilla): number of registered wells; and, for the 2002-2005 period, number of illegal water abstractions; number of fines imposed for unauthorised abstraction and amount that was set; number of fines paid for unauthorised abstraction, and amount that was charged; and number of illegal wells that were closed as a result of disciplinary proceedings. Requests for information were sent on 7th December 2005 and, by law, the Administration must respond within the next two months.

The only two River Basin Authorities that have given complete information are the Catalan Water Agency and the Douro River Basin Authority. The Ebro River Basin Authority has provided all the data except for the number of registered groundwater abstractions. The Andalusian Water Agency and the *Dirección General de Recursos Hídricos* of the Balearic Regional Government have requested clarifications or extra time; as of 21st March 2006, WWF/Adena had not received any data.

The Júcar River Authority replied that attending to WWF/Adena's request 'would affect the efficiency of [their] services' as 'it would mean using essential resources [they] could not utilize [...] without detriment to the attention that responding to individuals' applications requires'. The Tagus River Authority requested 691 euros to produce their report. The other River Basin Authorities – Guadalquivir, Guadiana, the Northern River Basins, Segura, Aguas de Galicia and the Basque Water Agency – gave no answer whatsoever.

Data were also requested of the SEPRONA (a special group of the Civil Guard), which were promptly supplied.

4 Pressures and impacts

Illegal water use has very negative effects, both on the environment and the authorized users. The most significant impacts are (see table 2):

Alteration and degradation of water ecosystems. Most wetlands are formed when groundwater seeps to the surface. Therefore, the uncontrolled exploitation of an aquifer results in the wetlands' water input diminishing or even disappearing, which in turn results in the deterioration of related ecosystems (eg. Las Tablas de Daimiel). Likewise, the decrease in groundwater levels leads to the river-aquifer dynamics being altered and rivers becoming drains that recharge the aquifer rather than the opposite, which causes degeneration of the riparian flora and fauna that depend on water for their subsistence.

Depletion of resources available for legal uses. River Basin Authorities can not control the characteristics of illegal wells (eg. the location of a particular well in relation to others or in relation to the protection perimeter of rivers and wetlands) or the volume of water that can be extracted without damage to a third party or the environment. This leads to non-sustainable aquifer exploitation, with slumps in groundwater levels leaving the authorized users without water in their wells (eg. in the Upper Guadiana and the Segura river basin), disappearance of springs (eg. in Pegalajar, Granada) and reversal of the river-aquifer dynamics that leaves rivers and streams dry.

Deterioration of water quality. Excessive exploitation of surface or underground waters has negative consequences on the quality of water in aquifers and rivers. This is due to the fact that, with less water, the river or aquifer loses a great deal of its dilution capacity for dumped materials or diffuse pollution (eg. nitrate contamination connected with intensive farming

practices). In coastal aquifers, the uncontrolled exploitation of groundwaters causes salt waters to enter inland, resulting in freshwater and salt water mixing in wells[19]. The lower quality of the available water affects urban supply, authorized irrigation farmers (in Murcia the salination of coastal wells prevents growing vegetables that cannot tolerate high concentrations of salts), and, of course, the environment, as aquatic ecosystems are extremely sensitive to variations in salinity.

Practice/pressure	Impact	who/what does it affect
Drying up of rivers, springs and wetlands due to a drop in groundwater levels	- Degradation and disappearance of water ecosystems - Changes in natural landscape - Disappearance of historic springs and sources - Loss of historic tradition connected to rivers	- Environment - Leisure - Urban supply - Legal irrigation farmers (surface waters)
Uncontrolled, disproportionate use of resources (groundwater and surface waters)	- Depletion of available resources - Need to find new water sources (deepening wells, bringing water from other areas)	- Urban supply - Legal irrigation farmers - Industry
Saline intrusion due to a drop in groundwater levels	- Degradation and disappearance of aquatic ecosystems - Decrease in quality of legally-used waters - Need for more purification treatments for domestic water - Legal wells abandoned as they become unusable	- Urban supply - Legal irrigation farmers - Environment
Water pollution	- Decrease in quality of legally-used waters - Need for more purification treatments for domestic water	- Urban supply - Legal irrigation farmers - Environment

Table 2 Negative effects of illegal water use, further consequences and affected sectors/people.

5 Causes and responsible bodies

The main cause of illegal water use is the huge profit that can be earned from it, and this pushes people, to obtain water without regard to legal constraints in areas where it is more scarce. With regards to agriculture, the benefits obtained from illegally abstracted water are explained by the fact that irrigation crops (eg. fruit and vegetables) are more profitable than dry farming ones, either because they are more competitive in the market or because they receive considerable subsidies. As for urban use, water is the key element for those residential tourist developments with gardens and golf courses in dry areas, and which involve investments of large amounts of money.

[19] On the coast, seawater is in dynamic balance with the freshwater in aquifers: salt water, having more density, goes under freshwater, forming a characteristic “wedge” whose thickness diminishes as it goes inland. The intrusion of the wedge causes an increase in the volume of marine water in the ground and increases the probability that said water salinates the water in wells.

In this context, the Administration – at national, regional and local levels – is responsible too, as it is unable, and in some cases unwilling to tackle illegal water abstraction via political measures.

In particular, **River Basin Authorities** (which report to the Ministry for the Environment and the Autonomous Communities) are responsible for this situation, as they have been:

1. **Negligent in monitoring users and enforcing the Law**, either because the administrative proceedings are too complex, or because they lack the means or they are unwilling to intervene.
2. **Slow in dealing with proceedings for registration and concession** of new water licences, which makes it difficult to detect illegal users and pushes some people to drill wells before getting a reply from the Administration.

Illegal water abstraction is destined for land uses which are regulated and controlled by the **Autonomous Communities.** Therefore, these, directly or indirectly, contribute to the illegal use of this resource, in the following ways:

1. **Political pressure from the Autonomous Communities over the River Basin Authorities** in order to avoid confrontations with powerful financial and social groups that benefit from illegal water use.
2. **Insufficient control and prosecution of farmland transformations (dry land being turned into irrigated land)** on the part of Autonomous Communities, who have jurisdiction over land use.
3. **Agricultural policies that do not discourage illegal water use**. At present, agricultural subsidies are being granted through Autonomous Communities without checking that the irrigation is done with licensed abstractions.
4. **Non-sustainable urban developments promoted** and/or tolerated by some Autonomous Communities that do not take into account the actual volume of water available in the region and favour the search for unauthorised water sources.

Users authorized to abstract water, either for lack of information, for fear, or for some kind of solidarity, have rarely taken action to oppose the proliferation of illegal water uses:

1. **The users themselves do not participate in the water management process**, this results in lack of awareness on their part, which is an obstacle to the rational and sustainable use of this resource. As a consequence, illegal water abstractions are not reported, even though these damage legal users' rights.
2. **The users have not had enough training on the efficient** use of the available resources, as a result of which even authorised users look for new resources – illegally.

6 WWF/Adena's proposals

In February 2005, WWF/Adena approached the Ministry for the Environment with twenty proposals on tackling the problem of illegal groundwater use by means of administrative measures, and within the framework of the present Water Law.

Here is a summary of the proposals, emphasizing whose responsibility and competence it is to help solve the problem of illegal water use in Spain (see Table 3).

The **Ministry for the Environment and the Autonomous Communities** with jurisdiction over water management (Andalusia, the Balearics, Catalonia, Galicia and the Basque Country) should:

1. **Identify the illegal water abstractions.** Therefore, it is necessary to use the means that are already available to the River Basin Authorities and:
   - **Reinforce monitoring services to detect illegal wells and their illicit uses in the fields, and increase the number of staff working in the legal departments** of the River Basin Authorities to speed up the granting of licences and the penalties.
   - **Make 'legal water maps' in overexploited areas where it is forbidden by law to grant new concessions for lack of available resources (eg. the Segura river basin since 1986)**. In order to do this, air view photographs of 1986 could be compared to present-day high-resolution satellite pictures. The properties which were irrigated in 1986 would make up the legal map; any new additions, then, must been investigated to verify its legality in relation to water permits.

2. **Penalize illegal uses and stop further illicit water abstractions.** In this process it is necessary:
   - **To start with the exploitations that abstract greater water volumes**, and therefore contribute more to the depletion of the resources. A significant part of this excess volume is taken by a very small number of offenders. According to agricultural organization COAG, 'it is safe to estimate that 80% of the total volume that is extracted irregularly from Aquifer 23 (Upper Guadiana) is taken by less than 200 offenders'.
   - **To ensure that the offender stops extracting water**, by sealing the wells, and if the activity that used illegally abstracted water carries on, by demanding they justify where the water that is required comes from. Besides, it would be advisable to publicize the penalties and the closing of wells so that the example will caution potential offenders.
   - **Increase the value of fines**, as the present fines for illegal water abstraction or diversion do not discourage water theft at all in high-profit farmlands or tourist areas.

3. **Reform water users' communities**, making sure they are more involved in rational water. This implies, among other things: endowing them with greater legal responsibilities, but also establishing punishments in case they do not act according to them; establishing the compulsory creation of Groundwater Users' Communities, thus reducing the influence of large farms in the decision-taking processes of the communities (at present, the number of votes is assigned by hectare), which would make water management more democratic and provide them with economic and human means so their management is truly efficient.

4. **Promote the training and sensitizing of irrigation farmers** so they use water more rationally. This can be done by means of courses on efficient irrigation, activities to raise awareness and by publicizing services for farmers. In addition, it is essential that the River Basin Authority provides users with data on the state of the aquifers (at least the volume available, the annual recharge, the volume extracted for existing exploitations, as well as variations in piezometric levels) and the assigned water rights (eg. on the river basin boards' websites). This would let them see more clearly how extractions affect groundwater.

5. **Revise the existing water concessions in order to recover water volumes** in overexploited areas. This revision must be carried out, for example, when water is saved through the modernization of infrastructures and the introduction of new irrigation

practices. The volume that has been recovered should be assigned, first of all, to human consumption and environmental purposes, and then to those activities that are most in agreement with the objectives of rural development (eg. stabilizing of rural population, preserving landscape, fighting desertification). *This is stated in the Water Law Article 63) , even if it has never been enforced, as it is undoubtedly a controversial measure.*

The departments of Agriculture, Environment and Industry of the **Autonomous Communities** are responsible for cooperating with the River Basin Authorities in the detection of illegal water uses and the discouragement thereof, in the following ways:

1. **Monitoring and prosecuting unauthorised changes in land use.** The Autonomous Communities have jurisdiction over land administration. Therefore, it is their responsibility to efficiently monitor unauthorized changes in land use (eg. illegal transformation of woodlands or protected areas into irrigated farmland) and which necessitate water use.

2. **Cooperating with River Basin Authorities in order to detect offenders.** River Basin Authorities, in their tasks of detecting illegal water uses, need to use data which are managed by other administrations (eg. land cadastre data). It is essential that all the administrations concerned (town councils, Autonomous Communities) facilitate access to these data to avoid delays in the detection of offenders. Besides, the Autonomous Communities themselves should inform the River Basin Authorities of any illicit changes in land use.

3. **Authorizations to drill new wells – granted by the Autonomous Community – should only be given** if there is an official document by the River Basin Authority stating that the future owner of the well has a water use concession. At present, it is possible to obtain an authorization to drill without a water abstraction licence, which forces the River Basin Authority to prove that water is actually taken from the well.

4. **Making land use planning** compatible with the resources available in each river basin, according to the indications of the River Basin Authority. It is essential that that the Autonomous Communities be transparent and realistic in outlining their development plans and that they require local authorities not to approve urban developments which are incompatible with the actual water availability.

5. **Making it an essential requirement for individuals claiming agricultural subsidies to be authorized water users**. This requirement is included in the so-called 'conditionality' which is applied only to beneficiaries of direct CAP (the EU's Common Agricultural Policy) payments in overexploited aquifers. In those aquifers, anybody who applies for agricultural subsidies is required to prove they have irrigation water rights. Apart from extending this principle to all kinds of subsidy and to the whole of Spain, it is essential that the Autonomous Communities diligently monitor its compliance.

6. **Promoting alternatives to irrigation farming by means of the rural development funds**, so that dryland farmers that are planning to transform their activity into irrigated agriculture can be offered economically viable options. Examples of this are: grants for the restoration of dried-up wetlands, or for ecotourism, and support of dryland farming, plus handicrafts, gastronomy and local markets.

Legal users can also help stop the problem of illegal water use in the following ways:

1. **Pressing the administrations to prosecute illegal water use.** Legal users must demand that legality be observed, since non-compliance directly affects them.

2. **Organizing groundwater users in communities** to improve their self-regulation and raise awareness with a view to a more rational water management.

3. **Cooperating with River Basin Authorities,** which would help to monitor the Hydraulic Public Domain, eg. by installing flowmeters and ensuring prompt readings, and sharing the data related to crops and water use (through water users' communities). It is also essential that they report illegal water use to the River Basin Authorities.

Cause	Responsible party	Effects	WWF/Adena's proposals
Hydraulic administration's lack of forcefulness in monitoring practices and enforcing the law	MIMAM (Ministry for the Environment)	Illegal wells proliferate as the law does not seem to penalize offenders	Reinforcing vigilance to ensure compliance. More diligence in dealing with legal proceedings and applications for licences.
Political pressures on the River Basin Authority so as to avoid conflict with powerful pressure groups (construction companies, irrigators)	Autonomous Communities; Users	Illegal wells proliferate as the law does not seem to penalize offenders	Supporting River Basin Authorities in ensuring compliance
Water theft being unreported and even covered up sometimes	Users	It seems safe to steal water. Legal irrigation farmers run out of water	Making users aware of the importance of reporting illegal practices
Illegal water users receiving subsidies	Ministry for Agriculture, Fisheries and Food; Autonomous Communities	Agricultural activities using illegally abstracted water get support from public funds	Extending the 'conditionality' to any kind of agricultural subsidy and to the whole of Spain, and penalizing illegal water use by withdrawing the full amount of the subsidy as punishment for illegal water use
Land being turned into irrigated land without control	Autonomous Communities	Illegal wells and black market sale of water for irrigation	Detecting and penalizing illegal transformations and informing the relevant River Basin Authority
Disproportionate urban development	Autonomous Communities; town councils	Illegal water sources are sought, especially for complementary activities such as the irrigation of gardens and golf courses	Planning regional development according to the water resources available in the river basin. Demanding that land use planning by other competent authorities ('comarcas', town councils) be compatible with the existing water resources
Slowness in dealing with water applications	MIMAM	The detection of illegal irrigators gets harder; applicants drill wells before getting the authorization	Improving legal services in charge of applications
Lack of responsibility on the users' part	Users	Overexploitation of resources; proliferation of illegal wells	Making groundwater users'communities compulsory, and increasing their responsibilities (with penalizations)
Lack of training and awareness, which results in users seeking new resources, the existing ones being insufficient	Users	Overexploitation; proliferation of illegal wells	Courses to teach users more efficient irrigation techniques (eg. so as to respect the conditions of the exploitation)
Crops paid by quantity not quality	Cooperatives, market	Resources are sought with the purpose of turning dryland into irrigation land to increase production (eg. olive groves and vineyards)	Promoting changes in the common organizations of the market, and limiting production per hectare according to the type of cultivation.

Table 3. Causes, responsible parties, effects and proposals by WWF/Adena on how to tackle the problem of illegal water use in Spain. Source: WWF/Adena.

7 Examples of illegal water use

7.1 Olive cultivation in Úbeda

Until 15 years ago, almost all the Andalusian olive groves were on dry land and aquifers were only used for human consumption. Since the drought of the 90's, a large number of deep wells have been drilled – to a depth of 1,200 m. in some areas – to irrigate the olive groves.

Its farmland turned into irrigated land, olive cultivation has become the largest consumer of water in the Guadalquivir basin[20], with approximately one fifth of the olive trees being irrigated, which amounts roughly to 296,000 hectares. Taking into account that the water volume apportioned on average is 2,094 m^3 per hectare per year, the olive groves in the Guadalquivir basin consume about 621hm^3/year, which equals the yearly domestic consumption of 10 million people. Therefore, olive cultivation contributes significantly to the 480 hm^3/y 'structural deficit' that the Guadalquivir is facing.

As regards employment, olive groves need more water than other types of crop to create new jobs (50,000 and 80,000 m^3 are needed to create one job in olive farming) [21]. A study carried out in La Loma (Jaén), an area where olive cultivation is predominant, shows that in most cases, the job market is typically based on informal relationships, with discrimination against women, frequent resource to piecework, etc. [22].

Until the end of 2005, payment of European Union (EU) subsidies depended on the yields, and this could encourage the illegal transformation of drylands into irrigated lands, as the latter produce better yields.

As for **water use in the aquifer of La Loma de Úbeda**, the first drillings were done privately in 1995 on an aquifer that was almost unknown until 2000.

The growth of irrigated olive cultivation has been extremely fast: as early as 1999, there were some 12,000 ha of this kind of exploitation in La Loma de Úbeda, the water consumption being about 23 hm^3/y while in 2002 the number of applications for inclusion in the concessions register totalled 25,000 ha, which corresponds to more than 46 hm^3/year in consumption[23]. According to the Spanish Geological and Mining Institute (Instituto Geológico y Minero de España –IGME), farmers currently abstract about 35 hm^3/year from the aquifer, much more than the annual recharge rate of the Guadalimar river. If the present rate is maintained, the aquifer will run dry in less than 20 years.

The Guadalquivir River Basin Authority[24] reckons that in the Loma de Úbeda area there are about 450-500 illegal wells of great depth, the volume abstracted from which could reach 3.5 hm^3.

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[20] Confederación Hidrográfica del Guadalquivir (2005). Informe Art. 5 y 6 DMA.

[21] Junta de Andalucía (1999): "Inventario y Caracterización de los Regadíos de Andalucía". Sevilla

[22] "El Olivar de Regadío en Andalucía. Un cultivo insostenible y con un marco institucional favorable". Universidad de Sevilla, quoting Martín Díaz, E. y Rodríguez García, M. (2001): "Inmigración y Agricultura en la Comunidad de Andalucía: Comarca de la Loma-Las Villas (Jaén) in *Mercados de Trabajo e Inmigración extracomunitaria en la Agricultura Mediterránea*, páginas: 101-155.

[23] Gollonet Fernández de Trespalacios et al. (2002) Los acuíferos de la Loma de Úbeda, reserva estratégica para el desarrollo del olivar; en IGME (2002) Presente y futuro de las aguas subterráneas en la provincia de Jaén: 379-383. Madrid. ISBN. 84-7840-472-4

[24] Source: conversation with officials of the Guadalquivir River Basin Authority.

Before 2005, the Guadalquivir River Basin Authority had initiated 31 judicial proceedings for drilling illegal irrigation wells, based on accusation by SEPRONA, by the River Basin's river guards, and by individuals. In July 2005, the River Basin Authority initiated 14 new proceedings, with fines between 6,000 and 30,000 euros for irrigation communities in Jaén for using illegal wells. Most accusations concerned olive farmers exploiting the aquifer in La Loma[25].

7.2 Lack of control in the Segura basin

In the Segura river basin water consumption amounts to 225% of the renewable resources[26]. This is the greatest pressure on a natural system in a Mediterranean country[27]. For this reason, as of 31st December 1986, the Segura River Basin Authority cannot grant new water concessions.

Despite the prohibition, it is estimated that in the last 20 years about 100,000 new hectares have become irrigated land[28]. These consume approximately 400 hm^3 of water per year, which add to the structural deficit of the basin[29]. In some cases illegal irrigated land appears even on protected natural areas – including Special Area of Conservation and Special Protection Areas of the European Union – , as it has been repeatedly denounced by the Civil Guard, Forest Rangers, citizen platforms and environmental ONGs. The Carrascoy-El Valle Regional Park, the *Paisaje Protegido* of Humedal de Ajauque y Rambla Salada, the Regional Park of Sierra de la Pila, el *Paisaje Protegido* of Sierra de las Moreras, the Regional Park of Cabo Cope, the *Paisaje Protegido* of Saladares del Guadalentín are some of the protected areas where illegal irrigated lands have appeared during the past 10 years. In some cases, these new arable land was even granted European subsidies by *Consejería de Agricultura, Agua y Medio Ambien*te of the Regional Government of Murcia.[30].

The tourist industry in southeastern Spain has grown by 50% in the last five years. Furthermore, the provinces of Almería and Murcia predict a large increase in tourism. Murcia expects to double its tourist potential in the next ten years and is planning to increase the number of golf courses from 6 to 50 in the next eight years, with 114,850 associated buildings[31]. All this in spite of the mandatory - but non-legally-binding - reports from the Segura River Basin Authority warning that there are not sufficient water resources to sustain such growth.

The Fiscalía del Tribunal Superior de Justicia de Murcia is investigating a 'water black market' in the Murcia region: water from illegal wells, canals and rivers being 'sold' and transferred to other areas through a complex pipe system. The investigation was started from a report by the Fiscal de Medio Ambiente, Emilio Valerio, which states that these illegally abstracted resources

[25] El País, 19/08/2005

[26] Martínez Fernández, J y M.A. Esteve Selma. (2002), Agua, regadío y sostenibilidad en el Sudeste Ibérico. Editorial Bakeaz. Bilbao, Spain.

[27] Institute For Prospective Technological Studies (1997), Towards a sustainable/strategic management of water resources: evaluation of present policies and orientations for the future. European Commission. General Directorate XVI. Institute For Prospective Technological Studies. Joint Research Centre.

[28] Instituto de Desarrollo Regional Universidad de Castilla La Mancha (2005). Informe-Resumen. Estudio de evolución del Regadío en la Cuenca del río Segura (IDR-UCLM). Grupo de Teledetección y SIG. Instituto de Desarrollo Regional Universidad de Castilla La Mancha.

[29] According to the press (Información, 16/11/2003), "The Fiscalía de Medio Ambiente del Tribunal Superior de Justicia de Madrid estimates that, based on data provided by the Segura River Basin Authority, the illegally abstracted water sums up to 200 hm^3 and the land irrigated without authorisation is of about 30.000 ha. These supposed illegalities refers to only 6 companies, which act with «total impunity»".

[30] Martínez Fernández J. y Brufao Curiel P. (2006). Aguas Limpias, manos limpias. Corrupción e irregularidades en la gestión del agua en España. p.209-211

[31] El País. Propiedades. 24/06/05.

are destined for 'housing developments, intensive irrigation, or to be sold to farmers' who have run out of water due to these illicit practices.[32]

The case of a property called "El Chopillo" (Moratalla, Murcia) is a typical example of the lack of control over unauthorized water abstraction in the Segura basin, and of the links between illegal water use and illegal land use.

In 1994, this property and some others in the area burnt in what was the worst forest fire in Spanish history (more than 30,000 ha burnt). A few months later, the owners received grants from the EU and the Autonomous Community for reforestation. However, according to investigation, the property was never reforested. The grants were used for the land to be transformed into irrigated farmland, while 'there had never been any agricultural activity in it' (a necessary condition for obtaining those subsidies). Afterwards, the same property received grants for the modernization of irrigation farms.

The presumed fraud, which could exceed 3 millions euro, is being carried out in Madrid as the money comes from European Funds and so far, neither the Murcia courts nor the Regional Government had taken appropriate action, although there were numerous accusations (almost a hundred from the Civil Guard alone).

The Public Prosecutor points out that 'in these files is the irrefutable evidence that behind the falsehood of the allegations was the complicity or knowledge of members of the public administrations', and explains that, according to the documents, 'the involvement of civil servants and authorities' in this case 'was not unconnected with the personal profit of the beneficiaries, something that completely deviates from the usual parameters of processing applications.' [33]

Excessive water extractions are causing the gradual disappearance of sources and springs, such as those of El Chopillo, Architana and Guarunos, among others, with ensuing damage to the environment and to the historic rights of the small traditional irrigation farms associated to these sources.

7.3 Overexploitation in the Upper Guadiana

Water use in the Upper Guadiana Basin is another example of how the Hydraulic Administration's inability to control illegal water uses, in addition to agricultural policies that have encouraged massive transformation from dryland farming, can lead to totally unsustainable situations, both environmentally and socially.

In the Upper Guadiana Basin the so-called Aquifer 23 is located, which was declared as overexploited in 1987 (provisionally) and 1995 (definitively). This declaration was due to the fact that the water abstracted each year greatly exceeds the volume reaching the aquifer from seeped rainwater, so the water level is gradually going down, which will eventually lead to the total depletion of groundwater resources.

Overexploitation originated during the transition period of the 1985 Water Law, a time when the River Basin Authority received and authorized concessions for volumes that did not correspond with real availability and that greatly exceeded the aquifer's recharge capacity. The situation has worsened considerably with the drilling of thousands of illegal wells: 22,000 unauthorized

[32] La Opinión. 22 de marzo de 2004.
[33] Extracted from WWF/Adena (2003). Desarrollo en la aridez -La incompatibilidad del trasvase del Ebro con el desarrollo sostenible en el Levante. www.wwf.es.

abstractions, in contrast to 16,000 legal ones, according to the Guadiana River Basin Authority[34].

Irrigated crops have increased in parallel with the uncontrolled illegal exploitation of aquifers. Among these are irrigated crops that received large EU subsidies (eg. beetroot, maize, alfalfa), highly profitable crops (melons, garlic, onions) and irrigated vineyards – even though this has traditionally been a dryland crop. Moreover, the Junta de Comunidades de Castilla-La Mancha (regional government) subsidizes transformations from traditional dryland vineyards to irrigated ones, because the yields and the quality of the grapes are better, and maintenance and harvesting are quicker. However, this has involved, in many cases, drilling wells without authorization.

According to the Guadiana River Basin Authority[35], this situation is out of control: not only are new wells drilled in properties without a water licence, but also the vast majority of the authorized users are deepening their wells in order to obtain the water from increasingly deeper levels. At present, there are about 4,000 fining proceedings started for illegal use of water in the Upper Guadiana, and out of these, 2,700 have a legal ruling calling for their closure. However, political and social pressure have led to an apparent 'moratorium' in the enforcement of these rulings.

Overexploitation affects legal users, as a large number of wells have run dry or only contain water whose salts content is so high that it cannot be used for irrigation. Moreover it has also had devastating effects on the wetlands that are fed by groundwater from Aquifer 23. For example, in the Daimiel enclave, originally formed by 13 wetlands, 80% of the area they used to cover has been lost and the Tablas de Daimiel National Park, a wetland of international relevance, only survives because of the contributions of the river Cigüela during wet years and the flows which are artificially diverted from the Tagus-Segura aqueduct in some dry years[36].

So far, the Administration's attempts to revert the downward trend of the groundwater level have failed. Neither the control over the type of exploitation –which limits the volume each licence holder can extract from the aquifer- nor subsidies for the abandonment of irrigation have had significant, long-lasting effects. Since 2000 the Ministry for the Environment has been promoting the so-called Upper Guadiana Special Plan (*Plan Especial del Alto Guadiana* – PEAG), with the objective of finding an agreed solution to the problem of the aquifer's severe overexploitation and the associated environmental and social problems. However, although different affected parties have been discussing the 'Plan' for years, no agreement has been reached so far that would allow its approval and implementation.

7.4 Strawberry and rice cultivation in Doñana

Illegal water use also affects the area neighbouring the Doñana National Park (Guadalquivir Rive Basin), especially in the rice-growing area of Los Hatos, north of the marsh and at the headwater of the Rocina stream, west of the park, where the strawberry fields are concentrated.

In the Hatos area, 12 hm^3/year of groundwater are abstracted illegally, mainly to irrigate the rice, which causes important depletion in the Doñana aquifer, apart from the fact that this activity contributes to the Spanish Government being penalized for exceeding the rice quotas established by the European Union. The Guadalquivir River Basin Authority has been initiating

[34] Confederación Hidrográfica del Guadiana (2005. Plan del Alto Guadiana del Alto Guadina (PEAG). Borrador Documento de Directrices 4.07.2005. p.42.
[35] Source: conversation with officials of the Guadiana River Basin.
[36] A. De la Hera (2003). Caracterización de los humedales en la cuenca alta del Guadiana. In Conflictos entre el desarrollo de las aguas subterráneas y la conservación de los humedales: la cuenca alta del Guadiana. C. Coleto et al. Editores. Fundación Marcelino Botín.

disciplinary proceedings in the area since 1990, but it was not until December 2005 that some wells – eight in total – were actually closed. In some cases, the River Authority has needed help from the Civil Guard or warrants to close wells.

As regards the area surrounding the Rocina stream, the River Basin Authority reckons that 50% of the strawberry fields are using illegal water: in some cases the farmer has no water abstraction licence; in others, their application is being dealt with; and, in a large number of cases, the volume of water extracted greatly exceeds the amount that is or could be allowed.

As a consequence of illegal water abstraction, the Doñana Aquifer is overexploited in several areas. The Guadalquivir River Basin Authority has detected decreases in the piezometric level in 86% of the sampling points, with increasingly lower values, even after several wet years; these controls have also found alarming decreases in the groundwater level north of El Rocío (of up to 12 metres) and south of Villamanrique (between 8 and 16 metres).

These water table drops have had a direct effect on the natural values in La Vera, La Rocina and the coast, as some temporary pools in these areas have disappeared, and the ecosystems that depend on the aquifer are changing considerably. The Rocina stream, currently one of the main water suppliers to the Doñana marsh during the summer, has had its water supply from the aquifer reduced by 50% in the last 30 years. As a consequence, its riparian forest is changing, which will modify the habitat of plants, fish and molluscs living in the stream.