

WATER ALLOCATION SYSTEM IN SOUTHERN FRANCE

Past experience and current challenges

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EXECUTIVE SUMMARY

While environmental aspects and abstractions control are drawing all attention in the beginning of the XXIth century, last century particularly in South France witnessed the emergence of bold infrastructures with permanent vocation intended at multi-use development. Meanwhile French water policy, in accordance with EU orientations, guided Water Agencies' financial intervention towards quality aspects and pollution control, supporting sanitation and treatment disposals rather than resource development infrastructures, which were mainly supported at that time by Ministries (mainly agriculture and industry).

However, the repeated droughts in the early 21st century showed the growing risks of conflicting uses of water, especially in the context of climate change. New attention is now paid at national level to water allocation and to the feedback of relevant practitioners. This report is based on testimonies of water managers in charge of water allocation at complementary levels in structural imbalanced Mediterranean water Basins.

The French legal and institutional framework is the result of a continuous process of supplementation and modernization starting with the 1st water law in 1964. Current water policy definition and implementation is built on a clear distribution of responsibilities between three categories of stakeholders :

- The Ministry in charge of water and the decentralised administration are responsible for coordination, regulation, control, delivery of water permits and public information.
- Six water agencies, public institutions under the double supervision of the Ministry in charge of water and the Ministry of Finance, are entrusted with financial and technical tasks consisting in collecting fees from water users and redistributing them to projects enabling to reach good water status. Water agencies are executive organisations, implementing the Basin Committee decisions, in charge of strategic programming.
- Project's owners : they are in charge of building, operating and maintaining networks and equipments. They perform rights and obligations of the owner.

Some principles prevail that determine the conditions for implementing water policy, namely: i) the State is the sole guarantor and arbiter of water rights, whatever the resource considered, as water is considered as an inalienable good, ii) participation of stakeholders is a prerequisite at national, basin and local levels, iii) polluters and users pay and water pays for water.

As regards quantitative water management, the 2006 law on Water and Aquatic Ecosystems is aiming at renewing the regulation with the progressive removal of annual abstraction authorizations and the greater involvement of farmers organisations in the water allocation process in water scarce areas.

Indeed, before the 2006 Water Act, the system was relying mainly upon the followings:

- All abstraction points are identified due to the authorization/declaration procedure;
- Water amounts abstracted are known thanks to water meters compulsory whatever the use since 1992;
- Compliance controls with regulations can lead to sanctions when infringements;
- Reduction or prevention of all abstraction can be ordered by the Prefect whenever needed.

But it revealed less and less satisfactory, as the system conceived for being reliable 8 years out of ten, started to face too frequent scarcity crises resulting in progressive restrictions in percentage of volumes, timing and/or discharge.

2006 water law innovation consisted in adjusting the water demand to the total resource available and to avoid crisis management. After defining water bodies concerned with regular water shortage or major risks, a maximum permissible volume, established by the local Water Commission, is distributed between the different sectors. This administrative act is attached to the beneficiary and is not transferrable, unless the administration is delivering a new permit. As regards irrigation, a multi-annual authorisation (15 years maximum) for a maximum amount of water is delivered by the prefect to a unique organism representing all irrigators. This collective organisation for irrigation management is responsible for sharing this volume yearly between all the irrigators (individuals and WUAs) based on criteria of their choice (including acceptance of new irrigators).

This collective system is promising, assuming the question of structures already in charge of irrigation networks, whose assets need perennial water allocation, can be overcome. In this context, the recent report Martin (2013) emphasizes the interest for additional storage capacities enabling to reconcile environmental, economic and social needs. But the public financial capacities for such investment, even with the notable efforts of the Adour Garonne water agency detailed here, is way too little...

The historical perspective of the Durance-Verdon water system, with its continuous process, until now, of governance where the agriculture-energy nexus led to the development of multi use reservoirs and water transfers, is providing an insight on the need, when talking about water allocation, to talk about water services as well, whose relevant scale is no more necessarily the watershed, and which require coordination of sector policies and cost recovery.

At the local scale, WUAs represent a model to be preserved. Public Administrative Body established either at the initiative of owners concerned by their land development, or directly at the State initiative, these associations are given by law prerogative of public power, such as the recovery of contributions by the Treasury. All lands included in the area of the association benefit from water access rights, but are irrevocably compelled to contribute to the expenses of the association. Member land owners participate in all decisions, and in the case of the Gap canal WUA, once voted, allocation keys are applied with authority and the absence of any form of exemption makes any action legitimate for restriction of uses.

INTRODUCTION

While environmental aspects and abstractions control are drawing all attention in the beginning of the XXIth century, last century particularly in South France witnessed the emergence of bold infrastructures with permanent vocation intended at multi-use development. Meanwhile French water policy, in accordance with EU orientations, guided Water Agencies' financial intervention towards quality aspects and pollution control, supporting sanitation and treatment disposals rather than resource development infrastructures, which were mainly supported at that time by Ministries (mainly agriculture and industry).

This report is based on testimonies of several water managers in charge of water allocation at complementary levels in structural imbalanced Mediterranean water Basins where drinking water, agriculture, energy and tourism compete together and with the aquatic environment. Priority is given to quantitative water management, the quality aspects, not less important as regards public health and sustainability of natural resources, would need specific developments not targeted thereafter.

French history of access to water is long and as diversified as its territories. Basis date back the Romans, the XVIIIth century ended the private ownership of Lords on water canals, beginning of the XIXth century the civil code introduced the right of use for any type of water, whilst since the 1992 Water Act water is considered as an inalienable good, ie. the principle of no use unless certain conditions is prevailing now.

The way human organizations dealt with their system of constraints through recent time is of particular interest, as it is jeopardizing social acceptance, technological innovation and political responsibilities all together in large negotiation and adaptation mechanisms. This paper is discussing the way sovereign water management is being transferred at sub-level, how local water management is evolving in particular in the agriculture sector and underlying challenges ahead.

After a brief presentation of the national framework in charge of policy definition, coordination and assessment, with a focus on legal anchoring of water use, the text is developing on the water basin level, responsible for strategic planning, financing and effective water management implementation. At operational level water management does not fit well with the intervention of the administration during the irrigation season, therefore managers try to develop local arrangements with the local administration where they agree beforehand on the methodology and results, and take of the daily implementation.

Examples are taken from the Adour-Garonne and Rhone-Méditerranée-Corse basins where irrigation by water users associations led both to more diversified and higher added value agriculture improving significantly water efficiency, while not always leading to water abstraction reduction. Considered at one point as obsolete, these original collective structures have been reinforced by the 2004 modernization Act, and keep on demonstrating their solid role in the transmission of water management experience and know-how in scarcity situation. Focus is made on the Durance-Verdon water system, featuring a continuous process of governance where the agriculture-energy nexus led to the development of multi use reservoirs and water transfers between "pouring" basins that proved their relevance until now.

Keywords : quantitative management, water allocation, water-energy nexus, water users association, local governance, France

1. The legal and policy frameworks for French water management

1.1. Legislative basis through time

The 2006 French law on Water and Aquatic Ecosystems, on application of the 2000 EU Water Framework Directive (WFD)⁵, is moving a step forward as regards quantitative water management and the control of volumes abstracted. However it is the result of a continuous process of supplementation and modernization starting with the 1st water law in 1964.

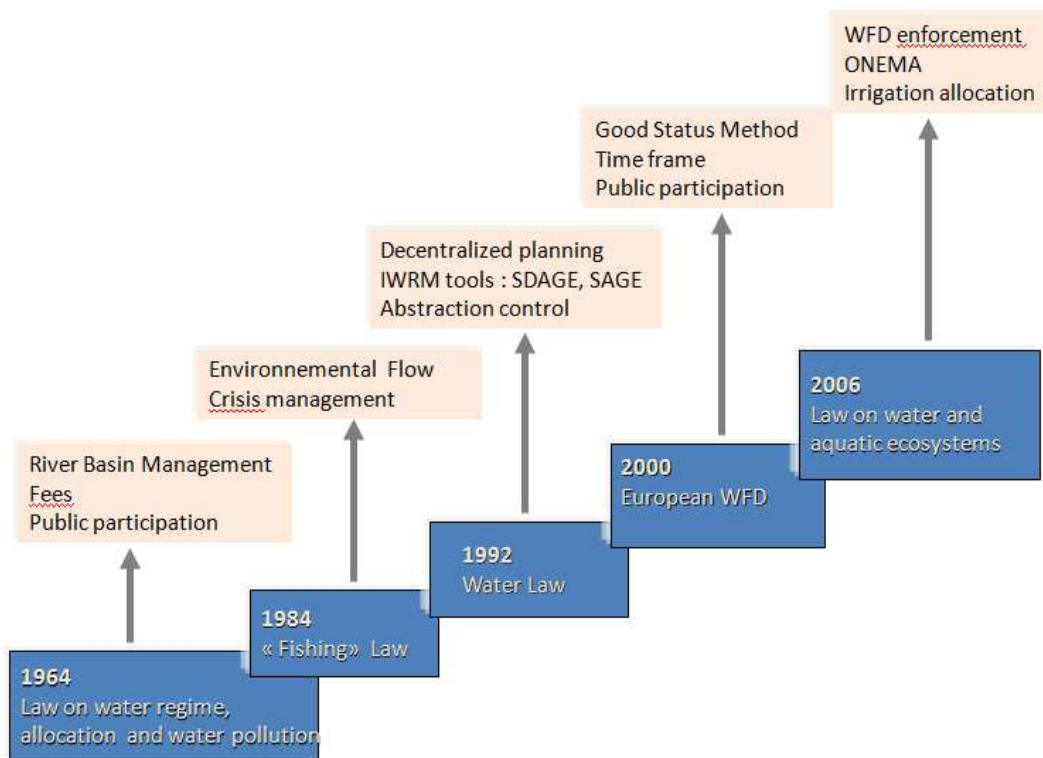


Figure 1: major steps in the French water policy recent legal frame

The Law of 16 December 1964 organized water management at the level of river basins. It states three essential principles, which are now recognized but were innovating at that time:

- decentralized management at the level of the large river basins,
- concerted management involving stakeholders,
- incentive financial tools.

For organizing dialogue and the sharing of responsibilities, an advisory body, the Basin Committee, and an executive organization (the Water Agency) were created in each large river basin.

⁵Water Framework Directive 2000/60/CE <http://ec.europa.eu/environment/water/water-framework/>

With the 29th June 1984 Law, taking into account the aquatic environment strongly progressed. It introduced the obligation of “environmental flow”, i.e. a flow considered as ecological minimal flow, which is imposed to any water diversion devices, thus particularly to the dam managers, in order to guarantee the functioning of the aquatic ecosystems.

The Law of 3 January 1992 laid down the principles of true integrated water management: patrimonial nature of water (water is the “common heritage of the Nation”), management balanced between the various water uses, overall management of all waters, conservation of aquatic ecosystems and wetlands, use of water as an economic resource, priority given to drinking water supply. This law developed planning instruments on a basin scale: the SDAGE (River Basin Master Plan) for large basins, the SAGE (Local Water Management Plan) for sub-basins.

The European Water Framework Directive (WFD) of 23 October 2000, establishing a framework for Community action in the field of water policy, gave overall consistency to a well developed European legislation (about thirty directives and regulations since the 1970s).

The Law on water and aquatic environments of 30 December 2006 renewed the whole water policy. Its objectives are to provide the means for achieving the goals of the WFD, to improve the conditions of access to water, to give more transparency to the operation of water utilities, and to renew the organization of fishing in freshwater. It reformed the financing system of the Water Agencies and created the National Agency for Water and Aquatic Environments (ONEMA).

As regards quantitative water management, the 2006 water law is aiming at renewing the regulation with the progressive removal of annual abstraction authorizations and the greater involvement of farmers organisations in the water allocation process for irrigators in water scarce areas.

1.2. Policy definition and coordination

The French system is built on a clear distribution of responsibilities between three categories of stakeholders. *The Ministry in charge of Ecology, sustainable development and energy*⁶ is responsible for water policy. It lays down and coordinates water policy, and operates the secretariat of the Inter-ministerial Mission for Water which gathers all the ministries concerned under the authority of the Prime Minister.

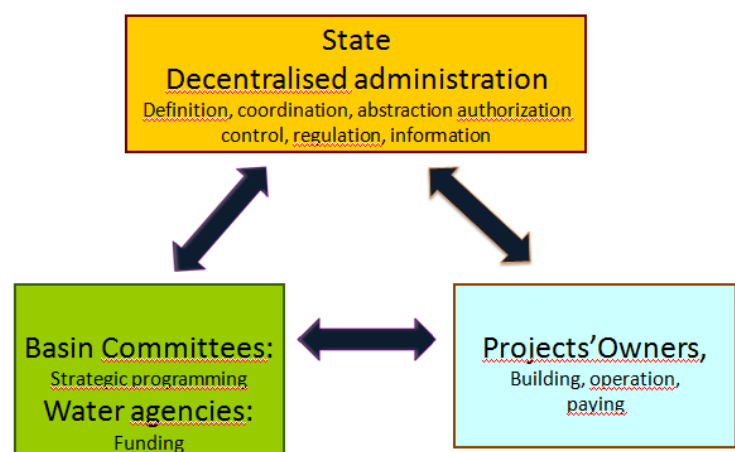


Figure 2: institutional organisation

⁶ <http://www.developpement-durable.gouv.fr/>

Decentralized services guarantying “vertical” integration are under Prefects’ authority, representing the State:

- at river basin level: the Basin Coordinator Prefect coordinates the actions of the various State services in the field of water;
- at sub-basin levels, the Water Inter-services Mission (MISE) is coordinating under Prefect’s authority.

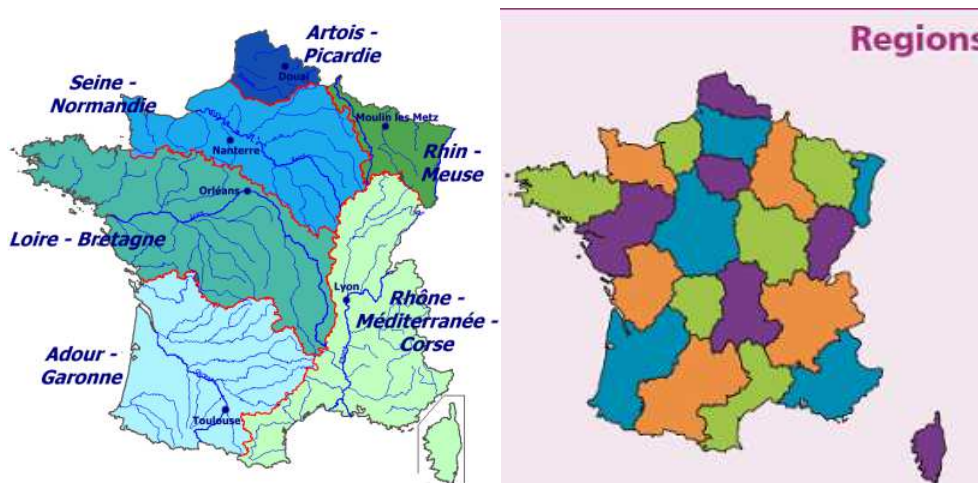


Figure 3: 6 Hydrographic units in metropol France

and 26 administrative regions

Six water agencies, public institutions under the double supervision of the Ministry for Sustainable Development and the Ministry of Finance, counting some 1,800 employees, are entrusted with financial and technical tasks consisting in collecting funds from water users and redistributing them to projects enabling to reach good water status. Water agencies are executive organisations, implementing the Basin Committee decisions transcribed into the objectives and provisions of the River Basins Master Plans.

The fees of the water agencies are environmental tax revenues levied on users (consumers and economic activities) in application of the principle of prevention and the principle of repairing damage to the environment. Thanks to these fees, the water agencies can provide financial support (subsidies and loans) to public and private who carry out river basin actions or projects, with the goal of achieving the balanced management of water resources.

90% of these fees are reallocated, while 10% are used to finance its internal technical and scientific expertise in support of the Basin Committee and for advising decentralised administration and project owners. Water Agencies therefore support the production of information related to the definition of initial states and pressures, so as prospective models and studies.

For the period 2007-2012, the total amount of payment credits came to 14 billion euros.

A Water Agency is not

- A state administration, it has no sovereign power to enforce water regulations, water use authorization or right violation punishment
- A project owner,
- in charge of operational water management ◊

Specific development or management responsibilities are entrusted to separate specialized institutions by the public Authorities. For example, most main watercourses and their uses are managed by territorial public institutions (EPTB). They act on behalf of local authorities for the management and enhancement of groundwater sources, rivers, and aquatic environments. They are the official actors for river basins and sub-basins' water policy implementation. Regional development societies (CACG, SCP, BRL), Electricity of France, local Authorities, Agriculture chambers, WUA, etc can also act as project owners, ie. they perform rights and obligations of the owner, on behalf of the conceding Authority, depending on the territorial scale and on the water uses concerned by the issue.

1.3. Some major principles and their consequences

1.3.1. Water is an inalienable good and its management must be balanced

In France, the State is the sole guarantor and arbiter of water rights, according to the basic principle recalled in the article 1 of the 2006 Water Act "in the frame of legal acts and regulations, so as rights acquired earlier, the use of water belongs to everyone and each individual, for his food and sanitation, has the right of access to drinking water in economically conditions acceptable for all".

In addition, Article L.211-1 of the code of the Environnement stipulates the obligation of balanced management under the control of the administrative judge. This cornerstone principle is implemented by the prefect, at first between economic uses and ecologic needs, and second between all water uses, some having priority, namely health and drinking water, then aquatic environments and economic activities.

According to the 1992 Water Act, water use - whatever the resource considered - is submitted to an authorization⁷ to divert or withdraw for purposes duly specified and approved by the State administration that may modify or suspend it and to which it may add specific requirements. The civil code is specifying some conditions of use for each type of resource (rain, source, underground, surface), which can be accompanied with obligations such as servitude or maintenance of river banks. However, with the recent permitting system introduction, all waters whatever their legal status is more subject to regulatory control and the distinction between private and public water is no more relevant.

Permitting system and enforcement activities

Facilities, infrastructures, work or activities, which can have an impact on health, safety, water resources and aquatic ecosystems, are regulated by a "water police". It covers two aspects: authorization procedure and control compliance with regulations.

All abstraction points (surface or groundwater) are at minimum subject to a declaration and require an authorization beyond 8 m³/h; the local administration under the Prefect authority is delivering these permits according to the characteristics of the project and the provisions of the legal documents on-force locally. When the water resource is a main stream or a transboundary

Water meters

- Abstraction devices must all be equipped with a counting system, allowing the control of measures anytime in accordance with the Article L214-8 of the code of the Environment
- Managers must keep registers and make them available to the administration for three years◇

⁷ in the form of an administrative authorization or a concession contract

course, the regional administration under the Basin Prefect may be concerned. This administrative act is attached to the beneficiary and is not transferrable, unless the administration is delivering a new permit. It is valid until the installation is modified or in case of a water limitation notification.

The 2006 law on Water and Aquatic Ecosystems is renewing part of the regulation with the delivery of a multi-annual authorisation delivered by the prefect to a unique organism representing all irrigators and in charge of sharing this volume yearly between all the irrigators. It is developed in part 2.3.

The State entrusts part of its water policing responsibilities to ONEMA whose local teams control the compliance with regulations and note infringements. Field inspections concern hydroelectric installations as well and may result in citations and numerous injunctions ordering owners to ensure ecological continuity.

The special case of title based rights

Administratively, the title based rights are specific rights for water use, exempt from any administrative authorization or renewal procedure. The structures benefiting from these rights are called "title based structures". These water rights derive their "perpetual" nature from the fact that they were issued prior to the establishment of the principle of authorization of these structures on given rivers, i.e.:

- On State-owned rivers⁸, they are titles by alienation prior to the "Moulins Edicts" before May 1566, a royal edict that for the first time gave inalienable rights to crown lands (today "public domain") which included navigable or floatable waterways. Therefore, this inalienability implied the need to obtain an "authorization" establishing a "right" to install a water intake, a mill, etc., on these rivers. The edict recognized the rights previously acquired by exempting them from authorization.
- On non State-owned rivers, they are rights for mills, ponds, irrigation, issued under the feudal system by the lords before the revolution, and that the night of 4 August 1789 did not abolish or buy back from the lords. The idea was not to deprive of flour and therefore of bread the people in these troubled times. In general, they concern water intakes established or presumed established under an emphyteotic lease⁹ prior to the abolition of feudalism, or based on a sale of national assets with transfer of perpetual rights for use.

The title based structures are covered by a perpetual right, which does not exclude any additional provision that may be established by Prefect Order¹⁰. Today, Article L. 214-6 of the Environmental Code, modified by the simplification order of 18 July 2005, assimilates them to authorized or declared structures according to water policing.

These already existing rights allow those who are holders to bypass establishing documents for an authorization from State services for the diversion and use of water. Their use can be considered, including in the context of restrictions. In other words, it may become possible to consider a use pursuant to an existing right rather than establishing a new authorization request. On a river under concession, the recognition of a title based right exempts the owner from paying the concession holder for production losses caused by this use.

⁸ State-owned rivers are navigable and floatable waterways, except particular administrative classification, which is precisely the case of the Durance (Cf §3).

⁹ Cession by the King to the Lords of tenure rights over non-navigable or non-floatable waterways.

¹⁰ Circular on the implementation of the State action plan for recovery of ecological continuity of 25 January 2010, Annex II circ. 25-01-10 legal sheets

Is there a "market" for water use rights?

The right to use water only makes sense if investments accompany this right to give it added value. The development of water resources involves heavy investments and their vocation of sustainability, maintenance and continuous rehabilitation. In addition, this "raw material" that is water has a very low unit cost, that despite the need to mobilize large volumes, is comparatively much less than the cost of displacing populations.

There is a market for the rights to use water or "water rights". It was created because of the interest that the buyer and seller could have in this type transaction. To a certain extent, the water markets have also been settled by the legislator and the case law merely providing a framework for rights assignment's conditions. However, this market does not make the resource "mobile" and it remains connected to the categories of immovable properties.

Thus the title based right can be sold outside the selling of the mill or of immovable properties to which it is attached and which initially allowed their exploitation. Therefore, the use of these rights is somewhat flexible because they can be "separated from the immovable property to which they were attached," but also to some extent because they can be moved on the river, combined between them, combined with a new authorization, etc. It is interesting to note the renewed interest, the stakes and finally the multiplicity of appeals made in the past fifteen years in order to, for some people, have these water rights recognized and, for others, to obtain their cancellation, this often up to the Supreme Administrative Court of the State Council.

Water right acquisitions can be initiated differently. For example, an institution holding a right for water entering the area of a concession, of a Union or another users association, of a regional development company, induces a transfer of the right to water access. In addition to direct development of the resource, holding a water right can allow its owner to present himself as a priority stakeholder for a new use that would emerge in a given territory. Similarly, if new water needs are authorized and affect the earlier right, the right holder may legitimately ask for compensation¹¹.

The subsidiary question that may arise is "Who" makes use of the possibilities of acquiring the right to use water? In fact, they are essentially private law operators (investors) who have knowledge of the texts and make use of them. Transfers of ownership of water rights are mostly from "public to private", in the limit of concession contracts which goods at the end return to the Public Authority. The Ventavon canal developed hereafter illustrates the case of an acquisition of a private water right of 1000 l/s in maximum immediate flow and of 31 million cubic per year by a public body.

The status of reservoirs and hydraulic works

According to the Environmental code (R.214-1), the authorization system applies as well to reservoirs storage over 200 000 m³. Their construction usually benefits from public subsidies and requires preliminary environment impact studies.

In general, hydraulic works belong to the public patrimony of the State, regions or departments (for major ones), of urban communities (municipalities or inter-communal groups) for drinking water and sanitation distribution networks, or of users associations having the status of public institution. All these public

¹¹ Principle of compensatory measures to be proposed as part of the documents to obtain Declarations of Public Utility

Authorities have the ability to entrust the achievement and the management of this heritage, through concession, leasing or service contracts, to delegates under private law¹².

1.3.2. The involvement of stakeholders in water management

The main purpose of public participation is to improve decision-making, by ensuring that decisions are soundly based on shared knowledge, experiences and scientific evidence, that decisions are influenced by the views and experience of those affected by them, that innovative and creative options are considered and that new arrangements are workable, and acceptable to the public.¹³

The principle of public participation is dating back the 1964 Water Act with the creation of The National Water Committee, the establishment of an advisory body in each hydrographic basin¹⁴, the Basin Committee, and an executive organization, the Water Agency.

The National Water Committee is chaired by a Member of Parliament nominated by the Prime Minister. It is consulted on the orientations of the national water policy. It gives advice on the draft legal texts (laws, decrees), on reforms and draft governmental action plans.

The 2006 water law, following the WFD 2000, reinforced the participation of stakeholders by increasing the stakeholders proportions in the decision making bodies at national and district levels. The number of the National Water Committee members was increased: new ministries became members and the representation of some categories of users was increased. The public may also influence important projects through the Public Enquiries procedures.

National Water Committee Composition

- - Water director from the Ministry of Environment (which ensure the Secretariat)
- - Representatives from other ministries
- - Director from water agencies
- - Representatives of local administration
- - National representatives of water users
- - Expert in the water sector designated by the Ministry of Ecology on proposition of interested ministries ◇

The Water Framework Directive is a milestone for participation. The key public participation provision of the Directive is article 14. According to Annex VII, the river basin management plan should tell where and how background information can be obtained. This plan should moreover summarise the public participation measures taken and should evaluate their results and the impact on the plan.

The Member States have to encourage active involvement and ensure consultation and access to background information. For every phase of the project the role of the different stakeholders should be reviewed. Annex I of the EU guidance document on public participation in relation to the WFD presents a technique for selecting the relevant stakeholders with a so-called stakeholder analysis.

France was the first Members State to implement National Water consultation from 2005 following the state of the art in each hydrographic district. The results of this consultation showed public joining the process. A second consultation took place in 2008 after the achievement of management plans and programs of measures. Consultations were organised by Basin Committees and State administrations. Significant communication campaigns were organised and all planning documents available to public comments at

¹² There are a few scarce examples of private ownership such as the Canal of la Brillane for irrigation in the Val de Durance.

¹³ Cf. Guidance on public participation in relation to the WFD, Final version, Dec. 2002.

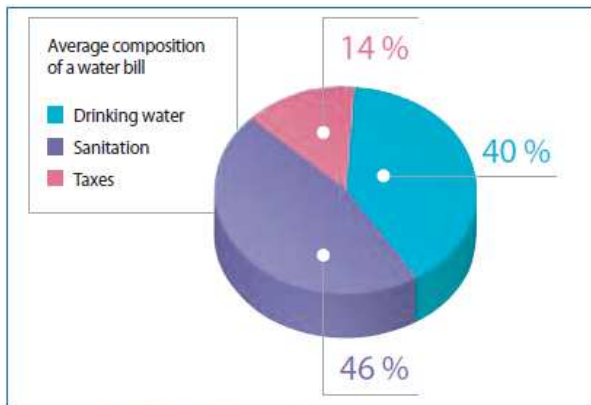
¹⁴ The 6 main hydrographic basins correspond to District definition according to the WFD 2000.

prefectures, Water Agencies headquarters and websites during 6 months. A Commission including stakeholders representatives was in charge of following the process.

1.3.3. « polluter pays », “user pays”, « water pays water »

The total cost for water uses encompasses water services and general interest programs for qualitative and quantitative water resources amelioration. In France, the cost of water services must be entirely supported by the users' water invoice. In addition, water services have the obligation to be financially balanced.

Fees that nourish the budget of the Water Agencies cover only one part of this cost. They are based on the consumption measured by water meters at the abstraction points. These fees represent for example 15% of the users' water and sanitation invoice, the rest being intended at investment, operation and maintenance of networks expenses. These taxes (Cf. Fig. 4) are based on the application of the “polluter-pays” and “user-pays” principles. They are assigned to water: not only are they levied on activities having an impact on water resources, but also the product of these taxes is allocated to actions for water resources conservation. It is the “water pays for water” principle. Studies and expertise ahead of these projects are also supported, in particular the definition of minimal natural discharge and permissible volumes, or the development of management tools.



Source : IFEN, March 2007

7 different taxes

According to the user's pressure on the water resource, water Agencies levy :

- water pollution tax,
- tax for modernization of the wastewater drainage systems,
- tax on non-point agricultural pollution,
- water abstraction tax,
- tax for water storage in low flow periods,
- tax on obstacle on rivers,
- tax for the protection of aquatic environments◇

Figure 4: average composition of a water bill

and types of taxes according to users activities

The aim of these taxes is to integrate environmental costs, with an incentive for water users to reduce their emission of pollutants and/or to reduce their consumption. The tax rate is modulated according to the uses and the fragility of the environment. It is defined by each basin committee, according to the national framework set by the government.

2. Mechanisms for planning and allocating water at Basin level: the Adour Garonne experience.

2.1. *The Adour Garonne River Basin brief characterization*

The Adour-Garonne river basin is one of the six river basins delimited in mainland. The basin is divided into five sub-basins (Charente, Dordogne, Garonne, Adour, and coastal rivers) as illustrated in Figure. It represents 120 000 km of watercourses and 7 million inhabitants living in the area, though unequally spread, with 35 cities gathering 28% of the population.

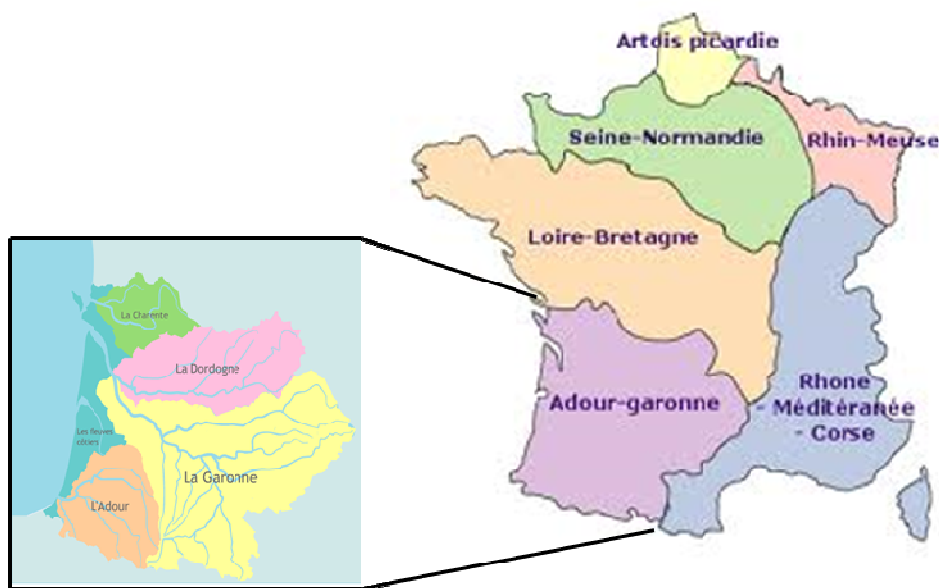


Figure 5: French river basins and sub-basin for the Adour-Garonne river basin

France and in particular the Adour-Garonne river basin, faces increasing water scarcity issues every year. In the Adour-Garonne river basin, 1,9 million ha are cultivated, and 580 000 ha are irrigated. More than two third of the area is cultivated with maize, the rest being planted with vegetables, fruits, seeds, tobacco, etc. The yearly water consumption in the river basin varies between 650 million m³ and 1 200 million m³. Irrigated crops on the Adour-Garonne river basin represent a gross margin of 780 million EUR, to put in perspective with 430 million EUR for non-irrigated crops.

Water abstracted for irrigation has different sources: 41% comes from surface water, 7% from captive aquifer, 35% from water table/groundwater, and 17% from retained water but with an important heterogeneity depending on the areas on the river basin. In 70% of the cases, water is abstracted directly by farmers themselves, except when collective structures are set up.

Concerning trends for irrigation, irrigated surfaces have developed widely during thirty years but decreased recently because of climatic, economic, regulatory and societal contexts. Eventhough, the water deficit in relation to surface runoff is on average about 150 hm³/year, this ratio being relatively stable over time.

		Agriculture general census	Provisional	Evolution
		2000	2007	2007/2003
Numbers of farms	nb	60 244	47 580	88%
Mean arable area	ha	39	49	
Arable area	ha	2 361 914	2 325 783	99%
Irrigated area	ha	269 258	245 000	86%

Figure 6: Evolution of irrigated surfaces from 2000 to 2007 in Adour-Garonne Basin (CACG, 2009)

The Adour-Garonne Water Agency recently decided to reinforce the measures targeted at reducing the impact of agriculture, in order to achieve the good ecological status of water bodies as stated by the WFD.

2.2. Local governance structures and IWRM tools

As in each water agency, water planning is articulated at three different territorial scales:

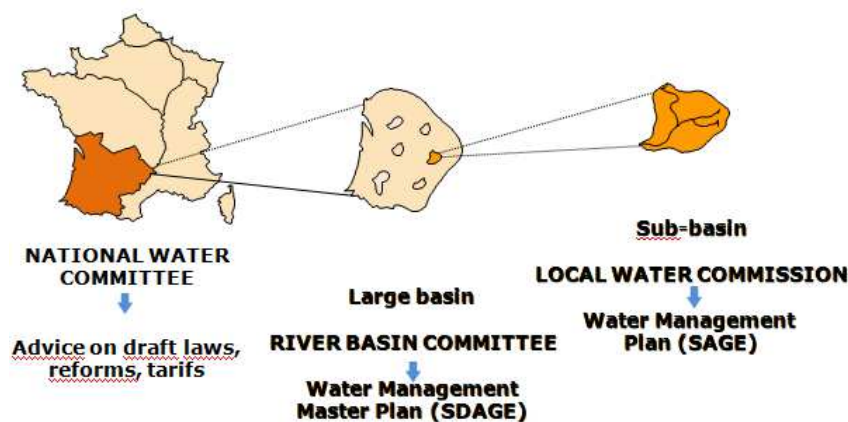


Figure 7 : water planning at three territorial levels

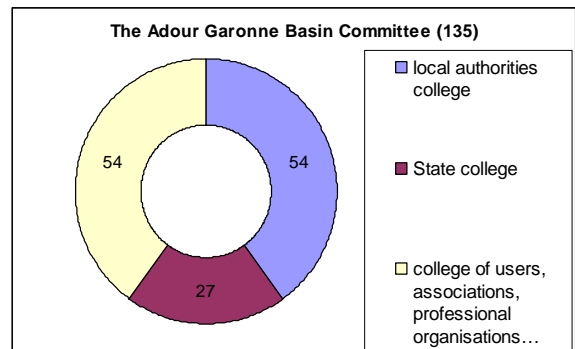
2.2.1. The Basin Committee

The basin committee¹⁵ is a deliberative body that gathers all the stakeholders (local governments, manufacturers, farmers, the State, consumers, NGOs etc.) from the river basin district. It determines the strategy for managing the water and the aquatic environments of the basin. It votes on the water agency's programme and the rate of fees, within the limit of the rates set by law.

¹⁵ The 2006 Water Act modified the composition of the Basin Committee so that the State college is reduced in proportion.

The Basin Committee arbitrates water conflicts, decides on the taxes to be paid by the users and defines action programmes. Each Basin Committee created a Planning Commission and several Geographic Commissions (implanted at a more local level) in which a number of debates and meetings take place.

For each of the main river basins, a 5-year River Basin Master Plan is produced since the 1992 French Water Act, called SDAGE. The Basin Committee is preparing it, which is then approved by the government.



2.2.2. The River Basin Master Plan (SDAGE)

The SDAGE is the planning document: it gives the overall orientations of water management in the basin and the objectives to be reached, the delay and the priorities in the actions to be developed. **It is also a legal framework for public policies: any administrative decision impacting the water resources (local regulations, programs for financial assistance, urban planning documents, large infrastructure...) must be compatible or be made compatible with the SDAGE.** The state of the art of the SDAGE is characterizing all water uses and water masses (coastal, surface, canals, groundwater...) from the qualitative and quantitative points of view. It is in particular identifying water bodies with quantitative structural imbalance.

Stations de mesures de la qualité		Etat écologique						Etat chimique					
Code et nom station	Prog. surv.	2007	2008	2009	2010	2011	2012	2007	2008	2009	2010	2011	2012
06177925 CANAL DU MIDI A VILLEPINTE	Oui	BE	MOY	MOY	MOY	MOY	MOY			BE	BE	BE	
06178500 CANAL DU MIDI A TREBES	Non			BE									
06180850 CANAL DU MIDI A ST-NAZAIRE-D'AUDE	Oui		MOY	MED	MED	MED	MOY			BE	BE	BE	
06180860 CANAL DU MIDI A MARSEILLETTE	Oui		MOY	MOY	MOY	MOY	MOY			BE	BE	BE	
06180880 CANAL DU MIDI A LABASTIDE-D'ANJOU	Oui		BE	MOY	MED	MED	MOY			BE	BE	BE	
06181020 CANAL DU MIDI A HOMPS	Non			BE									
06185500 CANAL DU MIDI A BEZIERS	Oui		MOY	MED	MED	MAUV	MED			BE	BE	BE	
06188930 CANAL DU MIDI A AGDE 2	Non		MED	MED									

Figure 8: Example of results of water state according to canal water mass monitoring network

In accordance with the WFD, the SDAGE¹⁶ is now accompanied by a Program of Measures which distributes the means (regulatory, financial) and the actions (water policing, infrastructures, communication, awareness campaigns, education, pilot projects, contracts, studies, experience sharing...) allowing achieving the objectives of good water status in 2015 required by the WFD. It gives provisions for new water storage capacities, prevention of water pollution, new abstraction authorizations, extension of monitoring networks, etc for all water masses.

The reduction of quantitative imbalance is a priority objective of the next Program of Measures, and **studies for estimating the maximum permissible volume** must provide the elements to allow for new permits to take

16 <http://www.eau-adour-garonne.fr/fr/quelle-politique-de-l-eau-en-adour-garonne/un-cadre-le-sdage.html>

water from rivers or groundwater concerned, in accordance with available resources and without disrupting minimum low water flows. This volume, determined in function of statistical availability of water resources for the next 10 years, is taken with care and each Basin Committee is examining the methodology to be adopted in sub-basins. Most studies are carried out by local projects owners for a 2 years average duration. The reference to standard specifications is a condition for financing by the water agency. Each study for estimating the maximum permissible volume must notably:

- quantify the resources available and the impact of the abstractions;
- determine quantitative targets such as the minimal ecologic discharge for surface water and groundwater objectives¹⁷;
- determine the maximum permissible volumes and the low flow rates objectives;
- propose reallocation of volumes between uses in unbalanced water bodies through a flexibility analysis of possible use reduction or eventually the creation of substitution resource;
- propose areas where one single organisation is required for irrigation authorisation.

The minimal ecologic discharge for surface water

The 2006 water Act establishes the enhancement of natural discharge from 1/20th to a minimum of 1/10th of the module (inter-annual average discharge) from January 2014, in order to guaranty life circulation and reproduction of aquatic life, except for rivers which module is over 80m³/s and for hydropowers contributing to peak consumption production.

The Basin Committee is establishing minimal ecological discharge. ◇

The max permissible volume value is used by the prefects to deliver the permits/authorizations for water withdrawals (see below).

2.2.3. The local Water Commission (CLE)

On priority sub-basins identified in the SDAGE, a local Water Commission (CLE) can be established on a voluntary basis for 6 years, in order to design a specific local pluriannual plan addressing specific issues in the sub-basin. Its size is depending on the scope, issues, etc. Representation of local Authorities is stronger than at the basin level as it is representing half of it, while users and State representatives are counting for a quarter each. The principle of one representative-one voice leads to numerous assembly (up to 50 members or more) where decision making may be difficult. However it is the place where all the recommendations of the SDAGE will be refined and where projects owners will be designated.

2.2.4. The Local Water Management plan (SAGE)

The Local Water Commission is in charge of preparing the local water management plan (SAGE), **It is a planning document which has an administrative and legal status. This legal status does not only concern the administration but also private individuals.** When the SAGE is approved, the decisions made in the field of water by the administrative authorities in the area concerned must be compatible, or made compatible, with the SAGE.

¹⁷ The 21 october 2009 circular on the implementation of the minimal discharge increasing for existing infrastructure from January 2014

A SAGE must include :

- The Sustainable Management Plan : State of the art, Objectives, Provision (orientation, action plan, knowledge, communication) and Means;
- Settlement :procedures to reach the objectives, **including the estimation of the maximum annual permissible volume** by the CLE;
- Visuals representing information produced through the monitoring programs and devices, scientific studies and reports, on GIS system accessible to the public. ¹⁸

2.2.5. Other IWRM Tools at local level

Several other tools can be used in complement or instead of local water management plans depending on the local situation and the time when the problem was raised. For example, low water management plan (PGE) is an agreement between the stakeholders (State, farmers, water agency, associations, other users), at the scale of the sub-basin. It determines objectives in terms of water quantity management during periods of low water. The PGE is a tool introduced by the SDAGE and defines rules to share water between users. After a state of the art, an objective of flow rate is determined, called low water discharge. Multiple responses may allow to reach this objective, including water savings in agriculture. PGE can be considered as the quantitative component of a SAGE.

For example, the PGE Garonne-Ariège's objective for agriculture is to set a collective management, including counting, negotiated pricing, capped authorised volumes. The objective is to reduce by 25% the use of water in agriculture during dry years. The PGE Garonne-Ariège is managed and implemented by the EPTB Garonne and it was validated by the government (through the department prefect) on February 2004. It is at the moment being reviewed, with a collective elaboration of the new PGE protocol.

The PGE's implementation was articulated in 2 phases: the first one has begun since the government validation in 2004 and involves five major principles, required and priority:

- Respect of fixed low water discharge on all tributaries
- Priority to struggle water wasting and make effective water savings
- Satisfaction on the volumes of water allocated to irrigation
- The implementation of a collective management of withdrawals
- The progressive pricing of water withdrawn by users

The second phase of the PGE's implementation was relative to the mobilisation of the water resource, thanks to resources already existing (mainly hydroelectric) or the creation of new resources (i.e. reservoirs). Measures proposed for agriculture in the PGE of sub-basins in the Adour-Garonne, in most cases, do not provide much details on their implementation, without any timeframe or quantitative objectives other than the flow rates.

Contractual steps may also be taken to plan and finance actions: should they concern a river, an aquifer or a bay, they are called "river contracts", "aquifer contracts" or "bay contracts".

¹⁸ Cf www.eaufrance.fr the national water information system

2.3. Water allocation rules and procedures

2.3.1. From abnormal crisis management...

Before the 2006 Water Act, the quantitative water management was relying mainly upon the followings:

- All abstraction points are identified due to the authorization/declaration procedure;
- Water amounts abstracted are known thanks to water meters compulsory since 1992;
- Compliance controls with regulations lead to reports and sanctions when infringements, penal sanctions by the judge for serious cases;
- Reduction or prevention of all abstraction can be ordered by the Prefect in case of exceptional scarcity situations.

But it revealed less and less satisfactory, as the system conceived for being reliable 8 years out of ten, was facing too frequent **scarcity crises**. Water management schemes allocate water according to priority uses¹⁹ and progressive restrictions in percentage of volumes, timing or discharge. They include alert and crisis thresholds according to which regulatory limitations are taken by the Prefect, for example :

- Level 1: limited measures, restricting water abstraction 1 day per week or less or to 15% of water volumes on at least one river basin.
- Level 2: stronger measure, restricting water abstraction 1 to 5 days per week.
- Level 3: very strong measures, restricting water abstraction 5 days or forbidding abstraction.

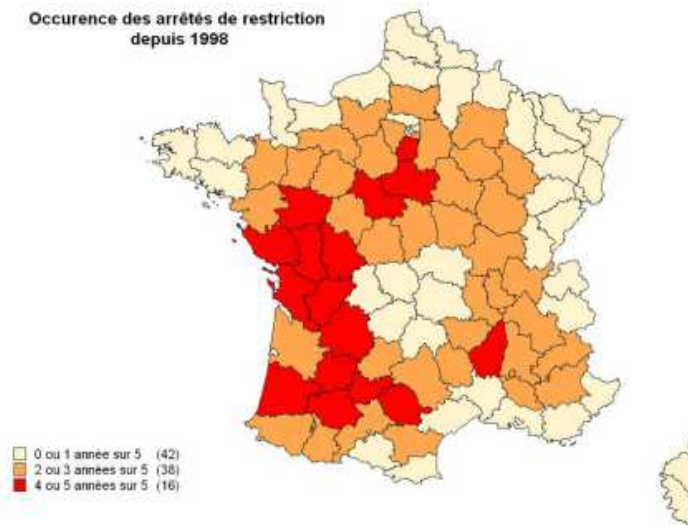


Figure 9: frequency of administrative limitation due to water scarcity since 1998

In 2011, 71 departments were affected by at least one regulatory limitation of water use, 20 of them being in the Adour-Garonne river basin. The level 3 of limitation affected river basins in 11 departments. For example, in the department of Gers, 4 regulatory limitations were in force at that date, two of them until the end of August, and the others until October. All water withdrawals for irrigation were prohibited except for drinking water production, fire fighting and water for livestock in case of rivers that are not fed by dams upstream.

¹⁹ Reminder: Art L211-1 of the environment code gives priority to health and drinking water, aquatic environments and economic activities.

This crisis management indexed on surface water discharge led to the development of individual irrigation from groundwater and pumping overcapacities to offset hours reduction.

During the 90's voluntary initiatives emerged for preventing regulatory limitations, and their harmful effects on agricultural production, to happen, such as irrigation scheduling advices, organisation of water turn amongst farmers, a mix of individual and collective responses. The Irri-mieux initiative was launched in 1997-1998 to promote a better dialog between farmers and other users on the implementation of water sharing. Measures were related to volumetric management of groundwater, irrigation scheduling, technological equipment, collective decision process and conflicts resolutions. The results enabled more efficient water sharing mechanisms, but not necessarily reduction of the abstracted volumes and consequently no evidence of water and aquatic life preservation.

2.3.2. ...To collective water savings management: the reform

The 2006 water law modified the allocation process in water bodies with quantitative structural imbalance identified in the SDAGE. **The purpose is to adjust the water demand to the total resource available and to avoid crisis management.**

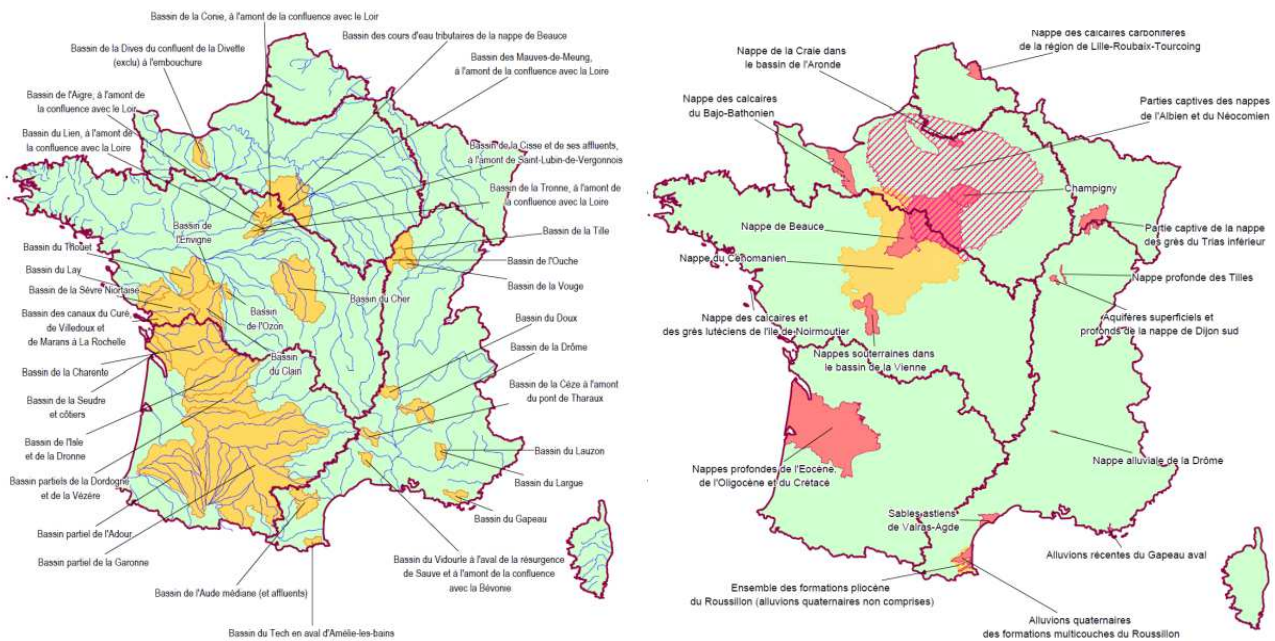


Figure 10: Water Allocation Areas for surface and groundwaters - June 2012 (Source Martin 2013)

After defining the limits of the area concerned with regular water shortage or major risks, a maximum permissible volume V_p , established by the local Water Commission²⁰, is then distributed between the different sectors. As regards irrigation, a multi-annual authorisation (15 years maximum) for a maximum amount of water is delivered by the prefect to a unique organism (UO) representing all irrigators. This collective organisation for irrigation management is responsible for sharing this volume yearly between the irrigators,

²⁰ or if it has not been created yet on the area by the Water agency

based on criteria of their choice (water quantity consumed the previous years, irrigation machinery, type of crop...).

The request from the UO for Vpi must include the allocation plan and an environmental impact study. The authorization to the OUGC specifies the total volume per type of water resource and per period so as the volumes reductions modalities according to the monitoring of water resources state indicators.

So far, 25 Unique Organisations have been designated, most of them are Agriculture Chambers, all the 10 UO in the Adour Garonne Basin were designated in 2013. The process has to go through a public enquiry inviting stakeholders to apply. The law provides financial incentives for irrigators joining the unique organisation.

Based on simulations, in the Adour Garonne Basin, the accumulated deficit in areas concerned with water shortage is 60 millions m³ compared to volumes abstracted during dry hydrological season one year out of five, ie 38 sub-basins out of 125, for 23 of them restrictions reach 30% minimum. The deficit reaches 220 million m³ compared to previous withdrawals permits. As a consequence, any irrigation increase is prohibited as long as the total volumes abstracted exceed the resources capacities. In addition, the individual authorization can be modified yearly at the beginning of the season according to the climatic conditions.

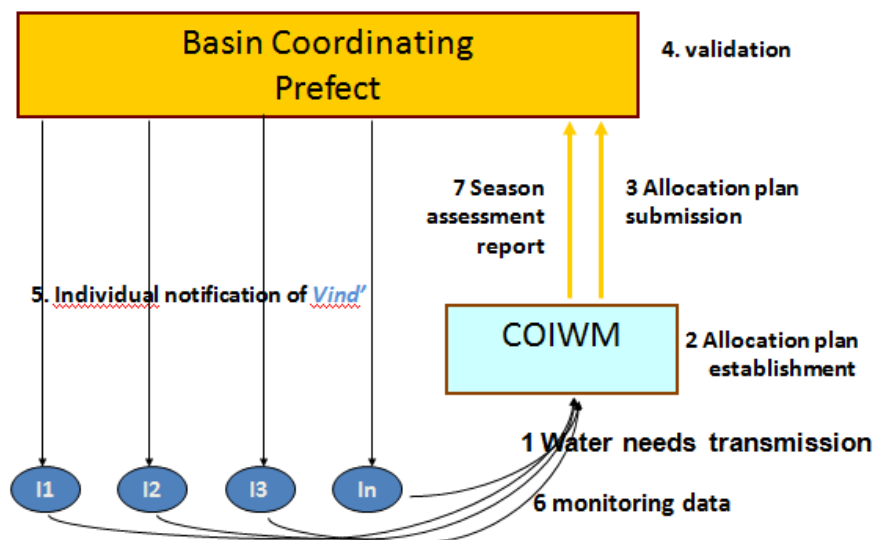


Figure 11: operational irrigation campaign in scarcity area (According to AG Figureau 2012)

Depending on the nature of the water resource (surface, underground, storage) and the size and the degree of artificialisation of the system, the operational management will be manual or based on decision making tools simulating pending water balance.

2.3.3. The cost of adaptation measures and issues to be achieved

The average added value of each irrigated m³ is estimated to 25c €/m³/year. On this basis, the global loss for the total gross margin in the Adour Garonne basin is approximating 15-35 million € per year in addition to social damage (unemployment). In order to facilitate the social acceptance of the reform, facilities are envisaged to ease the achievement and funding of additional storage identified through local consultation

process. Some of them could be included in the definitive permissible volume. As regards resource development, two measures are envisaged:

- the mobilisation of existing reservoirs, mainly targeted at electricity production, to release additional volumes without affecting minimal discharge in natural water courses ;
- the creation of new collective reservoirs dedicated at storing water during winter time, so that volumes can be substituted to direct withdrawals into unbalanced rivers summertime.

Water Agencies can support - up to 100 Million m³/year - local Authorities that agree with electricity producers to **save specific volumes targeted at feeding low flow rivers**. Nevertheless due to the cost of compensation for electricity production loss, especially during peak consumption, this can only be considered as a transitory solution. In 2012, release of 46 million m³ from a hydro-electric dam to secure the Garonne river flow in critical periods cost around 3 million EUR, with 75% financed by the Water agency. In this case the release of 15m³/s in the Garonne was equivalent to ~1 €/s running down the watercourse. Based on the “user pays” principle, an increase in the price for water abstraction paid by the users, allowed to partly recover the costs of dam water release.

The **practice of storing water** that can then be used for securing minimum flows, is controversial for it can be disrupting rivers, having environmental impacts on biodiversity and fish migrations, or flooding areas. To the opposite, specific dams devoted at securing minimum river flows throughout the year are considered beneficial both for the environment and for agriculture. 80 million m³ are to be created by 2021, supported by the Adour Garonne water Agency up to 11 million €/year, except for individual storage or storage which would be intended at developing or securing irrigation. Compared to the prospective exercise “Adour Garonne 2050”, which is dealing with the impact of climate change into the basin, a storage capacity significantly superior would be necessary just to maintain the minimal ecological discharge by 2050...

The question of ownership is another issue, as future regular irrigation projects should recourse for more than 50% to private funds, responsibilities are significant and the procedure is long and costly. The recent rate increase of the Adour Garonne Agency’s financial contribution registered in the next SDAGE (35% basic rate, 50% to 70% for works²¹ in major deficit areas), could lead under certain conditions up to 80% of public funding including EU (FEADER) and local Authorities. At minimum, the introduction of a tariff system²² for the beneficiaries covering the operation costs is a precondition.

²¹ Except distribution networks

²² On the existing secured system, tariffs for irrigators is around 2c€/m³

3. The Durance-Verdon water system: a multi purpose water infrastructure management

3.1. Historical overview of the Durance-Verdon water system

In the Provence region, water management facing the extreme characteristics of the Mediterranean climate has been a key element of its culture and development. The magnitude of the problem hardly allowed finding solutions on the individual scale and this led to early regional planning work.

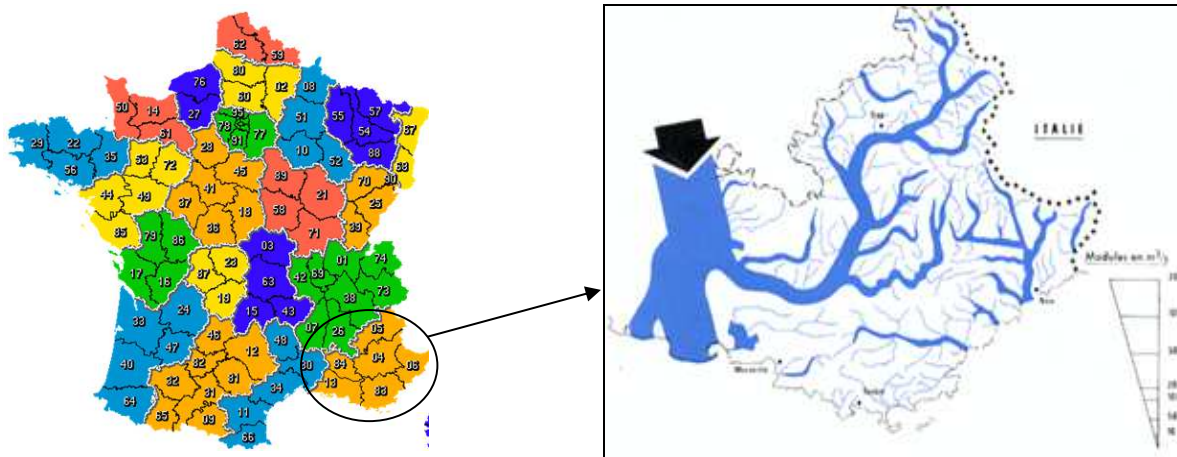


Figure 12: the Durance-Verdon River basin hydrography (SCP)

The significant population growth in the twelfth and thirteenth centuries required additional water resources, energy and food. Communities located near the Durance, the main river of the region fed by the Alps, taking advantage of the steep slope of the river, were able to exploit hydropower to run the mills, and quickly develop irrigation.

Many projects emerged to connect the wide coastal strip lacking water to the resources of the Durance river basin (nearly 6 billion m³ of annual flow at its outlet in the Rhône). But it was not until the mid-sixteenth century that Adam Craponne diverted the Durance waters from their direct catchment area to transfer them to the “plain of Crau”. In the second half of the nineteenth century, the canals multiplied keeping up to the energy target, but with an agricultural purpose becoming increasingly important. It was also in this period that legislation was introduced (1865) relating to Landowner Associations that still today are the most widespread legal form for Water Users Associations.

During the same period, the cities of Marseilles and Aix en Provence were allowed to divert the Durance and Verdon²³ waters for their supply. The Canal of Marseilles brought water to the city centre in 1849; the Canal of

²³ The Verdon is the main tributary of the Durance river

Verdon arrived in Aix in 1875. Both structures benefited from authorizations for additional water abstractions increasing their allocations to 9 m³/s and 6 m³/s respectively, in order to extend their service to nearby areas.

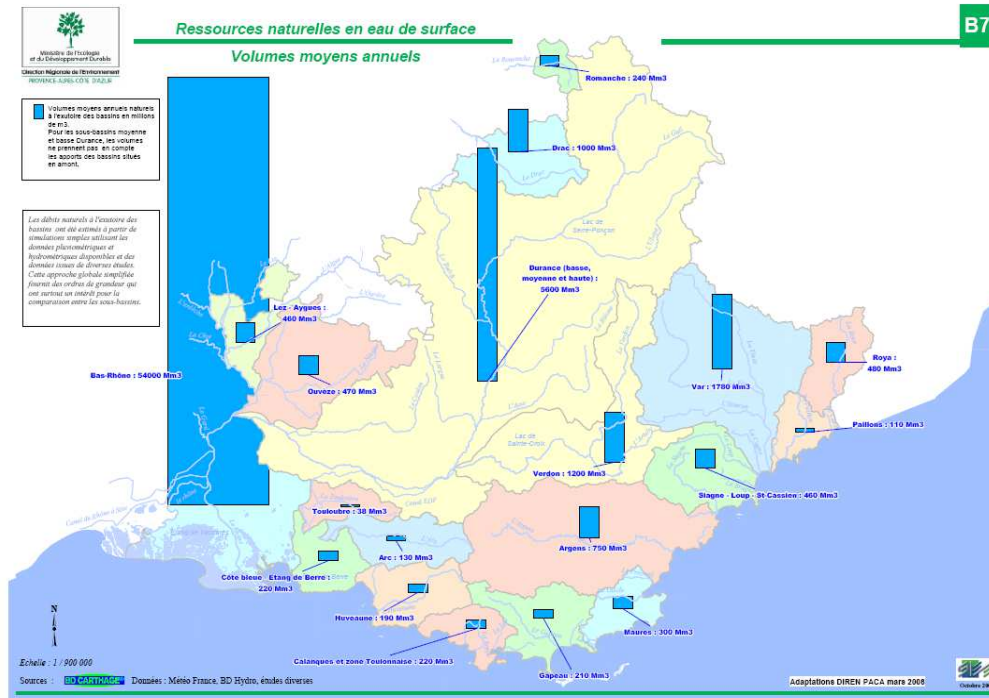


Figure 13: Natural surface water – average annual volumes (Ministry of ecology)

But the Durance River is capricious. Its floods (up to 6,000 m³ / s) are devastating, and its severe low flows (less than 30 m³ / s) are much lower than the sum of the allowed water abstraction rates (more than 100 m³ / s). With the increasing needs, conflicts occurred in the early twentieth century between the former allocation recipients and recent concession owners.

In 1907, a law regulating the Durance waters downstream of the Mirabeau bridge (where there are the largest irrigated areas: almost 100,000 ha) was established, and the "Executive Commission of the Durance-CED" was in charge of defining the strict requirements of the canals and monitoring the implementation of restrictive measures during low flow periods.

A region with a high hydro-energetic potentiel

Electricity production, with the Durance Verdon infrastructure, is representing nowadays 32 hydropower stations, a 7 billion kWh production and 2000 mégawatts power mobilized in a few minutes, ie. 10% of the French hydropower, 50% of the electricity produced in the Provence-Alpes-Côte d'Azur region and 15 to 20% of its consumption. ◇

However, this scarcity management hampered any new development. In 1923, a general work plan was established, in which the State was committed to contribute financially and to achieve it. The plan included:

- Primarily the creation of reserves, sufficient enough to ensure that the existing canals receive their water allocation, and to guarantee new services;
- Then the execution of works for water diversion from the Verdon to the coastal area and the possibility for the City of Marseilles to diversify its resources, up to 2.5 m³ / s, by substituting the Verdon to its withdrawals from the Durance.

The technical, financial and political difficulties (reluctance of the owners of rights on the Durance) encountered in the implementation of this plan did not allow its real start before World War II. Soon after, in 1945, Electricity of France (EDF) promoted the Durance / Verdon energy project, which involved the establishment of very large reserves to regulate the resource. The Ministry of Agriculture was interested in the project. This was the starting point of the whole "Durance-Verdon development" as we know it today.

The building and management of the Serre Ponçon Dam, with a reserve volume of 1.2 billion m³, including 200 million acquired by the Ministry of Agriculture to secure irrigation in the Lower Durance area, was conceded to EDF. The specifications also established provisions for the resupply of all the Lower Durance canals by a power canal.

The interests of the irrigators in the Lower Durance area being satisfied, the Verdon development became possible under the 1923 Act. The Departments of Var and Bouches du Rhone, and the City of Marseilles, decided to share their "water rights" to develop a joint structure, the "Canal de Provence", intended to supply water to the Departments of Bouches-du-Rhône and Var, and to the city of Marseilles, for agricultural, domestic and industrial purposes.

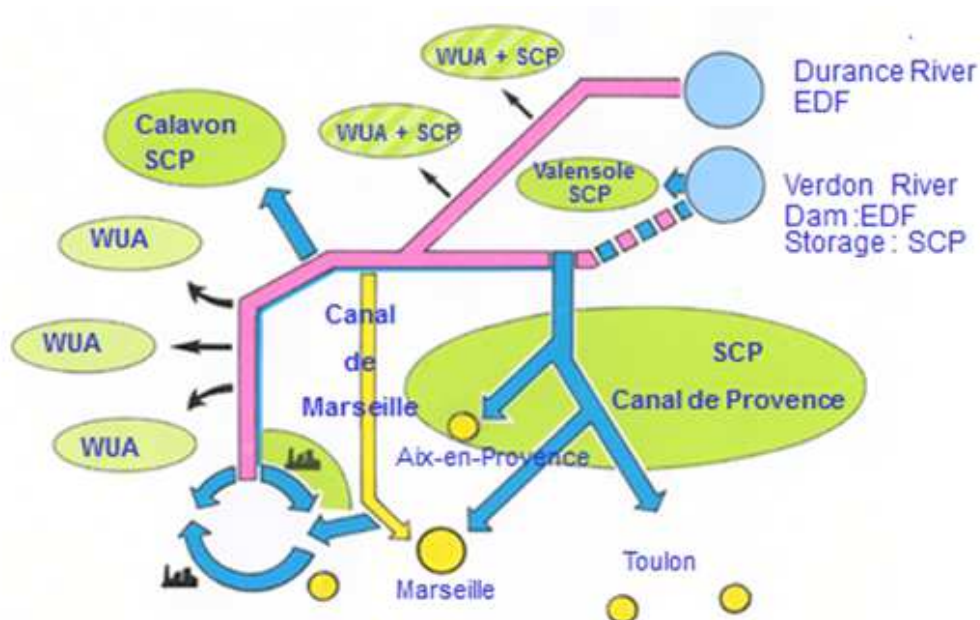


Figure 14: the Durance-Verdon schematic water system (SCP)

For this purpose, they established in 1957 the Canal de Provence and Provence Region Development Company (SCP), involving public authorities and economic stakeholders, including farmers, according to the mixed economy statutes of the Regional Development Companies allowed by the Finance Act of 1951.

In 1963, the State, by concession decree, entrusted SCP with the building of the "Canal de Provence" and of the hydraulic structures necessary for supplying water to the Provence region. The decree specifies that SCP should establish reserves of 250 million m³ needed to mobilize its entire water allocation, which is 21 m³ / s²⁴, or up to 660 million m³ per year. In accordance with agreements between EDF and the Ministry of Agriculture, in 1975, it bought especially for this purpose a portion (20%) of the reserve made by EDF (700 million m³) in the Sainte Croix dam reservoir on the Verdon.

In 1988, the Department of Vaucluse decided to develop irrigation in the Calavon-South Luberon areas, using the allocations granted by the 1955 Act, within the limit of a continuous flow of 2.5 m³ / s regulated by the Verdon reserves, under the agreement between the Ministry of Agriculture and SCP, and granted a concession to SCP for this purpose.

To date, SCP structures²⁵ thus allow securing the supply of water to nearly 60% of the population and 50% of the irrigated areas of the region, as well as to 400 industries, while contributing to the protection against fires.

So now the Provence region has more than 2 billion m³ of water reserves needed for securing its power supply (40% of the electricity of the region, with a power of 2000 MW mobilized in 10 minutes), for securing the supply of water for all uses, but also for mitigating the impact of floods.

The "Canal de Provence" establishes an upstream-downstream and downstream-upstream solidarity bond between the upper communities and all the coastal areas: water management in the Provence-Alps-Riviera region is practiced according to a concept of complementarity between the Durance catchment area and its "overflow area" in the territory of small coastal river basins supplied by water transfers from the "Canal de Provence" (or Canal of Marseilles). It is not confined to the single point local management scale or the classic river basin approach: complementarity occurs between managers of the various resources, either local or regional, natural or artificial, surface or groundwater, and between all uses (urban, industrial and rural consumers, energy, tourism and recreational activities, environmental conservation) in an inter-basin territorial dimension that covers the entire region.

3.2. Emerging issues beyond initial objectives of the infrastructure

The Durance-Verdon development has achieved its goal of enabling the socio-economic development of the region, not only for the benefit of coastal areas, which concentrate most of the people and activities, but also, in a way likely underestimated at the start, for the benefit of the upper communities: as soon as built, the dam reservoirs became lakes, which attract a large tourist industry: the Serre Ponçon Lake tourist area thus represents 40% of summer tourism in the Department of Upper Alps.

Tourism stakeholders and local authorities, gathered in the Joint Serre-Ponçon Development Association (SMADESEP), naturally bring pressure to influence the management of the lake, so that the level of the water body at peak tourist period is compatible with their activities. EDF seeks, in consultation with all interested

²⁴ These rights especially include the Verdon water rights granted a century earlier to the Canal of Verdon, that the "Canal de Provence" is expected to replace.

²⁵ Water is conveyed over an average distance of 100 km, by 210 km of underground tunnels and canals, 700 km of supply mains, 4,500 km of supply pipelines.

parties, to maximize the overall management of its reservoirs, to best reconcile these expectations with the needs of downstream uses, in compliance with the specifications of its concession.

The growing societal concern for environmental conservation has also led to more attention paid to the physical and ecological functioning of the river, whose regime has been strongly artificially affected, hence the inclusion of new constraints into the management of reserves which are related to the increase, provided for by law, in reserved flows that should be left in the river²⁶ as a priority, or to the seasonal modulation of these flow returns to the river to promote its ecological functioning, or to better manage sediment transport and sediment deposits.

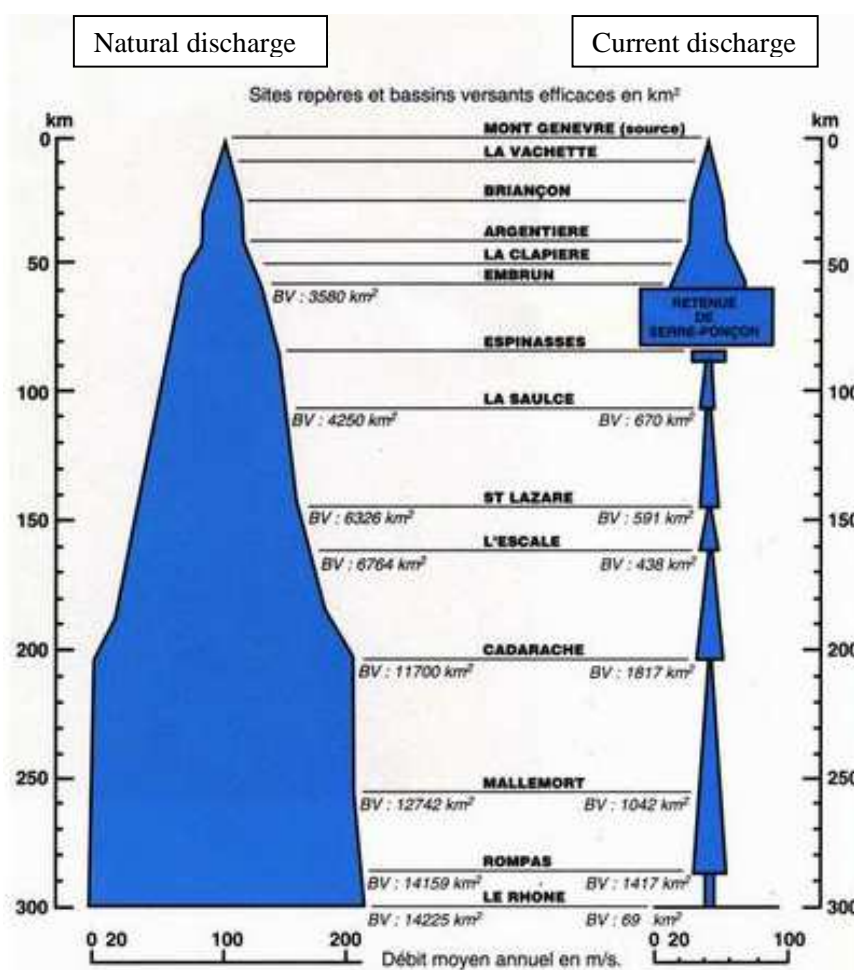


Figure 15: The Durance River, average annual discharge natural and artificial

²⁶ From the beginning, the rules of the Durance-Verdon reserve management prioritized the return of a reserved flow to the river (within the limits of the natural inflow into the reservoir), this condition being met, EDF must also ensure the establishment of reserves to prioritize the supply of water to other right holders (agricultural reserve on the Durance, SCP reserve on the Verdon). It is then entitled to use the other available volumes at its convenience to optimize its hydropower production; anxious to satisfy all stakeholders, it has also adapted its management to facilitate tourist activities around the reservoir.

To meet the need to better manage the river for mitigating flood risks for the conservation of the natural heritage and the reconciliation of different uses, the management of the Durance River Public Domain was entrusted by the State in 1982 to the Joint Durance Valley Development Association, made up of 78 municipalities, the 4 riparian Departments and the Region.

Regarding the overall level of the system security, if reserve management had previously been possible, in more than 9 years out of 10, to reconcile without any difficulty the optimization of hydropower production with the meeting of all the consumers and tourism needs, in compliance with environmental constraints, the situation may be more difficult in years of exceptional drought: on several occasions, the volumes of water removed from the Serre Ponçon dam reservoir to supply the traditional irrigation systems on the Lower Durance, whose water efficiency is low, have exceeded their allocation. We will return below to the conditions in which these situations were managed, but more generally, the need to anticipate the possible quantitative and qualitative evolution of resources and needs due to the impact of climate change and demographic and socio-economic perspectives, requires a thorough job of forward thinking in order to start in time the necessary adaptations to ensure the level of security required for an overall meeting of the needs.

3.3. Water allocation and sector policies coordination

The hydraulic structures of the Durance-Verdon system condition the existence and development of human activities. The services of general interest they provide cannot be questioned, they are structural and permanent. The investments they represent are significant, they cannot be considered without ensuring sustainable access to the water resources needed. The Provence Company, more than in other regions regularly better endowed with water, is fully aware that the issue of "water rights", their award, their compliance, their keeping is a critical challenge.



Figure 16: diverter and breaking-load of Rians (C. Moirenc SCP)

The precarious nature of authorizations is a very sensitive issue for the managers of many canals, concerned by the imposition of additional constraints or restrictions that threaten the very future of the service they provide. They hardly hear the State administration when it reminds them that the "water rights" term is inappropriate because it is only an "authorization" that only the State can issue. They are reluctant to pursue water saving projects since the administration refers to its intention to reduce "water rights" accordingly. Finally, they do not understand the application of the procedures regulating point withdrawals from the natural environment to their collective water supply systems by ancient canals, as practiced in the more northern regions.

The State services therefore wish to document with the greatest care these records relating to the management of "water rights" in consultation with the stakeholders. Authorizations are requested to and granted by the State under some conditions and for well specified purposes; they provide a real and exclusive right: it is therefore a key element in the organization and the sharing of tasks between the stakeholders involved in various water uses.

Thus, there is close complementarity, without undue overlap, between the respective missions of EDF, SCP, Canal of Marseilles, CED and SMAVD canals. The balance of the EDF concession is based on the development of the hydropower potential, its structures must ensure the supply of water to the different canal heads within the limit of the reserves acquired by the Ministry of Agriculture and SCP, but did not intend to directly cover consumer uses.

For example, to supply the Verdon water to the new facilities of Cadarache Atomic Testing Centre, it was certainly technically possible to do so from either the EDF power canal or from the "Canal de Provence". But the waters are regulated by the reserves established by the SCP for urban, industrial and irrigation uses in the region, which exclusively aim to ensure this supply, not the reserves made by EDF for hydropower production (and those may only be made available for other uses, with compensation for power loss, once the SCP reserves are depleted).

Another example: the "Canal de Provence" covers the Lavera port facilities, located west of Marseilles, which has, for several times over the last thirty years, allowed rescuing, by maritime transport, cities or industries under extreme exceptional circumstances of water shortage in neighbouring Mediterranean countries. In 2008, questioned on the legitimacy of this "export" under the law ("Water is part of the national heritage"), SCP reminded that the supply to the Port had been developed under a State concession and leadership, that this water supply to the Port fell within the water supply for all uses (domestic, agricultural and industrial), and that it helped the economic development of the region in accordance with the statutory purpose of the company.

3.4. The management of increasing pressures on water resources

3.4.1. Risk management related to the shortage of Serre Ponçon storage reservoir for agriculture

In case of years of exceptional drought, forcing the Lower Durance farmers to use a more intensive and prolonged irrigation campaign, the 200 million m³ allocated to them in the Serre Ponçon reserve might be insufficient. Anticipating this possibility, the 1952 convention with the Ministry of Agriculture opened the possibility of increasing this allocation, with compensation payment. In practice, in exceptional years when this allocation has been exceeded, there was no lasting purchase of additional storage, but EDF exceptionally made the needed volumes available, with compensation for power loss.

In 1989, for the first time, the Ministry of Agriculture, given the exceptional nature of the situation, agreed to take over the funding of this power loss. In order to minimize the risk of further excesses, of which farmers should bear the cost, it encouraged them to organize the management of their allocation, in close coordination with EDF which perfected its measurement instruments and forecasting models to better anticipate reserve management.

The Durance-Verdon system was thus able to meet the water needs of all users during repeated droughts in the early 2000s, while, in other areas of the region not secured by this system, restrictions of water uses had to be established by the State administration, which was thus led to draft "drought plans" discussed hereafter.

But the prolonged drought of 2007 again forced farmers to request an additional release of 60 million m³ to enable them to carry out the last irrigations needed downstream. The conditions for the supply of this

additional water were discussed and adopted in a Drought Committee, involving all stakeholders, under the authority of the State, represented by the regional Prefect.

Thus, the farmers, arguing that the compensation due to EDF compromised the balance of their farms, benefited from aids granted by the State, the Region and the Departments for up to 90% of the total power loss. To provide the necessary water volumes for irrigation in the Lower Durance area, EDF could, in agreement with SCP²⁷, use part of the Verdon reserves to limit the drop in the Serre-Ponçon water body level to preserve tourist activities around the lake.



Figure 17: the Sainte-Croix dam on the Verdon (SCP) and Serre-Ponçon dam on the Durance (C. Ben)

²⁷ The technical and tariffs system of the "Canal de Provence" encourages users to efficient water management: to date, it meets all the expressed needs while using only about one-third of its reserves every year, leaving a sufficient margin to cope with expected climate and socio-economic changes in the coming decades

3.4.2. Technico-economic perspectives to limit this risk in the future

The 2007 episode strongly encouraged establishing means to save water, by improving the efficiency of the traditional irrigation systems in the Lower Durance area.

These traditional gravity systems require much larger annual water abstractions, per hectare, than modern sprinkler systems. This is due, in a large part, to the rustic design of the old canals, using the technology available at the time of their construction: they are usually made to work at full and continuous flow whatever the needs to be met (while sprinkler systems only use the strictly necessary water):

It was observed that the losses associated with the operation of the main (primary and secondary) canals alone usually represent 35-50% of the diverted volumes. Very substantial water savings can be easily achieved at this level, with no change in irrigation practice, by helping canal managers to upgrade these structures by fitting simple control systems.

The work to be performed is small, given the volumes it can save: on the order of 20 million Euros, for a reduction of water abstractions estimated at about 180 million cubic meters per year. But, however small it is, it represents for canal managers an investment they hardly can fully bear: without any direct economic use of the water savings achieved, they have to increase the taxes paid by their customers.

However, they have shown that they can very effectively and sustainably use these control tools when the weight of these investments is strongly reduced by government subsidies or contributions from operators (EDF and SCP) who have an interest in securing reserve management in the long term.

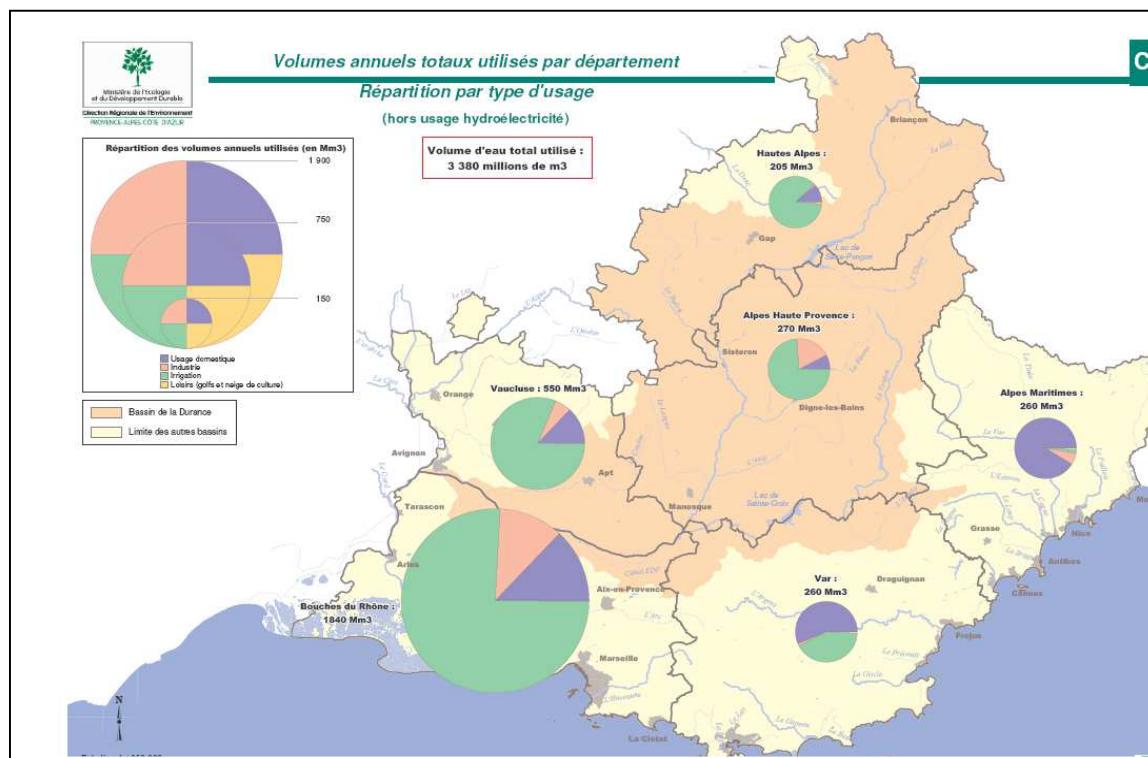


Figure18 : Total annual volumes abstracted per sector, except hydroelectricity (Ministry of ecology)

3.4.3. Implementation of water scarcity plans

The succession of drought episodes that affected the entire French territory in the early 2000s led the Ministry of Ecology and Sustainable Development, in charge of water policy, to prescribe the drafting of Drought Plans, under the authority of the Prefects of Departments and Regions. These plans are designed to anticipate, rather than decide in an emergency, the measures (definition and implementation of restrictions on each use, depending on the degree of the depletion of water resources) to manage such episodes.

In most regions, usually well endowed with water, water resources are generally directly abstracted from the natural environment; reserves made to overcome the rigors of low water are usually for the sole use of irrigation. Prolonged drought causes the depletion of rivers and groundwater, and therefore shortage of available resources to meet uses. As the mobilized resource and its use are located in the same area (at the municipal, inter-municipal, or river basin level), when the status of the natural resource no longer guarantees water uses without environmental damage, restrictive measures therefore apply equally to these uses in the entire area.

In the Provence region, the Durance-Verdon development raises the problem in quite a different manner: thanks to the reserves established for meeting all uses, drought is no more a scarcity! Drought Plans must differentiate the use of secured resources from direct abstractions from the natural flows in a river (or threatened groundwater):

Thanks to man-made reserves and inter-basin water transfers, whose aim, recognized as being of general interest, is precisely to free activities in the region from the drought handicap; uses supplied by secured resources cannot legitimately be subject to coercive restriction measures, as the reserves are sufficient²⁸. This does not preclude, however, encouraging consumers to avoid waste, to increase the security of their supply, and contribute to an exemplary water management in the region.

Restriction measures therefore focus on abstractions from the natural environment, that the water transfers from the Durance-Verdon development also help minimize. Drought Plans thus highlight the complementarity of resources - either natural or artificial, surface or groundwater, local or regional- that inspires inter-basin water management in the entire region.

3.4.4. The emergence of a Regional Authority among “traditional” stakeholders

The Provence-Alps Riviera Region became a shareholder of the SCP, when the Decentralization Act of 1982 gave it this ability, joining forces with other public authorities already shareholders, for guaranteeing long-term water security for all uses (urban, industrial, irrigation) needed for the socio-economic life of its territory.

The decentralization Act of August 2004 opened the possibility of transferring the conceded assets from State to Region, with all its rights and obligations; in this case, the mission of the SCP remained unchanged, unless otherwise agreed to with the Region, new conceding authority.

²⁸ Consumers pay through their subscription the price of this security entrusted to SCP by the State: they are therefore legally entitled to challenge such possible restrictions

The Region immediately launched, in consultation with the shareholder authorities and the State, an opportunity and feasibility analysis of such a responsibility transfer, which showed that the future of the "Canal de Provence" is no more a priority concern for the State, since most of the major structures had already been built, and financially autonomous, whereas for the Region, this Canal, public heritage for public resource management, is a key element for a regional water policy consistent with the development and life of the regional territory. The Region therefore supported the principle of this responsibility transfer.

The practical terms and conditions, providing the necessary guarantees for the Region to fully and sustainably fulfil its new responsibility, were then duly agreed to with the State. In particular, the continuity of access to water resources was essential, because the region could not agree to become the conceding authority of the Canal assets without being sure of the continuity of the water rights that feed it²⁹, and of full ownership of the artificial reserves made by SCP³⁰.

At the same time, a consensus was established between the Region and all SCP shareholder authorities, on the principles of the company governance, on its objectives and orientations for the medium and long terms, on the planning of the investments that remain to be made³¹.

Indeed, this decentralization process, fully achieved in 2009, gave the Region responsibility over the water issue, closely linked with its responsibility over regional planning, which concerns the entire region: it allowed better articulation of the responsibilities between conceding authority and concession holder, reaffirming the missions of the latter, and induced a greater effort of transparency and communication. It resulted in a strengthened dialogue with water stakeholders, closer to the needs of the territory, and in the development of synergies, as the "Canal de Provence", a link between the upper communities and coastal areas, contributes to solidarity³² and regional identity.

²⁹ If there is transfer of responsibility over this heritage, it cannot be a transfer of the State sovereign powers, especially in the field of authorizations for "water rights")

³⁰ This clause implies joint ownership of the Verdon reserves by the State, conceding authority of the power reserves managed by EDF, and the region, conceding authority of the multipurpose reserves managed by SCP.

³¹ Some simple principles, which are subject to an ethic of public management, on which the SCP actions are based:

- Equitable access to the resource for all needs,
- Limitation of the abstractions to the strict minimum, useful and necessary to users,
- Encouraging customers to reasonable consumption,
- Awareness of the younger generations to water issues.

³² For example, this solidarity is translated into reality through an agreement between the upper communities and SCP, to promote the preservation of water resource quality for the benefit of downstream uses.

4. Legal and operational settings of WUAs for water scarcity management

Since ancient times, the waters of the Durance and its tributaries have been used to supply canals and operate mills. The Durance River bed is characterized by steep slopes, which justifies the use of its torrential power. In 1946, the law allowed nationalizing the companies installed to produce energy, thus leading to major restructuring work for hydropower development. The sharing of water resources in these areas between the different uses and depending on the season has steadily become more complex.

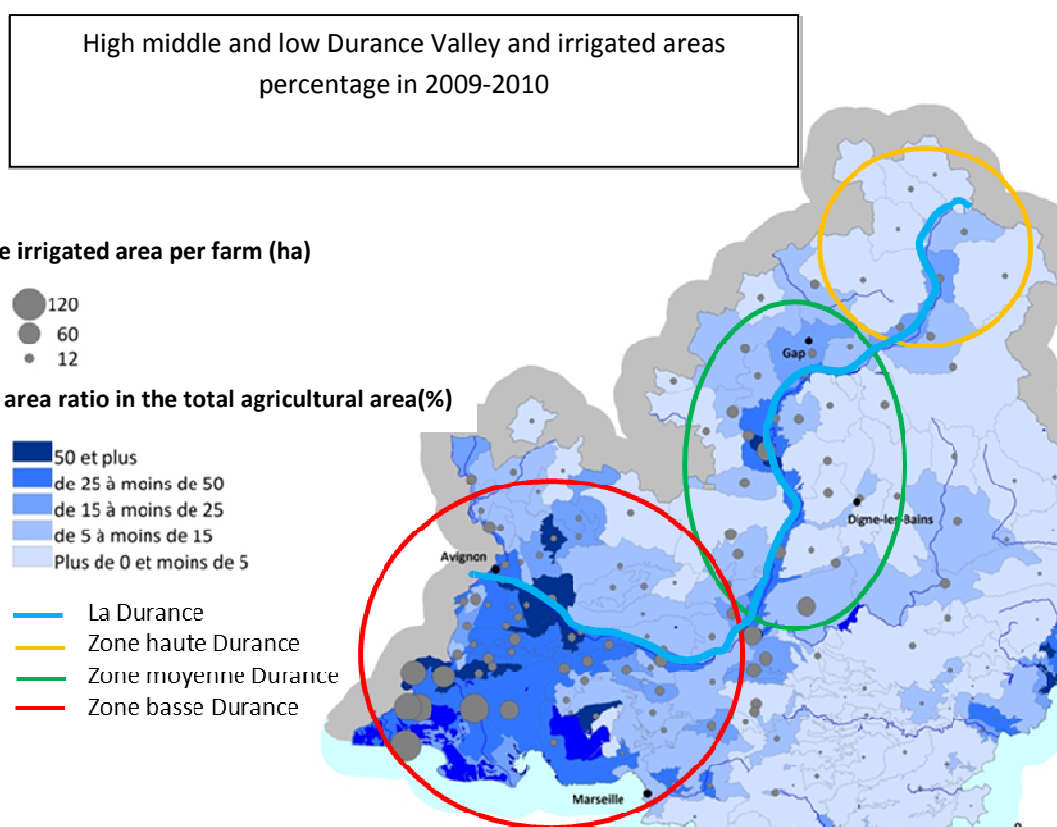


Figure 19: Durance Basin detail

4.1. WUAs in the middle and lower Durance Valley: characteristics and impact on irrigation

4.1.1. The collective model prevailing for irrigation management

Irrigation is practiced throughout the country, however, most irrigated land attached to community water management bodies are found in the South and especially in the South-East of France, where access to water resources usually requires the implementation of large projects that can only be initiated with collective strength.

The management of these systems is carried out by entities that can be governed by semi-public law, such as the Regional Development Companies, or be fully public under the supervision of the State, it is the case of Landowners' Union Associations (ASP) such as Authorized Union and State-imposed Associations (ASA or

ASCO). The ASPs are present in large numbers and it is often difficult to obtain statistics on them because, when they are small, they can be in "stand-by" and work without any meeting or budget but technically in service.

Water supply systems can also integrate the heritage of local authorities (municipalities) or of more specialized unions. In the Provence-Alpes-Cote d'Azur Region (PACA), over 75% of professional farms are supplied by community water systems. In the Middle and Lower Durance, the ASA and ASCO are by far the dominant system. Thus in the Durance area, 95% of the irrigated lands are irrigated by community systems. The schemes concerned by the following are in the Lower and Middle Durance Valley, i.e. downstream of the Serre-Ponçon dam, in "water-secure" areas.

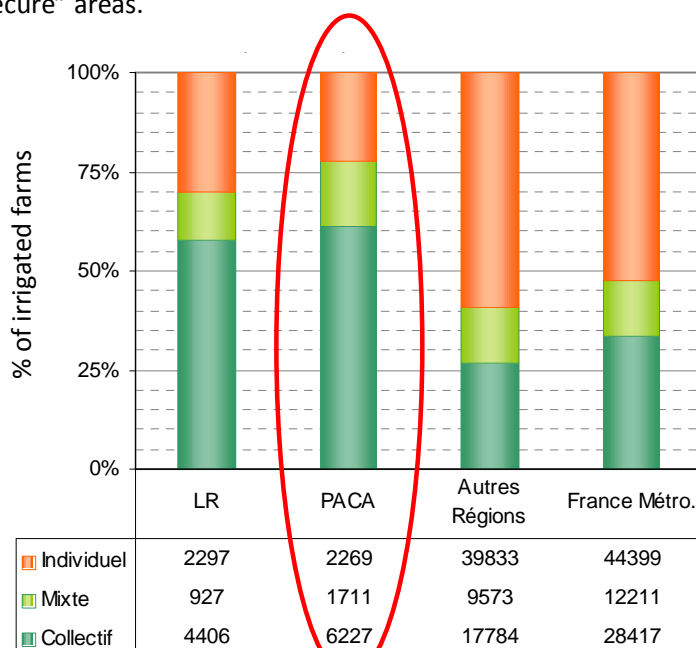


Figure 20: dominance of collective irrigation in the Mediterranean regions (RGA2000)

ASP, public administrative bodies

The ASA and ASCO's dominant model is a Public Administrative Body established either at the initiative of owners concerned by their land development, and authorized by the State, or directly at the State initiative.

In both cases, once established these associations are given by law prerogative of public power, such as: recovery of contributions by the Treasury, defence by administrative courts, the right to expropriate, public procurement under State control, etc. ◇

In order to ensure the sustainability of these institutions, the legislator specified that " **the attachment to immovable properties of the obligations arising from the establishment of associations, are transmitted to any people to whom the immovable property is being passed**".

All lands included in the area of an association benefit from water access rights, but are irrevocably compelled to contribute to the expenses of the association.

Case law is extensive and constant. It shows that, even without any use of water (fallow, dry farming, etc.), even in the case of expropriation for public use (construction of roads, railway tracks, etc.), the plots

located in associations' areas remain attached to these associations. Only the dissolution of the associations can stop the obligations.

ASPs are subject to the general rules of public accounting. There is a separation of powers between the President and the Ministry of Finance which ensures payments and recoveries, e.g. property taxes. The contributors to the budget are all owners located in the given area and not the users. The ASP has a duty to follow all land transfers that are made during the year in its area so as to make records that are up to date before delivering the recovery files to the Treasury.

The Treasury has all the resources of the State to levy contributions. In terms of balance, the ASPs are required to submit to the Prefect budget estimates in which revenues and expenditures are balanced. Otherwise, the Prefect "imposes" the missing credits. Most often, the ASPs implement investments when governmental aid programmes exist (capped at 80%).

The recovery of the charges induced by the ASP depends mainly on the irrigation mode. In gravity system, it is mostly fixed amount per hectare, whereas pressurized systems the contributions are distributed up to about 55% on the contracted area and the remaining 45% are calculated according to a volume of water per hectare supplemented by consumptions over the limit assigned.

4.1.2. A better agricultural valuation thanks to summer and winter irrigation

A favourable effect of these laws is the dynamism of agricultural production induced by these obligations. Indeed, on the scale of the plot, the joined access to water and irrigation load encourage the cultivation of water consuming crops with higher added value. Irrigation also guarantees an almost constant quality level of production against market volatility.

On the other hand, at the irrigated schemes scale, the utilization rates of the systems are very high (often from 80 to 95% of potentially irrigated lands are irrigated), providing a guarantee of economic optimization of hydraulic structures, which always require significant financial support from public authorities at their construction.

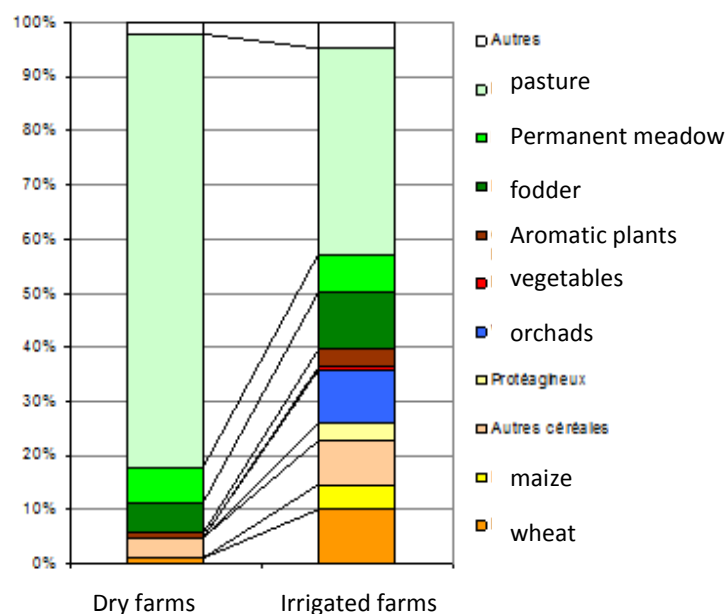


Figure 21: Repartition of arable land in 2000 for irrigated and dry farms in the Sisteron region (AIRMF 2009)

The above characteristic figure of the Sisteron small farming area illustrates the diversification of agricultural production induced by access to water, which also enables farms to adapt to market conditions by changing crop rotations. Studies made by the AIRMF in about twenty small agricultural areas throughout the French Mediterranean region consistently show that irrigable lands are experiencing strong diversification, particularly in high-value crops.

Fruit production in the Durance valley also requires protection against spring frost. This is done by "overtree sprinkler methods". To avoid duplication of infrastructure for plot irrigation, sprinklers are most often used both for fighting against frost and for summer irrigation³³.

4.1.3. Differentiated withdrawals

In the valley of the Middle Durance, three types of agricultural access to water resources coexist from the hydrographic network (Serre Ponçon dam, the Durance and its tributaries), and from canals equipped with energy production plants and water abstraction points:

- Those located on the Durance tributaries that are not "developed" for hydropower concessions,
- Those located on a section of the Durance or of one of its tributaries, "developed" for hydropower concession,
- Those directly located on hydraulic structures (mains or canals) of the hydropower concession.

In addition, there are two administrative situations:

- The water intakes that withdrew water according to a right prior to the hydropower concession. These water rights are recognized by Article 12 of the Concession Decree called "prior rights", which means that the concession holder has to recognize and, if necessary, to re-establish access to the resource.
- The water intakes that did not exist before the concession and that the hydropower structures have helped develop. These water rights are described as "new" as they are developed with the concession of the river. They are identified by Article 50 of the Concession Decree.

In terms of secured access to the resource, only the water intakes located on the Durance tributaries can be classified as unsecured. Indeed, the situation of water abstractions from tributaries or the "developed" Durance are immune to shortages, as the concession law and decrees planned that the concession holders have an obligation to release flows downstream of the hydropower structures, corresponding firstly to the value of reserved flows (or environmental flows) and secondly to flow rates maintaining previous water rights (Articles 12 and 21).

Some of these water intakes can be at the core of stake issues if they compete directly with energy potentials.

Specificities of the Lower Durance structures

The Associations of the Lower Durance are regrouped in the Executive Commission of the Durance (CED), an association under the 1901 Act, whose task is to allocate water resources between the different canals downstream of the Mirabeau Bridge (Cadarache) up to its confluence with the Rhone while taking into account

³³ The technique used for fighting against frost is based on the physical principle, which leads to the change of a gram of liquid water into solid state releasing 8 calories. This heat production protects the fruit buds and isolates the buds in an ice binder box..

the needs and resources³⁴. The CED is responsible for controlling the abstractions. It is a meeting and decision-making place for everyone concerned to make known his intentions of applying for the use of the agricultural volume part of the Serre Ponçon dam reservoir, all needs being then expressed by the CED to EDF.

In the Lower Durance area, the situation of irrigable lands, of ASPs and water rights is very different from the Middle-Durance area. Indeed, in the "CED" area, irrigators benefit from large agricultural lands and high flow rates. Gravity irrigation is dominant and agriculture is particularly well satisfied as peak flows do not exceed the capacity of the open channels designed for continuous supply.

ASPs are large (from 2,000 ha to 10,000 ha). Administratively and at the time of the building of the hydropower structures, all previously existing water allocations were re-established on the infrastructure of the concession holder. So today, none of the ASPs, CED members, withdraws its water resource from the natural environment. In other words, *"all the rights of Departments 13 and 84 are governed by Article 12 of the Planning and Concession Act of 5 January 1955 and none is governed by Article 50 of this law"*.

These re-establishments were accompanied by a security acquired by an allocation of 200 million m³ in the Serre-Ponçon reserve which can irrigate up to 90 000 ha. This volume is intended to mitigate the effects of low flows. In summer, this volume, which can be released from the reservoir, is added to the Durance "inflow" into the Serre-Ponçon reservoir. The CED³⁵ defines the release regime of this volume. The overall water right for all irrigation channels during peak flow is 114 m³/s. The EDF canal conveys water which is activating turbines on its way.

Today, this situation appears to be very secure in terms of water resource availability for agriculture, due, on the one hand, to the re-establishments made by the concession holders, and, on the other, through the allocation of 200 million m³ acquired from the Serre Ponçon dam reservoir. Finally, by withdrawing their water from industrial structures, these users associations are not affected by the increases in reserved flows required by the WFD and 2006 water act, which can significantly affect other Irrigators abstracting their water from the natural environment.

Quantitative data on collective irrigation

In the Lower Durance area:

Department	Number of ASA /ASCO	SCP	Inter-community unions	Amount of water rights in flows	Volume Mm3	Irrigable area
Vaucluse (84)	5	1	2	34.1 m ³ /s	727	11,942 ha ³⁶
Bouches du Rhône (83)	6	1	2	78.65 m ³ /s	1,656	

Figure 22: characteristics of the structures and abstractions higher than 100 l/s per Department (BRLi 1995)

In fact, the yearly abstracted volumes are much lower. They amount, for the Vaucluse for example, to values between 362 and 446 million m³. In the Bouches-du-Rhone, during the same period, the abstracted volumes range between 813 and 1,090 million m³. This leaves the Lower Durance area with significant surplus.

³⁴ *The canals that withdraw water from the Verdon (further south and east) are managed by the Canal de Provence Company (SCP) and were developed in the previous section.*

³⁵ *Law of 11 July 1907 on the regulation of the Durance waters supplemented by the government's administrative regulation of 14 August 1908*

³⁶ *The Durance waters only contribute for 11,942 ha of irrigable lands out of a total of 31,566 ha of irrigable lands*

In the Middle Durance area:

Department	Nb of ASA/ ASCO	Local authority	Private	Amount of water rights in l/s	Volume leviable (1000 m ³)	Irrigable area (ha)	Irrigated area (ha)	Pressurized mode
Hautes Alpes	31	0	0	9,860	175,000	10,331	9,235	8,207
Alpes de Haute Pce	36	9	1	23,883	572,000	18,619	11,854	11,079

Figure 23: characteristics of the structures and abstractions higher than 100 l/s per Department (BRLi 1995)

Department	Amount of water rights expressed in discharge	Under Article 12 (secured)	Under Article 50 (non secured)
Hautes Alpes	9,860 l/s	2,835	551
Alpes de Haute Provence	23,883 l/s	8,050	4,850

Figure 24: Details of discharges and volumes of water rights prior or post of the Planning Act (BRL 1995)

The various legislative provisions relating to the restoration of irrigation by concession holders, the increase in reserved flows that occurred or will occur soon, and climate changes that are perceptible in the mountain basins, induced two situations for agricultural uses which differ very clearly: that of the water intakes whose water supply is called "secured" and that of the intakes called "unsecured".

The entities in charge of irrigation are larger downstream of the Durance valley and on the river main stream. All intakes are on secured structures. In contrast, the non or less secured intakes include smaller entities geographically located upstream of the Middle Durance and especially on the tributaries of the river. The stakes are lower and, in a context of scarcity of access to the resource, they will be subject to a greater number of constraints.

4.2. Example of water rights management on a granted watercourse on the Middle Durance

In the Southern Alps and Provence, water allocations have been sometimes granted since very ancient times, ignoring hydro-geographical limits. Here are some examples:

- In 1470, the Crown Prince granted to the town of Gap, which has no water resources, an authorization for the abstraction of 300 l/s from the Ancelle torrent to supply the city by river basin transfer (of the Drac tributary – from Rhone catchment area to the Durance river basin);

- In 1554, "*authorization and license*" are given to Adam de Craponne (authorized by the king) to divert the Durance waters and "*Choose the most useful sizes for his canal to convey water where he wanted to in the Salon de Provence area*". This is the first example of conveying the Durance waters outside the limits of its catchment area;
- The Ventavon Canal, for which an association was established on 20 June 1880, and which has a flow rate of 2,500 l/s to be diverted from the Durance waters, acquired by the Law of 07.20.1881.

Most of these structures are still in service today. There are many examples of granted allocations; they are hundreds in the Durance river basin, sometimes exceeding the capacity of the river or of its tributaries during low flows.

Today, the physical scarcity of access to the resource (already existing use, climate changes, increase in minimal flows, etc.), as well as its regulatory depletion (administrative complexity for obtaining new water rights, increase in minimal flows, WFD provisions) lead to pay more attention to the already existing water rights, as illustrated by the following example of the Ventavon Canal.

Soon after 1881, the Authorized Union Association of Ventavon benefitting from a flow rate of 2,500 l/s to be diverted from the Durance waters faced conflicts of interests with industrial companies involved in the concession for energy production³⁷. The irrigation channel will soon be also used to operate a hydropower plant at the edge of the irrigated area, but industrialists considered it as a barrier to the development of the valley. These industrialists, forced to deal, drafted several agreements over the period 1895 - 1950 for the rehabilitation of hydro-agricultural works, the restitution of energy³⁸ and the attribution of a discount on the electricity bill³⁹.

With the EDF nationalization Act in 1946, all the rights acquired by the Ventavon Canal were transferred to the new public and industrial body, and in 1973, negotiations started with the construction of the EDF new industrial canal in order to replace earlier hydraulic works. Since then, the Durance waters allocated to the ASA of the Ventavon Canal have been conveyed by the Industrial Canal of EDF, in charge of the canal maintenance.

The substitution of gravity irrigation and the development of pressurized irrigation was helped by funding from the concession company EDF, because, on the one hand, of the decrees' obligations it had to restore previously existing irrigation, and, on the other, because it was easier to restore irrigation by designing pressurized systems than gravity systems, finally as in helping to build modern systems, EDF induces significant water savings that it uses for its own benefit.

Simultaneously, the actual water consumption has dropped to 15 million m³ against an initial allocation of 70 million m³. For the union, the cost of energy expenditure (i.e., in the end, the cost of water) is limited due to agreements that remain on allocations of "reserved energy".

³⁷ *Alpine Electric Power, Electric Power of the Mediterranean coastline, Middle Durance Power Company, Middle Durance Hydro-Power Company*

³⁸ *Article 6 of the 1919 Act "The concession holder must return in kind the water or energy used and, if necessary, to cover the costs of recognized changes, needed for already existing facilities, caused by changes in operating conditions"*

³⁹ *The reserved energy consists in attributing a discount on the electricity bill expressed in kWh for some consumers designated by the law. ASPs are among the potential beneficiaries.*

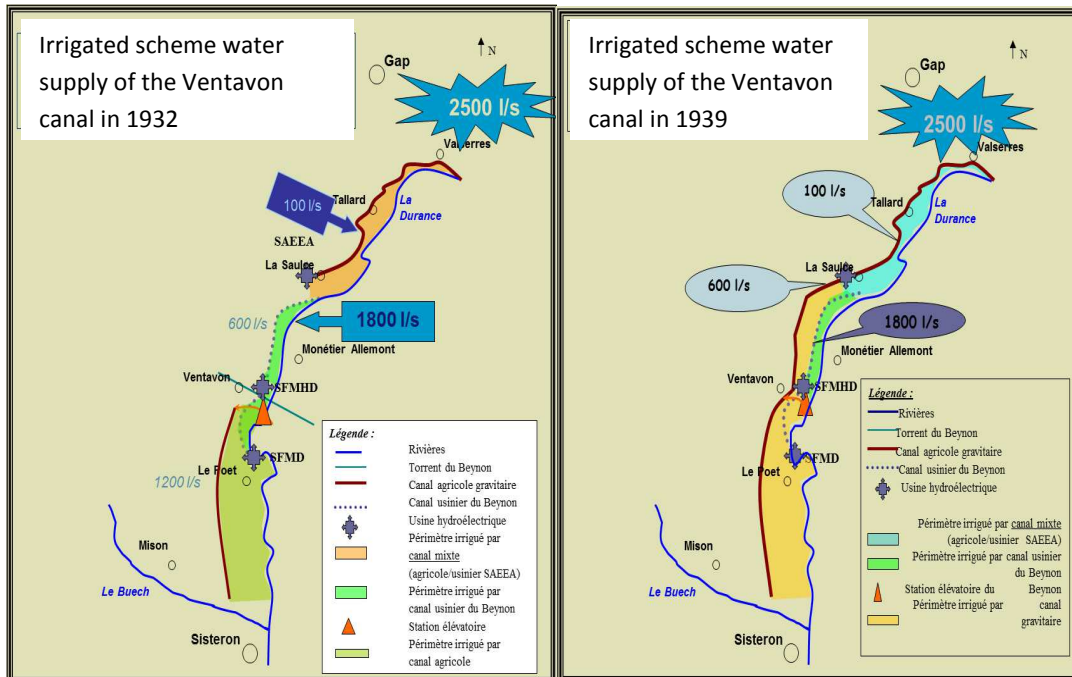


Figure 25: Simple representation of the evolution of the Ventavon canal hydropower system in the middle of the XXth century

4.3. Water scarcity perception and management: example of the Gap canal Users Association

Under the Departmental Drought Plan, each degree of water shortage shall result in a series of actions, from raising users and populations' awareness (alertness) to restrictions of water uses which have to be proven. Communication is strong "it is necessary to inform that scarcity exists and about the resolutions adopted to overcome the lack of water", by using the local media. The question that inevitably arises then is whether water scarcity is a natural data or a social issue?

4.3.1. Scarcity management plan perception by the manager

For operators of facilities located in a deficit area and in charge of the operational management of water supply and of its equitable sharing among users, the "Droughts Plans" are seen as making the management conditions heavier and requiring an investment of time to have the administration sharing the existing management procedures often introduced a long time ago.

In addition, a rigorous and precise water resources management is incompatible with the rules of management that may be imposed at departmental level, firstly because they are not technically suitable, and secondly because the management of droughts and shortages is made on a day-to-day basis and not at the rhythm of "drought committees". Failing this, either the departmental rules are generalized and inevitably lead to water losses and wastage, or they are extremely sharp and updated with great frequency and thus lead back to the management as practiced by the operator.

Departmental drought committees often look like a round table around which talks and lobbying outweigh the organizational rigor expected from the users and the application of water policing.

4.3.2. Users scarcity perception according to the manager

The Gap Canal Union Association gathers about 6,000 users. Agriculture is extensive in the area, mainly directed towards the production of grass for livestock. The production added value is low. The association also gathers about 4,500 "urban" users, i.e. having acquired constructed or building lands with rights to water use.

Water scarcity is well known by the users who have always structurally lived with it. They know that it results from failure at the source.

This notion of drought and restrictions of uses, which is imposed according to the rules established by the Gap Canal, rarely gives rise to tensions and criticisms. Indeed, for criticism to be successful, the user must outline elements of inequity between members, historical management incompetence (planning choices) or mismanagement during the crisis. When scarcity is due to a natural phenomenon and therefore there is no error or mismanagement, the idea of conflict is lost.

This is the explanation that can be given regarding the lack of conflicts on uses that may have a social origin, between the association members.

In this context, the limit of what would become no more acceptable is therefore not a social issue, but could be an economic issue:

- *"Do water resources globally bring me an added value?"*
- *"I may agree to pay with no gain for one year if necessary, but this situation should not occur again because I do not want that, over a few years, my membership to the Gap Canal results in no gain".*

We must remind that, as in all water users associations, member land owners participate in all decisions.

4.3.3. How restrictions are organized among farmers ?

Restriction on uses in the Gap Canal Union Association has been applied since 2008 according to procedures formalized in a document entitled "Drought Management Plan -DMP". At the ASA's initiative, this document was presented to the State in order to be relieved from the departmental drought plan requirements. It justifies that the means developed to manage drought are "more effective" than the departmental plan and that the objectives set by the government are all achieved.

To summarize, the outline of the DMP and imposed restrictions will depend on the following factors, listed in hierarchical order:

1. Compliance with acquired rights: acts having force of law must be comply with,
2. The efficiency of the hydraulic system, "a less efficient system (such as gravity irrigation) should not continue to be used in times of shortage and leave room for water supply to the most effective systems (such as pressurized systems)",
3. Securing of the subsystem on which I depend: if I am secured by a particular facility (storage, etc.), it should be normal that my access to the resource is less restrictive than the one that depends on a non-secured

structure. Fairness is not a "same restriction for everyone!", which would lead to unnecessary loss in production potential.

4. Finally, depending on the added value of the crop I cultivate: "If the shortage continues after adoption of points 1 to 3, then there is no other legitimate alternative than to deprive of water crops with less added value for the benefit of those with higher added value".

This allocation key, its application with authority, and the lack of any form of exemption make any action legitimate for restriction of uses which can go up to the decrease or even loss of production without compensation.

This field organization is complex, because it is managed daily, i.e. it is planned according to hydrological data, needs calculations, a time step equal to 24hrs. It should then lead to communication to each user affected by the change of status in water supply. The stake is high because it plays on 1 ha, on products valued at € 800 to €25,000 / ha. It does not allow for approximation or "amicable" resolution of the problem.

CONCLUSION AND RECOMMENDATIONS FOR TURKEY

The main objectives of the 2000 Water Framework Directive 2000/60/CE WFD are to achieve « good ecological status for water bodies » by 2015, to expand the scope of water protection to all waters and to settle river basins water management, based on natural geographical and hydrological units and considered as “the best model for a single system of water management” compared to administrative or political boundaries. French water Agencies have been implementing IWRM at basin scale from 1964.

The implementation of the WFD, even though targeted at ecological and chemical protection of water resources and the aquatic environment, is impacting quantitative policies mainly because water allocation has to do with water resources and water services, the proper scale of the latter not necessarily matching the limits of the watershed. The Durance-Verdon system example demonstrated the need for water managers in charge of providing water and sanitation services, energy, and delivering water for agriculture to think water as a full part of the regional planning.

The need to conserve adequate supplies of a resource for which demand is continuously increasing is also one of the main concerns of the WFD. And that is the reason why the Directive is insisting on defining the adequate water pricing for the users, and applying the principle of cost recovery for the service providers, such as for the abstraction and distribution of fresh water and the collection and treatment of waste water, as the logical counterpart of the access to water.

However, since the publication of the Directive, the rapid effects of climate change particularly in Southern Europe, have led the Commission to investigate further on the quantitative aspects (water scarcity and drought, e-flows...) notably in relation to food security and the water-energy nexus.

The European Basin Organisations Group for implementing the Water Framework Directive, created in November 2003 at the « Europe-INBO »⁴⁰ international meeting of Valencia and currently chaired by Prof. Dr. Ahmet Mete SAATÇI, President of the Turkish Water Institute (SUEN), is meeting annually in order to formulate recommendations for taking into consideration experiences of Water Districts Authorities into the Common Implementation Strategy (CIS) of the Directive.

In 2008 this Group established an interim assessment report on the implementation of the WFD in the European transboundary basins presented to the Water Directors and to the European Commission. In 2009 it prepared the chapter dedicated to river basin management of the European regional report at the Istanbul World Water Forum. The last meeting of the EURO-INBO Group in Istanbul in 2012, acknowledges the need to find a balance between protection and uses, and a better integration of policies, especially with the Common Agricultural Policy.

The French case developed above highlighted the example of a structuring multi-use infrastructure that was born in the middle of the last century after more than 50 years of political negotiation, technical progress and financial arrangements. It is gently inviting to think of the advantages of storage capacities for the general interest, and to the conditions that would have to be gathered in order to make it possible nowadays. The reader will go to the evidence that it would be quite problematical, despite the fact that France may suffer repeated droughts...

Besides, without human organizations tailored at the relevant scale according to a time scale sometimes even longer, infrastructures and equipment would not be as efficient as can be. This text is showing collective

⁴⁰ The International Office for Water is the Technical Permanent Secretariat of the Group <http://www.inbo-news.org>



structures, such as water users associations, that insure, through constantly inventive mechanisms not only abstraction regulation but also cost recovery.

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Main laws and regulation :

- General texts :
 - 1964, 1992, 2006 Water laws
 - Code de l'environnement
 - Circulaire du 21 octobre 2009 sur la mise en œuvre du relèvement au 1^{er} janvier 2014 des débits réservés des ouvrages existants.
 - Circulaire du 3 août 2010 relative à la résorption des déséquilibres quantitatifs en matière de prélèvements d'eau et gestion collective des prélèvements d'irrigation dans les bassins où l'écart entre le volume prélevé en année quinquennale sèche et le volume prélevable est supérieur à un seuil de l'ordre de 30 %
 - Circulaire du 30 juin 2008 relative à la résorption des déficits quantitatifs en matière de prélèvement d'eau et gestion collective des prélèvements d'irrigation
 - MEDDEM. 2007. Guide d'instructions relatif à la police des autorisations hydroélectriques d'une puissance inférieure ou égale à 4 500 kW.
 - MEDDEM. 2010. Guide pratique relatif à la police des droits fondés en titre.
 - loi de 1919 pour l'énergie hydroélectrique
 - textes institutionnels relatifs aux ASA : loi de 1865, décret du 18/12/1927, ordonnance 632 du 1/7/2004
 - textes institutionnels relatifs aux SAR : loi de 1951, décret de 1955, loi de décentralisation de 2004 (article 31)

- texts specific to the Durance-Verdon system :
 - loi du 4/7/1838 (droits d'eau sur Durance-Verdon pour Marseille et Aix en Provence)
 - décrets consécutifs : 25/5/1864 et 19/6/1867, augmentant les droits de Marseille
 - décret de concession du Canal du Verdon à Aix : 20/5/1863
 - loi du 11/7/1907 : réglementation des eaux de la Durance à l'aval de Pont Mirabeau
 - décret du 14/8/1908 : officialise la Commission Exécutive de la Durance
 - loi du 5/4/1923 : charte du Verdon (réserves et transferts d'eau)
 - loi du 5/1/1955 : DUP Serre Ponçon, concédé à EDF / décret du 28/09/59 concédant les chutes et le canal aval Serre Ponçon jusqu'à l'étang de Berre

- Conventions EDF/Min Agri du 24/11/53 ; conventions EDF/ Départements 04 & 05
- Convention EDF/ Ville de Marseille du 2/7/1962 (modalités d'alimentation du Canal)
- Décret du 15/9/1971 : concession EDF des chutes de Quinson et de Vinon
- Convention MinAgri / EDF du 22/5/1962 : alimentation du Canal de Provence par les ouvrages EDF de la chute de Vinon
- Décret du 15/5/1963 concédant à SCP réalisation et gestion du canal de Provence
- Convention MinAgri/SCP : affectation des réserves Verdon, à financer par SCP

Websites :

<http://ec.europa.eu/environment/water/water-framework/>

<http://www.developpement-durable.gouv.fr/>

<http://www.gesteau.eaufrance.fr>

<http://www.inbo-news.org>