

EURO-MEDITERRANEAN REGIONAL PROGRAMME  
for Local Water Management ME8/AIDCO/2001/0515/59763-P 016

# ISIIMM project:

## Case studies synthesis

### *France*



Institutional and Social Innovations in Irrigation Mediterranean Management

# ISIIMM

**“Promoting an integrated and balanced management of water resources by reconciling respect for the environment with economically viable irrigated agriculture»** is the objective of a local dialogue operation between farmers, development professionals, scientists and various stakeholders. This concept has served as a reference for the Institutional and Social Innovations in Irrigation Mediterranean Management project (ISIIMM) led by Agropolis International (France).

ISIIMM is a Euro-Mediterranean regional project funded by the European Commission “EU-MEDA Water” involving six countries: Egypt, France, Italy, Lebanon, Morocco and Spain. The aim of the ISIIMM project was to share experiences, knowledge and build new perspectives for sustainable water management in Mediterranean agriculture, based on a common understanding of six key mechanisms: Social, Institutional, Historical, Agricultural, Territorial, Hydrological/Hydraulic.

A comparative, progressive and participatory approach was adopted between different stakeholders coming from the eleven selected study areas where water is a central topic issue to social and economic life.

The ambitious and challenging activities of the ISIIMM project were built upon a framework of regional network co-operation systems. Many multi-national and multi-sectoral teams worked together with the support and organisational efforts of project partners.

With a primary objective to help local rural communities adapt to the emerging problems resulting from pressures on water resources, two priorities guide the project: a) working with local irrigation organisations; and b) working with the development professionals.

Three main activities were developed with the participation of the target groups.

**Diagnostics for action** in each of the 11 river basins (national and local case studies) leading to new water-sharing behaviours and institutional innovations. This was focused on a statement of conditions and aims for each river basin and country using a participatory approach and based on existing documentation plus the scientific assessment of the ISIIMM experts.

**Social and institutional innovations** have been approached through the **concrete actions** on the ground and a wide series of **training workshops and exchange seminars** complemented by field visits with farmers, managers of public organisations and canal managers. In total, 19 international workshops and seminars and around 35 local and national meetings and trainings

were organised with participation of more than 1500 persons to enable the target groups to gain a wider vision of the problems in Mediterranean irrigation management and more references to solve them in more suitable ways. Concrete actions (SWaMMA (Solid Waste Management in Mostafa Agha) micro-project in Egypt, AIRMF (*Association des Irrigants des Régions Méditerranéennes Françaises*) in France, Irrigators association in Lebanon, wider stakeholder participation in decision making in Morocco, pluri-stakeholders involvement at regional and local level in Italy and Spain) have been initiated with local stakeholders and will be continued thanks to the strong relations developed.

An **extensive information and data base system called OSIRIS** has been developed to enable target groups to access information about the ISIIMM case studies and compare this with their own situations ([www.isiimm.agropolis.fr](http://www.isiimm.agropolis.fr)).

In addition, a concerted effort was being coordinated to distribute this information through books, films, newsletters, guides and other media. ISIIMM has been contributed to mutual learning and knowledge transfer at local, national and regional scales.

#### The EU Partners are:

- In France: Chambre Régionale d’Agriculture du Languedoc-Roussillon (CRALR), VERSeau Développement
- In Italy: Autorità di Bacino dei fiumi Isonzo, Tagliamento, Livenza, Piave, Brenta-Bacchiglione (ABAA), Fondazione Eni Enrico Mattei (FEEM)
- In Spain: Universidad Politecnica de Valencia (UPV), Unidad Sindical de Usuarios del Júcar (USUJ)

#### The MEDA Partners are:

- In Egypt: Center for Rural Development Researches and Studies (CRDRS), Egyptian Association for Sustainable Rural Development (EARSUD)
- In Lebanon: Chambre de Commerce, d’Industrie et d’Agriculture de Zahle et de la Bekaa (CCIAZ)
- In Morocco: University Cadi ayyad (UCAM), Association Al Majal

#### Scientific Partner:

- IRD

#### Lead Partner:

Agropolis International (France)  
 Avenue Agropolis, F-34394, MONTPELLIER CEDEX 5  
**Contact person:** Michel SOULIÉ, [soulie@agropolis.fr](mailto:soulie@agropolis.fr)  
[www.agropolis.fr](http://www.agropolis.fr)

# **ISIIMM project:**

## Case studies synthesis

# *F r a n c e*

### *Synthesis of the French case studies*

- *Durance*
- *Têt*

This document was written by the ISIIMM French team:

#### ***National Coordination***

- Stéphanie BALSAN - Chambre Régionale d'Agriculture Languedoc-Roussillon

#### ***Facilitator for the Têt case study***

- Jacques FERAUD - Chambre d'Agriculture des Pyrénées Orientales

#### ***Facilitators for the Durance case study***

- Noël PITON – Chambre Régionale d'Agriculture Provence-Alpes-Côte d'Azur
- Claude BAURY – Chambre d'Agriculture des Bouches-du-Rhône



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## 1. INTRODUCTION

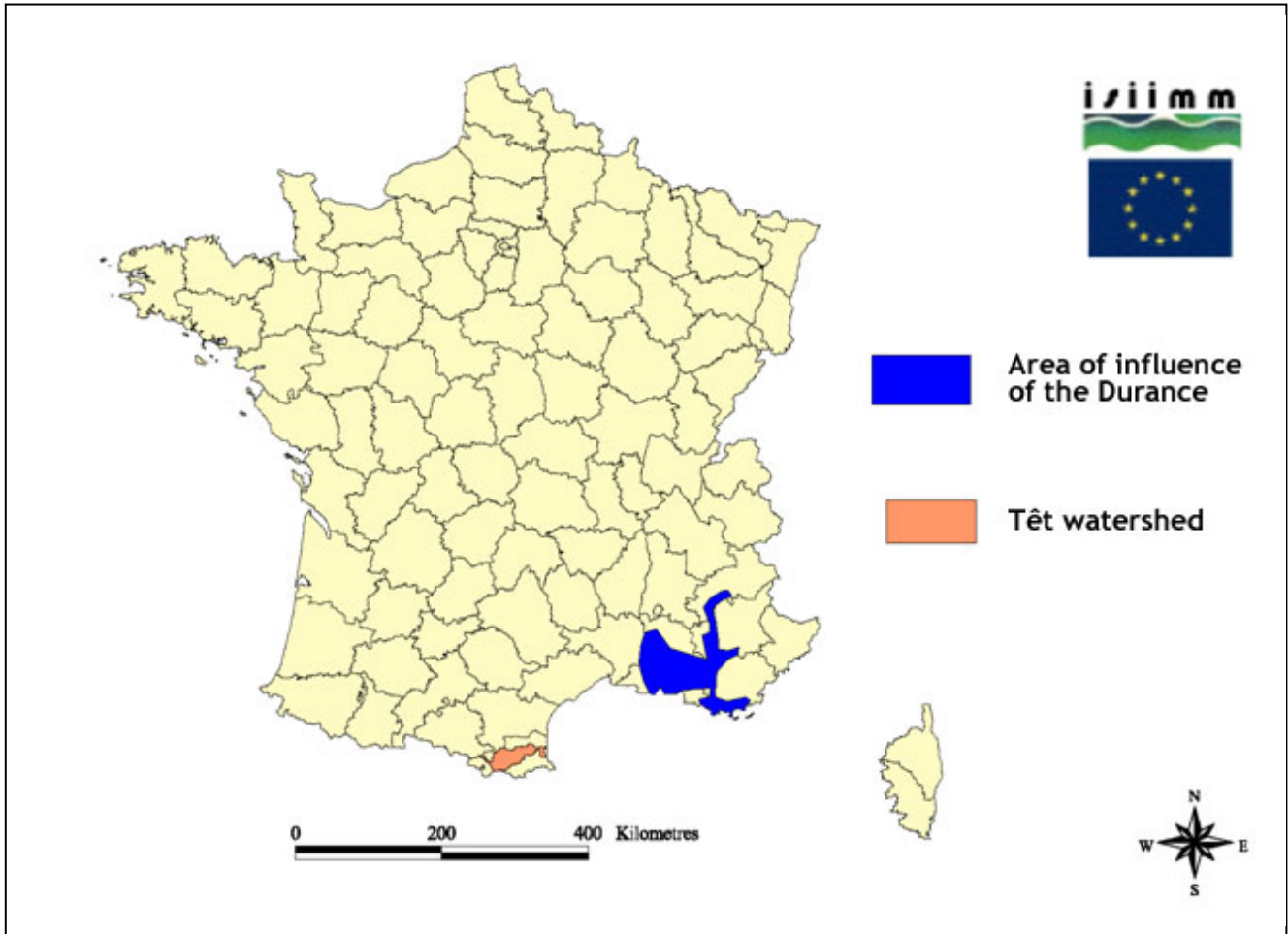
The main aim of the ISIIMM project: ***“identify and deal with the current contradictions associated with the local management of water for irrigation in Mediterranean watershed areas through innovatory social and institutional solutions...”***

The context of water management in the two French Mediterranean regions falls squarely within this objective. The *Languedoc-Roussillon* and the *Provence-Alpes-Côte d’Azur* (PACA) regions offer an historical, social, institutional, hydraulic, and agricultural richness... which places irrigation canals at the very heart of land planning and development.

- **historical:** our forefathers built an exemplary grid of irrigation canals, which we should take care of, maintain and develop.
- **institutional:** water management takes place in a concerted way, with the different water users, the local authorities and the administrative bodies.
- **social:** the management of the irrigation canals is one example of water management and a democratic operation. The principle for the management of the installations by Owners Associations.
- **hydraulic:** several thousands of kilometres of irrigation canals cross the Mediterranean territory. Here there is a variety of hydraulic installations: clay or modernised gravity-fed canals, pressurised irrigation canals the result of large planning developments.
- **agricultural:** these irrigation canals are generally managed by the agricultural community so as to satisfy its needs in water. Faced with a climate marked by droughts linked to the Mediterranean region, water is vital for agriculture.
- **territorial:** the irrigation canals are an integral part of the landscape, they daily fashion our so characteristic Mediterranean territory

This traditional management of these canals is gradually being shaken by a changing regulatory context and increasingly conflicting links with other users of the resource. The canals should begin a process of adaptation so as not to lose their place and their role in a territory shared between all the water players.

The project MEDA ISIIMM – France is based upon **2 study sites: the River Durance (in the PACA Region), and the Têt Valley (in the Languedoc-Roussillon Region)**. It undertakes both a territorial, historical, hydraulic, institutional ... etc. presentation of these 2 sites, and an approach to the social innovations, in the context of water management, and provides recommendations.



Map 1. Location of the ISIIMM sites

The Durance and Têt basins are two Mediterranean valleys of the *Languedoc-Roussillon* and *Provence-Alpes-Côte-d'Azur* regions irrigated since the Middle Ages by a dense network of gravity-fed canals.



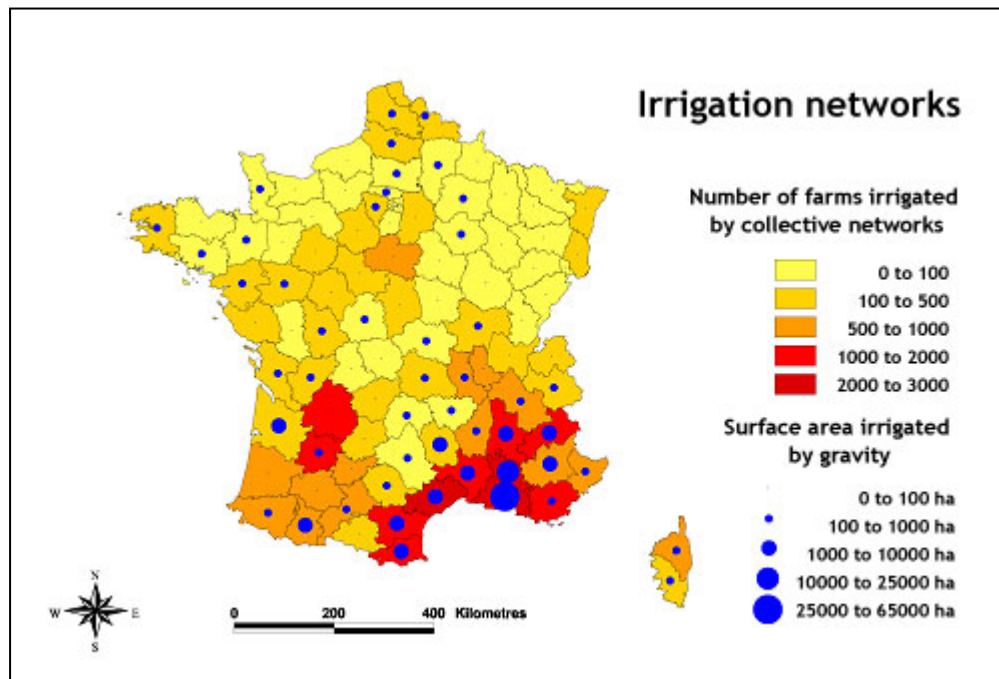
## 2. CONTEXT

### 2.1. GEOGRAPHICAL FRAMEWORK–MEDITERRANEAN SPECIFICITIES OF THE COUNTRY

The *Languedoc-Roussillon* and *Provence-Alpes-Côte-d'Azur* regions are two regions subjected to the Mediterranean climate. This is translated by a recurrent summer drought and torrential autumn rains. From the moment that these territories were occupied by Man, it became necessary to transfer this water from the zones which were well provided (springs, mountain areas) to the regions which were deprived by Nature. Further, even if initially the justification for these undertakings was to supply water for towns, they have always has a multi-use vocation which continued with the development of irrigation. In this context, irrigation does not represent a comfort factor or a complement, but proves to be indispensable for the majority of the crops: grasslands in the mountains or on the plains, fruit and vegetables, diversified farming.

Another specificity of the two regions, the importance of the gravity-fed networks, both in the mountain and on the plain: more than 1,300 networks servicing 250,000 hectares (625,000 acres). They are at the origin of the collective organisation of irrigation which is the rule here, unlike the other French regions. They are also at the origin of the *positive externalities* which have been discovered in the past few years: stocks for the springs and underground aquifers, creation of wetlands, evacuation of rainwater, protection against wildfires...

In practically in all regions of the countries south of the Mediterranean, irrigation is indispensable for agricultural production. It is the leading use for water (82% of the total consumption), faced with the increase in needs of the population and the development of seasonal needs for tourism. Alongside the old gravity-fed networks, and the large networks developed in the 20th century, individual well drilling is on the increase, running the risk of leading to the over-exploitation of the underground aquifers.



Map2. The types of irrigation network  
Sources: RGA and Chamber of Agriculture PO production

## 2.2. HISTORIC EVOLUTION

The first hydraulic installations were those of the Romans (1<sup>st</sup> – 5<sup>th</sup> century), for the supply of drinking water, the thermal baths and the irrigation of gardens. It would seem that the development of the first canals for irrigation use in the South of France date from the period of the Wisigoths (5<sup>th</sup> – 8<sup>th</sup> century). The link between the use of the resource and ownership of the land is explicit in Wisigoth law (*liber juridicum*).

After the Arab invasion and the Carolingian “re-conquest”, there began a period of planning and economic development under the impulse of the abbeys and the *seigneuries* which structured the territory (9<sup>th</sup> – 10<sup>th</sup> centuries). A number of canals were created for the provision of hydraulic energy (mills, forges, textiles, timber rafting), drinking water, cleanliness and for irrigation. Archives reveal in the deeds of sale, the link between the right to water and ownership of the land. It is probable that the Arabo-Andalusian “transfer of technology” in the water mastery domain took place during this period.

With the emancipation of the Counts of Toulouse (and the Marquises of Provence) and Barcelona (not forgetting the Count of Cerdagne and Roussillon and the Count of Provence) *vis à vis* the House of Capet 12<sup>th</sup> century), the latter instituted the State ownership of running water.

Any authorisation to build a canal and the use of water became subordinated to a concession (gratuitous or subject to payment), granted to an individual or more often to a “university of inhabitants”. These communities of users nominated agents responsible for the administration of the canal and the drawing up and the application of the regulations. Numerous canals continued to be built from the 13<sup>th</sup> to the 16<sup>th</sup> century in the regions which depended on the Pope and the Court of Aragon.

Following their conquests in Italy, the Kings of France granted from the 16<sup>th</sup> century onwards numerous concessions to towns or enterprising private individuals to build canals so as to develop irrigation in the South of France. A number of projects were never to see the light of day or were to fall by the wayside for financial reasons, others were to be given extensions so as to service new territories. The old regime also witnessed the development of the system of delegated management of the canals by leasing them.

The Revolution formalised the ancient feudal rights which are not considered as privileges. The Law of 3 May 1795 gave a legal status to owners' syndicates. In the 19<sup>th</sup> century, the engineers from the *Ponts et Chaussées* engineering school built large networks for the development of irrigation, the submersion of the vines (to combat phylloxera) and for energy use. The management of these installations was handed over to *Associations Syndicales* (Syndicated Associations), Authorised or Forced (ASA or ASF), created at the initiative of the Law of 1865. Dams were also built to regulate the resource. Within the space of 20 years, the irrigated surfaces increased by 500,000 hectares (1,250,000 acres). On the initiative of central government, the managing syndicates of the traditional canals were transformed into ASAs. It would seem that more than 2,500,000 hectares (6,250,000 acres) were irrigated or irrigable at the end of the 19<sup>th</sup> century.

The ravages of the First World War and the rural exodus, together with the disappearance of the mills, led to the abandoning of a number of networks and a reduction in the irrigated surfaces, in particular in mountainous areas or their foothills. The second half of the 20<sup>th</sup> century was marked by the creation of the *Sociétés d'Aménagement Régional* (Regional Development Societies) and the building of large structuring installations in the regions of the South of France. In the concessions of the SARs, the irrigator is not the holder of a right to water, but a customer who benefits from a renewable contract for the supply of water.

During the past 30 years, and following the drought of 1976, irrigation has developed especially in the regions of the West and the Centre of France from extractions by individuals from rivers or ground water, essentially for watering maize, prized in the context of the Common Agricultural Policy.

In the Mediterranean regions, within the boundaries of their influence the ASAs introduced pressurised networks, for sprinkling or drip watering, while keeping the gravity-fed networks. The main crops irrigated are fruit, vegetables and animal forage. The two SARs deliver increasing amounts of untreated water to meet the requirements of manufacturing industries and local authorities.

In the South West, ASAs have been created to develop collective pressurised networks fed by extraction from rivers, sometimes re-stocking by the CACG. The irrigation of maize predominates here, alongside fruit and vegetable crops.

In these newly irrigated regions, it is essentially the individual installations that have exploded (extraction from rivers, drilling into aquifers, hillside storage reservoirs...). In these areas, authorisation to take water is granted by the Prefect (of the Department) with the overall management of water resources still not being a preoccupation for the public authorities and the legislators. This management of demand, without a concern for the harmonisation between resources-requirements, is at the origin of large imbalances and conflicts of use observed in recent years.

*Overall, the irrigated surface areas amounted to 2,000,000 ha (5,000,000 acres) at the beginning of the 21st century, to be found above all in the regions of the south west and the centre of France. With the rise in environmental preoccupations since the 1980s, irrigation is singled out, accused of drying out rivers and exhausting the aquifers, polluting the resource and not paying for water. Every year, restrictive local bye-laws of restriction are enacted in numerous Departments.*

## **2.3. THE WATER PLAYERS AND INSTITUTIONS**

The French water management institutions are the result of the piling up of successive reforms in water policy, decentralisation and the transfer of competence from the State to local authorities.

Four large types of player and Institution in the irrigation domain may be distinguished in France: the administration, the watershed organisations, the local authorities and the managers of irrigation networks. They are to be found at several geographical levels: the local, hydrographical district, national and supranational levels; with very specific roles such as financing-planning, the application of regulations, consultation – representation...

### **2.3.1. Role and intervention of the State**

According to the terms of the 1992 law, it is not the vocation of the State to provide direct responsibility for the operational management of water resources: it is fundamentally the guardian of it.

Its authority should guarantee respect for the regulations which is necessary to reconcile and frame the uses of water which are subject to a declaration or an authorisation and involve the installation of appropriate means for measuring and evaluation.

The drawing up and the updating of the regulations should of course be carried out in consensus with the members of the water community, so that the users in infraction to these regulations remain marginal and the policing of water is really applied.

The preservation of water and the aquatic environment is assigned to the Ministry of Ecology and Sustainable Development. This ministry is therefore responsible for writing proposals of laws or decrees which will be examined respectively by the National Assembly (and the Senate) and the Government. It is also responsible for the coordination of the Regional Departments of the Environment (DIREN) and the writing of directives or circulars for the application of the laws and decrees. The State depends upon the recommendations of two instances: the Supreme Council for Public Health and the National Water Committee.

A number of public services and State establishments intervene in the management of water at the local level. Among these, the DDAFs (*Direction Départementale de l'Agriculture et la Forêt – Department of Agriculture and Forestry*) and the MISEs (*Mission Inter Services de l'Eau – Interdepartmental Water Mission*), under the authority of the Prefect, are the most heavily involved in terms of irrigation.

The Prefect is locally the head of the set of de-concentrated State services. He facilitates and coordinates water policy in terms of policing and the management of water resources, so as to ensure the unity and the coherence of the de-concentrated State actions.

### 2.3.2. Watershed organisation

In the context of the law on water of 1964, an "**Agence de l'Eau**" (Water Agency) was created in each of the six basin circumscriptions which has the form of a public administrative establishment granted a civil personality and financial autonomy:

The mission of these Agencies is to facilitate the various actions of interest common to the watershed with a view to ensuring the equilibrium of the resources and the requirements in water, to achieve the quality objectives fixed by the regulations, to improve and increase the resources, as well as fight against flooding. The domain for its intervention covers surface waters, groundwater and the territorial water at sea.

They collect the fees based on the extraction and the discharges. Then, they redistribute this income by granting subsidies to facilitate the creation of works which help to improve the management of the resource in the watershed.

**The Watershed Management Committee**, veritable water parliament in charge of the consensual, joint preparation, between the users, the elected representatives and the State administration, of an overall and balanced management policy for water and the aquatic environment throughout one of the six large French hydrographical basins. It is composed of representatives of local authorities (local councillors) users' representatives and associations, as well as central government.

The **Watershed Management Committee**, chaired by a local councillor, has a fundamental role of orientation and impulse: It draws up and adopts, following the opinion of the Regional and General Councils, the **Schéma Directeur d'Aménagement et de Gestion des Eaux** (Master Plan for the Development and Management of Water) (**SDAGE**) which determines for each watershed or grouping of watersheds, the fundamental orientations for a balanced management of water in both quantity and quality.

The SDAGEs take account of the main programmes agreed by the local public collectivities and define, in a general and harmonised way, the quantity and quality objectives of the water, as well as the improvements to be made to achieve them. They delimit the boundary of the sub-watersheds corresponding to the hydrographical units.

The Watershed Management Committee is consulted about the rates and the bases for the fees perceived on the extractions and the discharges by the Water Agency, instituted in the watershed, as well as on the priorities of the five year programmes for the intervention of the latter and the terms and conditions of the aid of the Agency for investments and the good running of the public and private installations and for the treatment of water.

**The Water Agencies** are the executive organ of the Watershed Management Committees: the fees that they collect in compliance with the decisions voted by the Watershed Management Committee, incite the polluters and consumers to pollute less and consume less; this encouragement to behave correctly is backed by an encouragement to invest well, since the product of the fees is assigned to the financial aid for actions of de-pollution and conservation/development of the water resource: the agencies contribute particularly, for irrigation, in the investments of modernisation and regulation of the installations of extraction, supply and distribution. After the running in of the system, for nearly thirty years, its founding

principles of solidarity and equity ("polluter-payer" and "extractor-payer") have been well assimilated by the collective conscience.

#### *Local level: concerted planning on the watershed scale*

At the local level, the different French laws have enabled the introduction of two very different procedures, the SAGE and the Environment Contract.

**The SAGE (*Schéma d'Aménagement et Gestion de l'Eau*)** (Plan for the Development and Management of Water) has a regulatory scope for its recommendations have the power of law and are imposed on all the administrations and, in the new law on water, on any physical or moral entity, public or private. The legitimacy of the SAGE is based upon the acceptance by a CLE (*Commission Locale de l'Eau* - Local Water Commission) of a management diagnosis and objectives. This CLE is composed of local councillors (50 %), local administrations (25 %) and representatives of users and associations for the protection of consumers or the environment (25%).

**An Environment Contract (*Contrat de Milieu*)** (river, lake, aquifer, bay...) is based upon a strong mobilisation of local councillors, local residents and users on a coherent territory around a common project to rehabilitate and exploit their aquatic heritage.

Collective objectives are defined. They are then translated into a development and management programme taking advantage of the ecological potential of the watercourses or aquatic environment.

The Environment Contracts should guarantee balanced management ensuring both the satisfaction of the quantitative and qualitative uses of water, the preservation of the aquatic ecosystems, the prevention of the risk of floods, the protection, the exploitation and the development of the resource, in a perspective of sustainable development.

They should contribute to the installation of a management structure for the river which will provide its monitoring and upkeep beyond the duration of the contract.

For a number of years, the RMC Watershed Agency has instituted the Canal Contract which, on the model of the Environment Contract but on the scale of general large canals, achieves the introduction of a programme of work which synthesises the set of objectives fixed by the Canal Committee, objectives and programme also submitted to the approval of the Watershed Committee. These Canal Contracts also bring together the State (DDAF), the local stakeholders (Borough Councils, Department and Region).

### **2.3.3. The territorial collectivities**

**The territorial collectivities are to be found at local level.** Here the term "collectivities" means all the Borough Councils or groupings of boroughs (Syndicates or Communities), Departments (General Councils, County Councils) and Regions (Regional Councils).

These collectivities today have no institutional or regulatory legitimacy for the management of water resources on the watershed scale; however, they are involved in numerous structures for the management of drinking water networks, irrigation or waste water disposal.

#### *- The Region: financing and planning*

In the water domain the Region may more particularly intervene by subsidising investments of regional interest

- *The Department: financing and planning*  
 Since Decentralisation, the Departments have consolidated their place in the investment process in terms of water and waste water disposal: they are today a privileged partner of the Borough Councils and also provide them with technical assistance.  
 The Departments may also intervene financially, in partnership with the Water Agency and the Region to support projects for the mobilisation of the resource, hydraulic installations or for the modernisation of networks.
- *The Borough Councils: management of networks*  
 The Mayor provides a power for the general policing to ensure public order and security or to fight against pollution. He also, possesses a number of powers for special policing.

### 2.3.4. The managers of irrigation networks

*. At the Hydrographical District level: representation and defence of the Mediterranean irrigators*

In 2003 the *Association Des Irrigants des Régions Méditerranéennes Françaises* (Association of Irrigators of the French Mediterranean Regions) was created to bring together:

- The Chambers of Agriculture (Departmental and Regional) of the two regions, PACA and LR
- The Network Managers: ASA, ASF, SAR, Collectivities, as well as the *Fédérations Départementales des Structures d'Irrigation* (Departmental Federations of Irrigation Structures)
- The Agricultural Syndicates of the two regions PACA and LR

The aim of this Association is to defend legally, institutionally and politically, the irrigation of the French Mediterranean regions. Today, it works essentially on the project of law for water, the prescription of administrative simplification of the ASAs, the Water Framework Directive (WFD) and generally, on the upkeep of the policy of town and country planning which, since the recent regulatory evolutions passes to the second level behind the environmental priorities. This Association is a member of the EIC.

*. Also to be found at the local level the managers of irrigation networks.*

There are to be found three large types of management structures:

- The Syndicated Associations of Owners (ASA or ASCO)
- The local collectivities
- The Regional Development Societies (SAR)

	<b>Associations</b>	<b>Collectivities</b>	<b>SAR</b>	<b>Total</b>
<b>PACA</b>	<b>606</b>	<b>57</b>	<b>1</b>	<b>664</b>
<b>Languedoc-Roussillon</b>	<b>417</b>	<b>18</b>	<b>1</b>	<b>436</b>

*Table 1. Inventory of the management structures of hydraulic networks of the two regions*

### *The associations of owners: local organisation and management*

One of the main features of irrigation networks, whether gravity-fed or pressurised, is the interdependence between the hydraulic installations and the territories that benefit from them: the irrigable boundaries. The agriculturist does not become an irrigator because his plot of land is serviced by a canal or a hydrant which improves his potential of production and therefore gives him added value for his land. It is this close liaison land/collective installations which is the basis of the first French legislation on the Syndicated Associations of Owners the aim of which was to have all the owners who took advantage of this added value participate in the financing of the undertaking.

Other than the financial aspects, the Association of Owners answers another imperative of irrigation: the need for management on the scale of the hydraulic unit (plots of land serviced by a hydrant, a network, a branch of a canal...). The fixing and the application of the rules for sharing water between irrigated plots or the sharing of financial charges between beneficiaries are indissociable from the use of the land. The Association of Owners enables the rules to be adapted to all the needs of the irrigators and their evolution. The irrigable boundary, delimited by the possibility of the service of water, corresponds to the limit of the syndicate, the members of which are owners of the plots and represent the management structure of the network. For much larger networks, built of several hydraulic units, the associations may group into unions or federations.

The articles of association fix the functioning of the association and the way in which the delegates are nominated, in charge of the good running of the association, the establishment and the review of the water regulations, their application, the arbitration of conflicts, the representation and the defence of the interests of the association *vis-à-vis* third parties and the public authorities. The public establishment character of these associations bestows upon them recognition of a legitimacy in the eyes of the administration and the watershed organisations. It also gives the membership fees the status of dues, which may be recovered in the same way as taxes, and guarantees the financial solidity of the associations.

Experience shows that the effectiveness of these associations is conditioned by the acceptance of their rules (technical, financial, administrative, and disciplinary) and by all their members. For that reason, these rules and their application should in permanence be transparent, fair and equitable.

**Several types of Syndicated Association** (Authorised, Automatically Constituted or Free) may be distinguished but the most numerous have the status of public establishment and are the official representatives of the public utility of the installations for which they are responsible. Their internal operation is certainly complicated since it is assimilated to that of local the collectivities but the strength of their existence is directly linked to this complexity.

**The Regional Development Societies** (*Sociétés d'Aménagements Régionales*) (**SARs**) were created in the 1950s-1960s, for town and country planning purposes in regions where water proved to be a factor limiting development. These structures are characterised by the originality of their mission and their status. The vocation of these Regional Development Societies is to “contribute to the material and economic development of the regions”.

Other than the Canal de Provence, the SCP has built a number of installations and irrigation networks. It also ensures the operation and the maintenance of the latter for its own account or that of other collectivities (ASAs or Intercommunity Syndicates).



Created in 1955, the *Compagnie Nationale d'Aménagement de la Région du Bas-Rhône et du Languedoc* (BRL) (National Lower Rhone and Languedoc Development Company) is one such regional development society whose prime vocation is to *contribute to the material and economic development of the Languedoc-Roussillon Region*. Its original status has evolved so as to take account of the transformations of its economic environment.

Table 2 below presents a synopsis of the institutions and players in the water domain in France for the 4 territorial levels (supranational, national, hydrographical district and local level).

For each level, the organisations which intervene are identified as well as their main missions.

	Administrations	Watershed organisations	Territorial collectivities	Irrigation network managers
Supranational level	European Union	INBO		Euro-Mediterranean Irrigators Community
	Directives Financing	Consultation Information		Representation
National level	Ministry of Ecology and others	ONEMA		
	Regulations and application	Inter-basin solidarity Surveillance Information		Association of Irrigators of the French Mediterranean Regions
Hydrographical district level	DIREN Watershed	Water Agency		Representation Information
	Surveillance Regulation application	water policy / financing SDAGE Fees/financing Surveillance of		
Local level	De-concentrated services of the Ministries	River syndicates, mixed syndicate	Region	Departmental Managers Federations
			Department	Representation and services to members
		SAGE: local management rules Environment contract: Work	Borough	ASA, SI and Boroughs
	Regulatory control Financing		Network management Policing	SAR Network creation and management

Table 2. The Institutions and players in the water domain

## 2.4. THE REGULATORY CONTEXT

Centuries of regulations: For the past 2 centuries and even previously, the water domain has been the subject of an enormous amount of legislation and regulations. Gradually, a system of successive strata has been built to respond to the needs of different periods.

Gradually, preoccupations of health and public safety and today the protection of the environment have been added to the rights of the owners and the users.

### 2.4.1. The overall principles of the 1992 water law

The **law on water of 3 January 1992** consecrated within French law the notion of the overall management of the water resource, based upon the principle of solidarity between the users and an appreciation of water in all its forms: vital resource, ecosystem, support for activities, etc. So as to guarantee the implementation of this approach, a certain number of tools were created, new means were entrusted to the controlling authorities and a larger place was granted to the public. **The SDAGE and the SAGE** are two such examples.

**The SDAGE** fixes the orientations for intervention for 6 years on the districts and directly influences the decisions of the Water Agency (aid and fees). It should be approved by the State representative (Prefect of the Watershed region).

**The SAGE**, on the more local scale of a coherent hydrographical unit (watershed for surface waters and aquifer for groundwater), also fixes rules for the management of the aquatic environment. These rules may also, as is the case of the SDAGE, be enforceable on decisions of the administration.

**The Law on Water is centred on 4 fundamental principles:**

**Management which reconciles economics and ecology.** This new vision is based upon the principle of a unique resource that should be managed by reconciling economic interests and ecological equilibrium. **Local management of the resource.** The Law on Water lays down the principles of the local management of the resource based upon a new tool and depending on the collectivities. **The fight against pollution and waste** and a **high degree of transparency.** One of the objectives of the Law on Water of 3 January 1992 is the transparency in terms of information of the councillors and the public. This information is to be found at several levels and should enable a closer association between citizens and the management of the resource.

### 2.4.2. A new law on water adopted on 30 December 2006

The new Law on Water and the Aquatic Environment was enacted on 30 December 2006. It provides the tools to the administration, the territorial collectivities and the players in the water domain to reinforce the application of the Water Framework Directive (WFD) and by 2015 achieve the fixed objectives good ecological status.

Other than the provisions making the fees of the water agencies constitutional and homogenising them, it confirms the right of access of everyone to drinking water “in economically supportable conditions”.

It bolsters the system of the SDAGEs and the SAGEs which are the privileged means for the achievement of the good status of the masses of water and respect for the commitments of the WFD.

As regards the quantitative management, it introduces regulatory tools which enable the administration to implement a collective management in areas with deficits.

This law reinforces the notion of reserved delivery/flow by increasing the volume to be left in the water courses, which leads to strong constraints on the extractions in the Mediterranean areas which are naturally subject to severely low summer water levels.

### 2.4.3. The European Water Framework Directive

The policy of the fight against water pollution is the oldest of environmental policies in Europe. **Since 1975, more than 30 European directives or decisions have been adopted in the fresh water and sea water pollution domains.**

This directive obliges France, as it does the other Member States, to achieve between now and 2015, a good ecological status of the masses of water except in the event of postponement or derogation.

The directive provides for a system which resembles the French organisation: "**hydrographical districts**" should be introduced on the scale of the large watersheds. In each of these districts between now and 2009 "management plans" should be prepared which define the objectives to be reached and "programmes of measures" defining the actions necessary, the implementation of which is to be co-ordinated by "**competent authorities**" (the Prefects, watershed co-ordinators in France).

The RMC Water Agency is piloting the work and the reflections over the whole of the RMC district. The Agency was determined to associate all the users in each stage. The Chambers of Agriculture, the canals and the Federations participated in the consultation meetings with the intention of underlining the stakes of Mediterranean agriculture and the specificities in hydraulic management.

Twice per year, Geographical Commissions take place. They bring together all the users on a single coherent hydrographical unit. They are used to validate each stage and to consult "the public".

3 Geographical Commissions are in the study areas:

- Coast, Provence, Côte d'Azur - Toulon
- Durance,
- West coast.

## 2.5. THE HYDRAULIC INSTALLATIONS

Over the centuries, on the Mediterranean Rim, the construction of hydraulic installations has been accompanied by the creation of a management structure, drawn up according to the rules of their period. It is for this reason that the management of the hydrological installations and the water resource is carried in a collective manner in our regions.

The collective irrigators are either in Syndicated Associations of Owners, Intercommunity Syndicate, or customers of an SAR.

This collective organisation extends beyond the natural limits of the watersheds, since we talk mainly of the transfer of water from one watershed to another (e.g. the case of the Durance whose waters are transferred by the Canal de Provence to the Mediterranean Coastal area). *Map 2: Types of irrigation networks (p 5)* images well the predominance of the gravity irrigated surfaces, as well as the number of exploitations irrigated by collective networks in our Mediterranean regions.

### 2.5.1. The irrigation networks

#### *a) Gravity-fed irrigation networks*

The history of the Durance and the Têt is indissociable from that of the hydrological installations and the men who contribute to them, in the early stages for its driving force, then more widely for irrigation and the supply of drinking water and the cleanliness of the towns and cities, and finally for the service of water for multiple uses over a large part of the regional territory.

Other uses, albeit indirect have become equally essential: the re-stocking of the aquifers and springs from which a good number of collectivities take their supply of drinking water (Arles, Salon, Avignon, Perpignan, and some small mountain boroughs), the evacuation of rainwater, protection against natural risks, fire-fighting, as well as the development of tourism through the upkeep of contrasted and luxuriant landscapes in an ocean of natural aridity.

One of the main handicaps of this method of irrigation remains of course the importance of the flows used, even if nowadays the extractions take place, for the Durance as for the Têt, on rivers which are re-stocked by dams. The other major problem resides in the importance of the labour necessary to bring and distribute the water to the plots and the constraints of the water reel (night watering).

#### *b) Pressurised networks*

Of more recent construction, these networks have essentially developed on the territories of the Durance and the Languedoc since the end of the 1950s, in the context of the State concessions of the two regional development companies: the *Société du Canal de Provence* (SCP) and the *Compagnie Nationale d'Aménagement de la Région du Bas Rhône Languedoc* (BRL). As for the canals of the end of 19<sup>th</sup> century, these large structuring installations take their place in a policy of town and country planning and development with the impulse coming from the State (Plan Commission).

Other pressurised networks are the result of the conversion or the modernisation of former gravity-fed networks (the Ventavon, Thuir, Vinça and Corbère canals) from the 1980s. Their particularity is that both networks are functional and that pressurised irrigation and gravity-fed irrigation cohabit on adjoining plots.

Table 3 below presents the main features of the 4 types of collective network management structure (ASA, ASF, SAF, intercommunity syndicates) to be found in France. For each of these structures are to be found the features concerning:

- creation,
- administration and operation,
- terms and conditions of the work and installations,
- financial dispositions.

Table 3. Comparison of management structures of collective networks

	ASA Authorised Syndicated Association	ASF Forced Syndicated Association	SAR Regional Development Society	Intercommunity Syndicate
Creation				
CONSTITUTION	Grouping of <b>owners (often agriculturists)</b> who need water: they create an ASA and define the project	The <b>State</b> decides to create an ASF in a sector. Concerns structuring projects, on large territories, with the retrocession of the installations to the ASF.	The State and the local collectivities concede the planning and development of the territory and the management of water (schedule of requirements) on a regional scale	Certain boroughs and agriculturists are at the origin of the project
Administrative and Operational Organisation				
STATUS	Public establishment	Public establishment	Mixed economy company: private company with both private and public shareholders	Public establishment
WATER RIGHTS	Water rights are fixed by the ASA. Water rights are fixed for each plot within the boundary	Water rights are fixed at the ASA. Water rights are determined for each plot within the boundary.	The SAR is the holder of the water rights – concession	The IS is the holder of the water rights
BOUNDARY for action of the structure	The boundary of the ASA syndicate is constituted by the list of irrigable properties (plots on the land register) in a delimited sector	The syndicated boundary of an ASF is constituted by the list of properties (Land Registry nos.) in a delimited sector.	There is no delimited sector. There are hydrants throughout the network. The agriculturist is free to subscribe to a contract to have access to water or not	There is no delimited sector. There are hydrants throughout the network. The agriculturist is free to subscribe to a contract to have access to water or not
Scale	One or several boroughs	Several boroughs	Region	Several boroughs
TYPE OF AGRICULTURIST LINKS WITH THE STRUCTURE	All the owners within the syndicate boundary are members. The users are responsible for the collective management of the installations.	All the owners within the syndicate boundary are members. The users are responsible for the collective management of the installations.	They are <b>customers</b> . The irrigators subscribe to a contract for an irrigation campaign, which they may terminate when they wish. The contract may be subscribed by a collective structure	They are <b>customers</b> . The irrigators subscribe to a contract for an irrigation campaign, which they may terminate when they wish
COMMITMENT OF AGRICULTURE V/S-A V/S STRUCTURE	All the owners within the syndicate boundary, whether they use water or not, until the dissolution of the structure.	All the owners within the syndicate boundary, whether they use water or not, until the dissolution of the structure.	The irrigators subscribe to a contract for an irrigation campaign, which they may terminate when they wish.	The irrigators subscribe to a contract for an irrigation campaign, which they may terminate when they wish
BOARD OF TRUSTEES	A Syndicate Council elected by the Annual General Meeting: they are owners – they may be indemnified	Part of the Syndicate Council is elected, the other part is nominated by the Administration. They are owners or local councillors and may be indemnified.	Representatives of shareholders and State controller – may be indemnified	Boroughs (local councillors) – may be indemnified
STATE CONTROL SYSTEM	Under State supervision. It validates: *the decisions taken by the Syndicate Council *the budget and financial decisions	Under State supervision: It validates: *the decisions taken by the Syndicate Council *the budget and financial decisions	No: no supervising body. Control of the respect for the schedule of requirements – However, the SARs are obliged to keep a balanced budget (income/expenditure)	Under State supervision. It validates: *the decisions taken by the Syndicate Council *the budget and financial decisions
Work and installations				
MANAGEMENT OF INSTALLATIONS Who manages? Who takes care of the installations?	ASA or the Farmer if there is one (Farmer = delegated party)	ASF or Farmer	SAR	Intercommunity Syndicate or Farmer
MAINTENANCE OF INSTALLATIONS	Regulatory obligation to maintain the installations in a good state of repair	Regulatory obligation to maintain the installations in a good state of repair	Regulatory obligation to maintain the installations in a good state of repair	Regulatory obligation to maintain the installations in a good state of repair

	<b>ASA Authorised Syndicated Association</b>	<b>ASF Forced Syndicated Association</b>	<b>SAR Regional Development Society</b>	<b>Intercommunity Syndicate</b>
OWNERSHIP OF INSTALLATIONS	In the installations belong to the ASA	The installations belong the ASF or to the STATE	It is the State which is the owner of the installations. The SAR has a concession for a limited duration	The installations belong to the IS
OWNERSHIP OF LAND Where the installations are to be found	The land belongs to the ASA or private owners (servitudes) where the master canal is situated	The land where the master canal is situated belongs to <b>the State or private owners (servitudes)</b>	State and owners (servitudes)	IS and private owners (servitudes)
WORKS	ASA	ASF	SAR	IS
<b>Financial dispositions</b>				
INVOICING of membership fees	The ASA or the Farmer issues invoices (it is the issue of the role). The invoices are sent to the <b>owner</b> (even if it is not he who irrigates the land). Obligation to pay the Syndicate tax, whether water is used or not.	The ASA or the Farmer (it is the issue of the role). The invoices are sent to the <b>owner</b> (even if it is not he who irrigates the land). Obligation to pay the Syndicate tax, whether water is used or not.	SAR, the invoices are sent to the customers (agriculturists, irrigators)	Intercommunity Syndicate or Farmer. The invoices are sent to customers (agriculturists, irrigators)
PAYMENT AND BANKING	The Tax Collector cashes the Syndicate tax for the ASA. He also pays the expenses. If there is a Farmer, he cashes the contractualised part, the Tax Collector cashing the Syndicate part of the tax.	Tax Collector or Farmer + Tax Collector: In this case the Farmer cashes the contractualised part, the Tax Collector the Syndicate part.	SAR	Tax Collector or Farmer + Tax Collector
RATES Gravity-fed	All within the boundary of the Syndicate pay (whether water used or not), a fixed price per hectare.	All within the boundary of the Syndicate pay (whether water used or not, a fixed price per hectare.	There is no gravity-fed irrigation in the SARs	Fixed price/ha irrigated
Pressurised	Fixed price/hectare (whether used or not) + cts €/M3 according to consumption (meter)	Fixed price/hectare (whether used or not) + cts €/M3 according to consumption (meter)	A fixed rental contract linked to the discharge of the hydrant (€/m3/h) + cts of € variable part = consumption (meter)	A fixed tax linked to the discharge of the hydrant (€/m3/h) + cts of euro variable part = consumption
SUBSIDIES Structures-works Exclusive of irrigation material	Up to 80% of the works (State, Region, Water Agency, Department, EU)	Up to 80% of the works (State, Region, Water Agency, Department, EU)	Up to 80% of the works (State, Region, Water Agency, Department, EU)	Up to 80% of the works (State, Region, Water Agency, Department, EU)
Agriculturists	Yes in Languedoc Roussillon 30% - not in PACA	Yes in Languedoc Roussillon 30% - not in PACA	Yes in Languedoc Roussillon 30% - not in PACA	Yes in Languedoc Roussillon 30% - not in PACA

### 2.5.2. The network pricing structures

The price of irrigation water paid by the agriculturist in the Rhone-Mediterranean basin varies according to the region, under the effect of the variability of the needs in water of the crops, depending on the system of organisation of the irrigators (individual, Syndicated Association, Regional Development Society) and the method of irrigation (gravity-fed or pressurised).

Three large pricing structures may be distinguished:

- a fixed price pricing structure: it is based on the surface area covered and more widely used for gravity fed irrigation,
- two binomial pricing structures, which each include a fixed part (as compared with a surface area or a flow) and a variable part (as compared with a volume).

*Table 4. Pricing structures in 1997 in France*  
*Source CEMAGREF*

	Water distribution mode			Together
	By gravity	Pressurised	Mixed	
Fixed price	17.0%	13.5%	1.5%	32.0%
Binomial	-	60.5%	1.0%	61.5%
Fixed and binomial	-	1.0%	5.5%	6.5%
Together	17.0%	75.0%	8.0%	100.0%

### 3. THE STUDY SITES

The work carried out in the context of the project ISIIMM was based upon 2 case studies: the Têt Valley and the area of the River Durance watershed.

This part is devoted to the presentation of these 2 study sites.

#### 3.1. THE TÊT VALLEY

##### 3.1.1. General presentation of the study site

###### *a) The natural environment*

Bordering on the Mediterranean along fifty or so kilometres, the Department of the *Pyénées Orientales* (Eastern Pyrenees) is the most southerly in Metropolitan France. To the west, a vast mountainous area, the eastern extremity of the chain of the Pyrenees, whose summits are close to 3,000 m in altitude, etched by the enclosed valleys of the 3 main rivers: the Agly, the Têt and the Tech, whose terraces and alluvia constitute to the East, the Roussillon. Three other small basins complete the hydrography: to the West, that of the river Aude, which runs northwards towards the Department of the Aude, and the Sègre which runs southwards towards Spain, to the east, that of the Réart which ends in the *étang de Canet*. To those should be added the micro-basins of the *étang de Salses* and the torrents of the *Albères*.

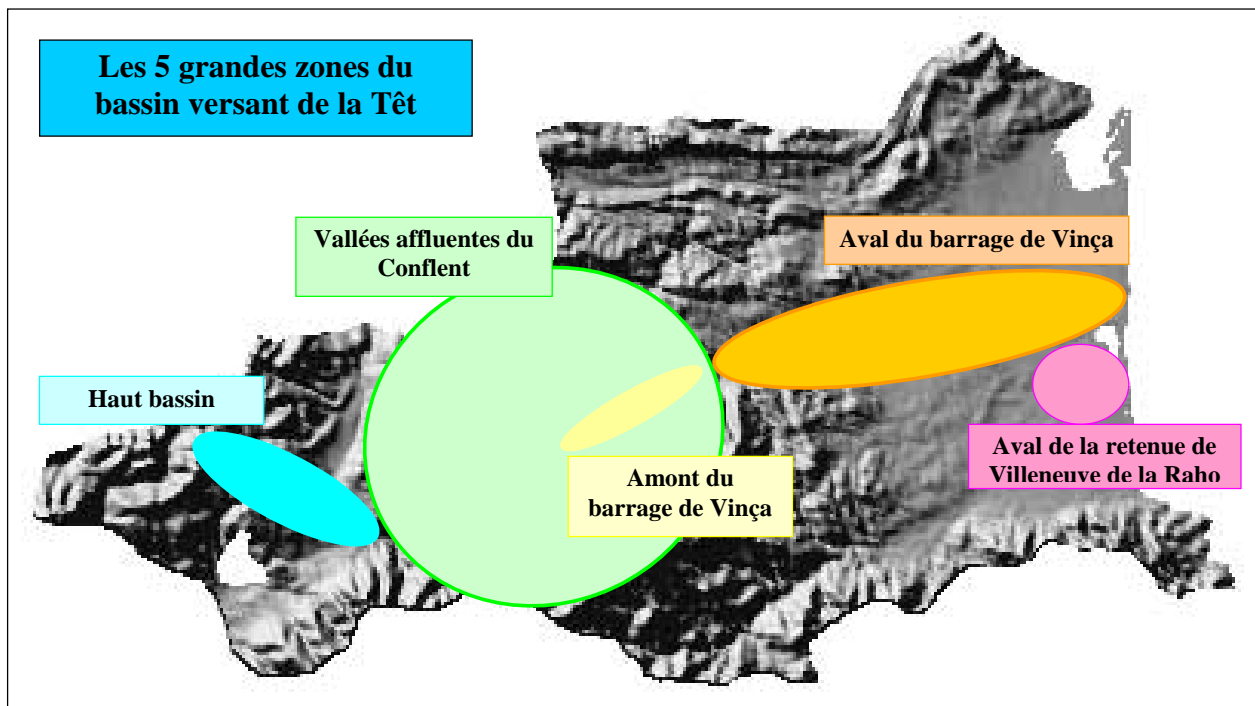
The Roussillon plain is home to 2/3 of the 400,000 inhabitants of the Department of the Eastern Pyrenees, 2/3 of whom are to be found in the conurbation of Perpignan. The valley of the Têt is the central river axis of the Department. It crosses it from West to East, from the high mountains to the sea and as well as the majority of the population, also houses the economic activities, the irrigated surfaces and the water resources and uses. It further presents a diversity of natural environments which have given rise to the inscription of half a dozen or more sites of “habitat” and “birds” directives.

Water is an essential resource: if we except the vineyards of the lower valley, all the agriculture practiced, intensive or extensive, including livestock breeding, is based on access to water and the use of water. From the high mountains to the sea, the Têt watershed measures 1,400 km<sup>2</sup> for a length of 120 km. More than half the watershed area is situated over 1000 m in altitude. Its great diversity of topographical, climatic, geological and hydrological conditions leads to its subdivision into 5 parts:

- ***the upper basin***, comprising the Têt valley proper, from its spring to the Conflent, marked by the mountain climate, hydro-electricity and extensive breeding, profiting from the re-stocking from the Bouillouses dam;
- ***the tributary valleys of the Conflent***, on both sides of the Têt, where the climatic conditions are influenced by both the Mediterranean and the altitude, where arboriculture and breeding cohabit and whose water courses are subject to severely low level discharges in summer;
- ***upstream from the Vinça dam***, around Prades, with its Mediterranean climate, specialising in arboriculture and profiting from the re-stocking from the Bouillouses dam;



- *downstream from the Vinça dam*, with its Mediterranean climate, where the majority of irrigated fruit and vegetables are concentrated, with increasing and urban sprawl around Perpignan and profiting from re-stocking from the Vinça dam;
- *downstream from the storage reservoir at Villeneuve de la Raho*, where, despite a vast collective pressurised irrigation network, agriculture is receding under the effect of the tourist installations along the coast in competition with drinking water for the use of groundwater.



Map 3. The 5 zones of the Têt watershed

The climate is subjected to a double influence, Mediterranean and topographical. This double influence is at the origin of the main feature of local climatology: its variability in space, in the spread of precipitations and temperatures (from Barcarès to Prats de Mollo the rainfall goes from simple to double, while the average temperature drops by half between Perpignan and Mont-Louis). Variability in weather then, with an irregular seasonal spread of rain and especially a very large inter-annual variability: 310 mm of rain in 1973 at Perpignan against 1245 mm in 1959.

The Roussillon plain has a Mediterranean climate, characterised by mildness propitious to the production of early fruit and vegetables, a summer drought which makes irrigation indispensable for the quasi-totality of crops and strong autumnal rains likely to provoke floods which destroy crops and erode the land. The average temperature is 14.5 °C, average rainfall from 500 to 600 mm.

In the mountains, the topography is at the origin of several types of alteration of this Mediterranean climate, which may become cold and damp, causing frosts which reduce the period of vegetation (150 days of frost on average at Mont-Louis). The summer drought and the *Tramontana*, which blows more than 150 days a year, thus aggravates the consequences of

wildfires. The average temperature is, depending on the small regions, from 5 to 10 °C, average rainfall 600 to 900 mm.

#### *b) Climatic accidents and agricultural calamities*

##### ***Drought***

While drought is an intrinsic feature of the Mediterranean climate, 3 years out of 10, it takes on considerable proportions and may affect areas which are not typically Mediterranean (mountain). The result is a dramatic drop in livestock forage production, the yield of the vineyards and a reduction in the calibre of the fruit. Conflicts appear for the distribution of water between irrigation canals within the networks. Happily, the large hydraulic installations constructed over the past century (the Bouillouses, Vinça and Caramany dams) enable the discharge of the main rivers to be maintained in summer and the supply to the irrigation networks to be ensured.

##### ***Floods***

2 years out of 10, the plain and/or the valleys are subjected to floods which may be catastrophic. Erosion of the land, destruction of crops, suffocation of the roots of the perennial crops, breaches or infill of the irrigation canals is at times accompanied by damage to buildings and roads and even the loss of human life. Alongside these “simple” floods, the *aigats* (violent floods which occur every 100 years or even every millenium): in 1940, Vernet les Bains received 800 mm of rain in 24 hours, that is more than its average annual rainfall!

Even if their effectiveness in the event of an *aigat* may be very limited, the dams contribute to a reduction of the effects of the most frequent floods, as a complement to the calibration undertaken on the main water courses. The irrigation canals which criss-cross the region, also play a non-negligible role in the evacuation of surplus rainwater, even if that raises problems of responsibility.

##### ***Hydrology***

Thanks to the vast *impluvium* which the mountain region represents and the winter snowfall, the resources in surface water are abundant in the Têt valley (300,000,000 m<sup>3</sup>) but insufficient during the summer period. Heavily influenced by the melting of the snow upstream, the regime of the river evolves rapidly downstream taking on the features of a Mediterranean plain water course.

The period of high water is situated at the conjunction of the melting of the coat of snow and the Spring rainfall.

The shortage or run-off affects firstly the tributaries of the Conflent from amid-July, the discharge becomes insufficient to satisfy the needs and the regulation and certain years the needs alone. The Têt itself, profiting from the summer re-stocking of the Bouillouses and Vinça dams and not suffering from the shortage.

The Têt is today an artificialised water course, thanks to the storage reservoirs which back up its discharge in summer, by the extractions from the canals and through the extraction of material and the recalibration of its bed downstream from Vinça caused by the redevelopment of the towpath.

The marine alluvia from the Roussillon plain are the centre of a very large and deep system of aquifers (50 to 100 m), strongly solicited for drinking water. The multiplication of drillings, especially to supply the coastal resorts, has led to a drop in the piezometric levels. This aquifer

which is considered as fossil in origin and as a result of the weakness of its supply is subject to measures of protection (ZRE).

The accompanying water tables (between 5 and 10 m in depth) are also rich and solicited for irrigation and drinking water as well as for the watering of the very numerous gardens and for filling the large number of swimming pools. The measures carried out demonstrate the preponderant share of the canals and gravity-fed networks (and therefore the waters of the Têt) in the supply of these Quaternary water tables.

### 3.1.2. History of the management of water

The creation of the canals in Roussillon is often attributed to the Romans or the Wisigoths, however, no archive enables this hypotheses to be confirmed. It is from the archaeological side that the proof of the former existence of hydraulic installations came, with the dating of the 8th century Ansignan aqueduct built above the Roman bridge.

It was from the 12th century, with the attachment of the County of Roussillon to the Kingdom of Aragon, that the hydraulic installations were to develop noticeably, for mills, forges, the supply in drinking water and cleanliness, irrigation being a complementary use. This development was to mark an important rupture: contrary to the previous period where the seigneuries and abbeys developed the canals or mills freely, the use of water became subject to royal concession. The royal administration through the intermediary of the Lieutenant of the *procureur royal et maître des eaux des comtés de Cerdagne et Roussillon* decided on the conflicts between canals and users of a canal. The rights to water of the communities of users or individual users were officialised by numerous acts that today fill the archives of Perpignan and Barcelona.

Even after the Treaty of the Pyrenees and the attachment of Roussillon to France, royal justice was based upon the deeds of the Kingdom of Aragon to decide upon conflicts: between the inhabitants of St Féliu and the canal of Perpignan (1787), between the Clairà canal and the inhabitants of Caramany (1836). In the same way, the Revolution confirmed the rights of users of water, which were not considered as privileges. During this period irrigation developed, even if the energetic uses remained important, with Catalan mills and forges.

The 19th century marked a new stage, personalised by two exceptional men. The first, François Jaubert de Passa was heavily involved in the resolution of the conflicts between canals and encouraged the creation of irrigator associations which were to inspire the legislator for the law of 1865 on the ASAs. He would leave us three remarkable installations on the watering in Roussillon (1821), in València (1823) and his fundamental *Recherches sur les arrosages chez les peuples anciens* (1846) which made him a precursor of the project ISIIMM. The second, Antoine Tastu proposed the creation of dams (Bouillouses, Vinça) enabling the discharge to be maintained during the summer period.

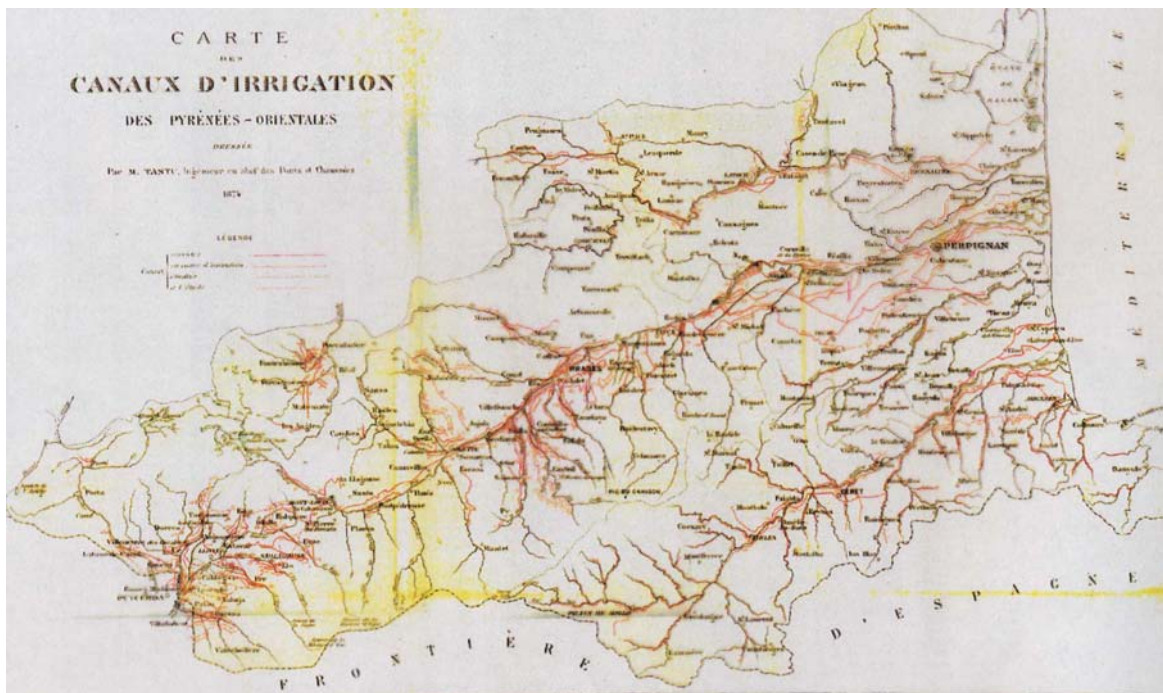
The railway is another important player in the hydraulic development of the valley of the Têt. Firstly, because the new proximity of the site of consumption (24 hours from Paris), provoked an agricultural upheaval with the development of fruit and vegetables. Then, because the needs for the supply of electrical power for the *train jaune* (yellow train) which serviced the Cerdagne, led to the construction of the Bouillouses dam which initially did not have an agricultural function. At the end of the 19th century, there were more than 400 canals, for nearly 5000 linear km and more than 50, 000 ha irrigable more than half of which in the Têt valley.

The first half of the 20th century was marked by the gradual disappearance of the mines and the hecatomb of the 1914/1918 war which led to disappearance of a number of small mountain canals. It was not until the second half of the century, following the Franco-Spanish conflict over the Lanous dam, that in compensation the Bouillouses dam took an agricultural vocation with releases for the irrigation of up to 15,000,000 m<sup>3</sup> per annum.

The creation of the Common Market reinforced the productions of early fruit and vegetables in France which became European fruit and vegetables. In the 1970s the Vinça dam was built as was the reservoir of Villeneuve de la Raho for the irrigation of the Roussillon plain. Since the 1980s, the main networks have been modernised: from pumping in the canal, pressurised conduits take water to hydrants servicing the plots, where it is distributed by drip feed. The gravity-fed canal subsists however in parallel and continues to be used. Today there are some 240 Authorised Syndicated Associations managing areas going from a few dozen hectares up to 3,000.

On the other hand, the widening of the European Community to the Iberian Peninsula and the agreements with third party countries totally modified the economic situation of fruit and vegetables which are today subjected to an exacerbated competition, involving an increasing mastery of the costs of production.

This multitude of canals which were gradually built in relation to ad hoc industrial and today forgotten needs, form a gigantic interconnected network which could be the result of the genial plan of a visionary architect. The dams and the storage reservoirs integrate formidably well into this complex system, which was nevertheless put together haphazardly, to the point that a canal dating from the 13 century is used to transfer water between two dams built in the 20th century. Who could have foreseen in the Middle-Ages that the irrigation of the Middle valley of the Têt would create an abundant water table where the city of Perpignan would centuries later pump its drinking water?



Map 4. Irrigation canals in the Pyrénées-Orientales 1874

### 3.1.3. Current uses of the resource

Apart from the upper watershed basin area, where the pasture surfaces produce little, irrigation constitutes the main use of surface water in the Têt watershed area. 12,500 ha are irrigated, prairies for forage in the mountain area, orchards and market crops downstream. 5,500 ha are watered by gravity, 1,500 by sprinklers and 5,500 by localised irrigation. The extractions by the canals amount to 250, 000,000 m<sup>3</sup> per annum of which 2/3 are put back into the water courses and water tables

Hydroelectricity is exploited from the Bouillouses storage reservoir and micro stations. Fishing is practiced throughout the basin, as much in the water courses as in in the reservoirs. The upstream part of the Bouillouses is classified as a fishing reserve and the Sahorre federal fish farm is supplied by the canal of Rec Majou. Canoeing is practiced on the Têt de Ria at Marquixanes while the canyons of the Llech are frequented by several thousands of people in the summer.

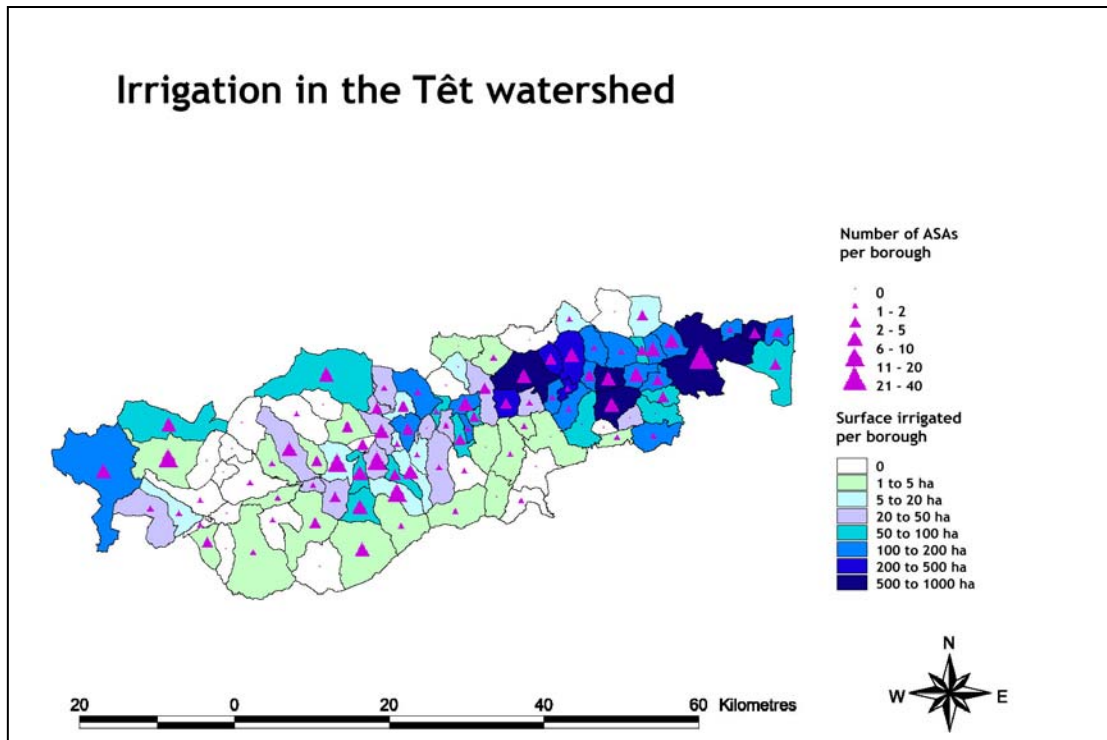
In winter, the water from the Bouillouses is used by the snow cannons in the ski resorts. The surface water is not used for drinking water, but the majority of the, springs and aquifers exploited are supplied by the infiltrations from the canals and the gravity-fed networks. Studies carried out on the *Natura 2000* sites revealed the presence in numerous water courses as well as in the irrigation canals of large numbers of protected species: the Pyrenean Desman, the Pyrenean lizard *Euproctus asper*, and the white-clawed crayfish, *Austropotamobius pallipes*.

In a logic of privileging the use of groundwater for drinking water, the reservoirs at Vinça and Villeneuve de la Raho play a fundamental role in supporting the needs in irrigation. The *Conseil Général* (County Council) is its owner and entrusts the management to BRL by lease. Beyond the role of Vinça for smoothing the floods of the Têt, the dams have seen new uses develop (tourism, fishing, water sports, the scooping of Canadair fire-fighting planes) which remain however marginal compared with agricultural use. In the case of Villeneuve de la Raho, the watering of spaces communal, the Cyprien golf course and private gardens contributes to the financial equilibrium of the pressurised network. A hydroelectric power station was planned at Vinça, but was unable to be materialised for fiscal reasons.

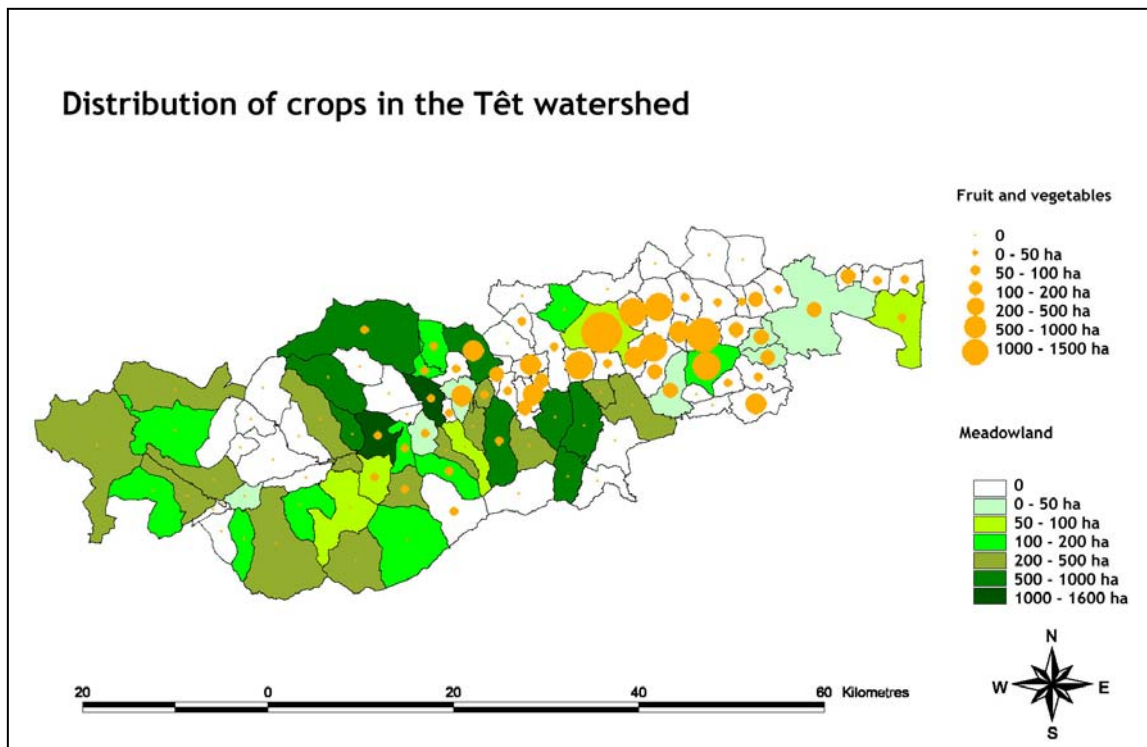
The ground water tables are mobilised for drinking water (50,000,000m<sup>3</sup> per annum), as well as for industry (food industry, 10,000,000m<sup>3</sup> per annum) and for irrigation (30,000,000m<sup>3</sup> per annum). A good number of private individuals also use ground water (including water from the deep water tables) to water their gardens. It is estimated that there are between 8 and 10,000 drillings into the water table in Roussillon for which a SAGE project is underway.

zone	surface irrigated by groundwater	extraction from quaternary aquifer	Extraction from deep aquifer
Downstream from Vinça	2,355ha	7,000,000m3	2,500,000m3
Downstream from Villeneuve de la Raho	1,650ha	4,000,000m3	2,500,000m3

The peak period for irrigation needs corresponds both to the low water level of the water courses and the peak summer period in needs for drinking water. Nevertheless, even in a very dry year, thanks to the volumes stored in the dams, the resource is sufficient to cover all the needs for consumption. On the contrary, the discharges left in the rivers in period of drought are below the reserved discharge and for several years, conflicts have broken out with the fishing federation and the Higher Fishing Council (*Conseil Supérieur de la Pêche*).



*Map 5. Irrigation in the Têt watershed*  
*Number of ASAs per borough*  
*Surface irrigated per borough - 1 to 5 ha, etc.*



*Map 6. Distribution of crops in the Têt watershed*

### 3.1.4. Terms and conditions for the management of water in the Têt valley

The quasi-totality of the canals in the Têt valley possesses **water rights** conceded in the Middle Ages by the kingdoms of Mallorca or Aragon. These rights have not been questioned by the Treaty of the Pyrenees (1659) which attached Roussillon to the Kingdom of France nor after the French Revolution. After the law of 1865 concerning the syndicated associations, the communities of irrigators were encouraged by the administration to form ASA.s by borough or by canal, which became holders of the water rights. With the application of the law of 1898 on the water, these water rights were transformed by the administration into **authorised discharges** which were not questioned by subsequent legislation.

The management of the Vinça dam is determined by **water regulations** which provide that in normal conditions the reservoir should be kept empty from 15 October to 31 December. The short filling period from 1 January to 30 June and the releases for irrigation are carried out from 1 July to 15 October. The regulations also provide recommendations in high water periods and a minimum downstream discharge to compensate the period of low water level.

The **Lanous convention** gives the right to releases for irrigation from the Bouillouses dam into the Têt of up to 17,000,000 m<sup>3</sup> from 1 July to 30 September upon request from the County Council. In an average year, the volumes released in the summer period are around 3 to 5,000,000 m<sup>3</sup>. A commission (EDF, SHEM, Administration, County Council, Chamber of Agriculture, ADASIA) meets at the end of the Spring to make the point on the possibilities for filling and the technical constraints (work on the dam) *vis à vis* releases.

Depending on the climatology and the state of the fill of the dams, the County Council meets, in the Spring then in the course of the irrigation season, the dam management commission comprising the various parties involved (irrigators, anglers, administration, City of Perpignan) to modulate the discharges released, in such a way as to reconcile the storage dynamics and the likely precocious needs.

Certain dry years, the Bouillouses releases may be requested from the month of June (1998), or restrictions on the discharge decided in consultation on the Têt. In situations of restriction, all the ASAs meet so as to determine the distribution of water between the different canals (by using the interconnections between them) which irrigation to be ensured as far as the part located in the most downstream area of the valley. As a complement, internal restrictions may be applied on each canal.

In the case of the tributary valleys, which do not profit from the re-stocking by the dams, the effects of drought are felt generally from the second half of the month of July and conflicts may appear between irrigation, fishing and drinking water. These conflicts are usually resolved amicably with the sharing of the shortage between users which provides overall cover for needs, but which only rarely enables the regulatory provisions on reserved discharges in river to be respected.

## 3.2. THE DURANCE

### 3.2.1. General presentation of the study site

#### *a) Natural environment*

The Durance is a river in South East France which takes its spring at an altitude of 2300m Montgenèvre in the Department of the Hautes Alpes Department. It covers 302 kilometres and crosses the Provence Alpes Coté d'Azur Region to empty into the Rhone at the boundary of the Departments of the Bouches du Rhône and the Vaucluse. Its watershed of 14 250 Km<sup>2</sup> concerns 6 Departments: Hautes Alpes, Alpes de Haute Provence, Drome, Var, Vaucluse and Bouches du Rhône.

It is very rural area on which the population is dispersed with a density of 32 habitants per Km<sup>2</sup>. This density is, however, greater in the lower Durance where it exceeds 100 habitants/Km<sup>2</sup> between Avignon and Pertuis. The main conurbations located in the watershed area are Avignon, Cavaillon, Pertuis and Manosque but this river “waters” indirectly nearly 75 % of the regional territory. The old and recent hydraulic installations (60s-70s) have in fact enabled areas situated outside beyond the watershed to be serviced, the Crau, North Vaucluse, the East of the Department of the Bouches du Rhône and even part of the Var, supplying on the way large conurbations the likes of Marseille, Aix en Provence and Toulon, as well as a multitude smaller boroughs and numerous industries.

Three geographical entities may be distinguished diagrammatically:

- The Upper Durance, from the spring to the Serre Ponçon dam, an area of high altitude and marked relief.
- The Middle Durance from Serre Ponçon to Mirabeau, area of transition between the Alpine reliefs and Mediterranean Provence
- The Lower Durance, from Mirabeau to the Rhone, a Mediterranean zone, an alluvial valley marked by intensive agriculture and heavy irrigation.

The climate is subjected to a double influence, Mediterranean and topographical, at the origin of a great variability of temperature and rainfall, between small regions, in the course of the year and from one year to another.

This double influence is at the origin of the main feature of local climatology: its variability in space, in the distribution of precipitations and temperatures.

The Mediterranean character of the climate is accentuated from the Upper Durance to the Lower Durance and to the sectors situated outside the watershed but profiting from the water deriving from the Durance: thus the average temperatures (Maxi + Mini /2) approach 25 ° in July and the average rainfall for this same month is 30 mm. The ETP (Penmann modified) exceed each year 180 mm for July.

The most remarkable rains arrive in the Autumn, in the form of snow in the Upper Durance.

The climate is thus marked by excessive rainfall and temperatures. The violence of the meteorological phenomena, marked as much in the violent storms as by the droughts, hail, the Mistral (180 windy days per annum at Avignon).



### *b) Drought*

If drought is an intrinsic feature of the Mediterranean climate, 3 years out of 10, as in Roussillon, it takes on considerable proportions and may affect areas which are not typically Mediterranean (mountain). The result is big drops in the production of forage and cereals (wheat and barley).

1997 and 2003 were among recent years, those which experienced the most severe droughts. Happily, the large hydraulic installations and the preventive management of the water managers have meant that the priority uses have been completely safeguarded (drinking water) and this without serious damage to agriculture, which was not the case in 2003 on the non-developed tributaries of the Durance.

### *c) Hydrology*

The Durance is thus a very developed river:

- Groynes, dykes and levees installed for protection against high water levels
- The agro-industrial development from 1955
- The very large extraction of granulates at the beginning of the 1960s
- More recently the motorways and the TGV

All these developments contributing to the transformation of the valley, and disturbing the natural functioning of the river.

The natural hydrological regime of the Durance is of pluvionival type with a marked Mediterranean influence in the lower part of its course:

- Upper Durance: low level in February (40 % of the average discharge) and maximum discharge in June (350 % Qm)
- Middle Durance: low level in August (30 % Qm) and maximum discharge in May (200 % Qm)
- Lower Durance: low level in August and September (20 % Qm) and maximum discharge in January (300 % Qm).

Since the construction of the hydroelectric installations of the 1960s, the Durance is in what is referred to as “reserved” discharge regime: the concessionaire of the installations (EDF) has the obligation to maintain at every point of the river a minimum discharge equal to around 1/40<sup>th</sup> of the average inter-annual discharge (module): thus while the natural low level discharge is around 30 to 40 m<sup>3</sup>/s the reserved discharge varies between 2 and 3 m<sup>3</sup>/s depending on the situation.

The large reservoirs of Serre Ponçon (Durance) and Sainte Croix (Verdon, main tributary of the Durance) were also designed to attenuate the devastating high water levels of the river: while the small and average high water levels have effectively disappeared, generating at the confluences large rise in the beds of the tributaries, the spate condition levels have been little modified by these installations

### **3.2.2. History of the management of water**

The Durance watershed area is characterised by the presence of very large hydraulic installations which were constructed over the centuries according to the available resources and the ambitions of the regional entities.

The history of the Durance is indissociable from that of its hydraulic installations and the men who have contributed to them, initially for use of their driving force, then more widely for irrigation and the supply of water to the large towns and cities and finally, for the servicing in water for multiple uses of a large part of the regional territory and above all for the production of energy.

*a) From driving force to irrigation*

This period which may be diagrammatically situated between the 12<sup>th</sup> century and the middle of the 20<sup>th</sup> century witnessed the development of the main installations of regional size. From the 12<sup>th</sup> to the 16<sup>th</sup> centuries a number of canals were built over the whole of the Durance valley: mainly intended to supply the mills with power, the most important being situated in the Lower Durance (*Canal de Saint Julien* dug from 1171) as well as in the Middle Durance (*Canal de La Brillanne*) and the Upper Durance.

Even if these mill canals could be used secondarily for watering, it was not until the 16th century that there appeared the first large canal projects with the aim increasingly turned towards the irrigation of the land. For a number of years, conflicts between mills and farmers, between agricultural canals as well as between agricultural canals and large towns were to succeed each other, the low water level discharge of the Durance being insufficient to satisfy all the needs, in particular on the Lower Durance.

Thus, all the canals on the Lower Durance represented in 1890 a maximum level of discharge of 70m<sup>3</sup>/s. The Middle Durance was also equipped with watering canals for a total discharge of 14 m<sup>3</sup>/s.

From the 16<sup>th</sup> century onwards an installation was built to transfer water from the Durance outside its watershed area (the Crau), a transfer which was to continue into the Comtat Venaissin with the accomplishment of the large installations of the 19th century (*Canal de Carpentras, Canal de Manosque...*).

The story is also marked by the construction of two major installations in the 19th century: the *Canal de Marseille* and the *Canal du Verdon*, intended to satisfy the ever increasing needs of the large conurbations (Aix, Marseille).

The irregular regime of the Durance and the development of authorisation for extractions rapidly complicated the water sharing and management of the installations.

The high water levels damaged the off-takes and moved the live bed, necessitating important works to ensure the supply of the installations.

But above all, the natural low level discharge (around 40 m<sup>3</sup>/s) did not provide, in the Lower Durance, a guarantee for water rights (70 m<sup>3</sup>/s in 1890) especially as half the derived water “left” the Durance watershed area (the Crau and Lower Rhone Valley) and was therefore not “recycled” in the river to benefit the downstream populations. Important droughts in 1895 and 1906 led to local troubles which constrained the legislator to intervene in 1907 by creating the Executive Commission of the Durance (CED) charged with managing the shortage situations, imposing and monitoring reductions in the extractions on the canals of the Lower Durance.

*b) The multi-purpose Durance Verdon development*

At the end of the 19<sup>th</sup>, beginning of the 20<sup>th</sup> century, the mills disappeared to the profit of agricultural irrigation and the supply of the towns. This abandoning of the driving force of the canals enabled the hydro-electric installations to be renewed at the beginning of the 20<sup>th</sup> century. The renewal led to the wide development of the surface areas irrigated. Thus, several companies turned towards the "*bouille blanche*" (hydroelectricity) by creating the first plants to produce electricity. As for the irrigators, and the towns, it rapidly appeared indispensable to create reserves.

The necessary development of the whole range of these uses led to the envisaging, as early as 1923, the constitution of reserves on the Durance and the Verdon. The Dam at Castillon was however only accomplished in 1949, with the creation of an agricultural reservoir of 85 Mm<sup>3</sup> and the possibility of new derivations towards the Bouches du Rhône and the Vaucluse.

The legislative texts from this period laid the bases of the transfer of water from the Durance watershed by subordinating them to the respect for the water rights of the downstream users and the improvement in their conditions of use.

While the installations created enabled the territories serviced to be extended, the latter remained at the mercy of the summer low water levels of the Durance and the conflicts between users endured.

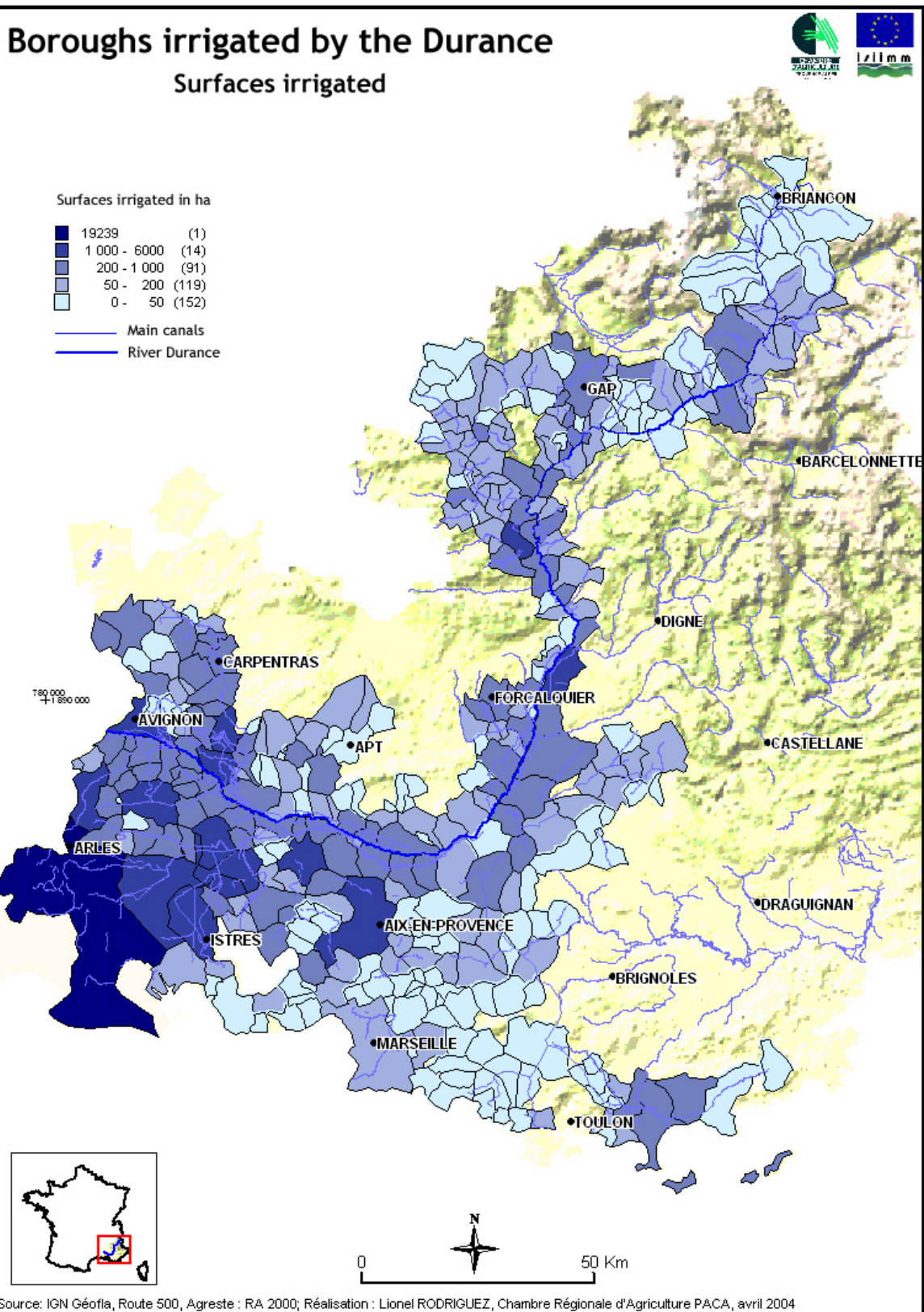
Finally, the Durance Verdon development was decided, declared of public interest by the law of 5 January 1955 called "*loi d'aménagement de Serre Ponçon et de la Basse Durance* (Law for the planning and development of Serre Ponçon and the Lower Durance)", thus marking the determination of the legislator to coordinate the energetic and agricultural uses, a determination bolstered by agreements between EDF and the Ministry of Agriculture concerning agricultural reserves, the re-stocking of the agricultural canals and the granting of supplementary rights for the canals of the Lower Durance and new rights for the development of the Middle Durance.

The current uses of the water from the Durance are therefore safeguarded to a large extent by the installations built since the 1950s.

Since the completion of these installations, agricultural reserves have thus been constituted on the Durance (200 Mm<sup>3</sup>) and the Verdon (250 Mm<sup>3</sup>) and should be reconstituted on 1 July of each year.

The development was completed by the construction of an installation for the transfer and servicing for multiple purposes to enable a better optimisation in the use of the water from the Verdon.

To do this, the *Société du Canal de Provence* (SCP) was created in 1959 and in 1963 the construction work was conceded to it along with the management of the Canal de Provence.



*Map 7. Boroughs irrigated by the Durance*

### 3.2.3. The current uses of the resource

The main use in volume terms remains agricultural irrigation; the great majority of surfaces irrigated from the Durance are situated outside the watershed area of this river: the Comtat Venaissin (Vaucluse), the Crau (Bouches du Rhône) and the region of Aix en Provence, but also the areas of the plateau accessible from the development of the pressurised networks (Valensole, South and North Lubéron, *Plateau de Forcalquier, Plaine des Mées...*). The surface areas irrigated from the valley are generally for the last 120 years at least, their supply being safeguarded by recent installations.

The main crops irrigated are:

- The forage crops situated in the breeding areas, the Hautes Alpes but especially the sector of la Crau where the hay of the Crau (*appellation d'Origine Contrôlée*) is produced.
- The orchards, essentially apples, peaches, and pears in the Durance valley, the Vaucluse and the alpine Departments as well as cherries and dessert grapes on the areas recently irrigated in the Vaucluse (Lubéron and Ventoux).
- Field grown and greenhouse vegetables essentially spread in the Lower Durance and the Vaucluse.

The other uses, while remaining less important in volume, have today become preponderant at the economic and social level.

- The domestic water of the large conurbations: the large towns and cities of the region PACA depend on the Durance for their fresh water:
  - Directly via the installations of the SCP and the canal de Marseille for Marseille, Aix and Toulon.
  - Indirectly via the supply by the infiltration water from the gravity fed networks from the aquifers in which the boroughs the likes of Avignon, Arles or Salon de Provence take their supplies.
- Industrial water: numerous industries the water from the Durance, directly from the canal EDF or through the Canal de Provence (Berre, Marseille...).
- A hydroelectric source of regional importance:

The Durance is developed from the Serre Ponçon dam as far as the *étang de Berre*. On this course a discharge of 250m<sup>3</sup>/s is permanently derived in a factory canal to produce electricity for fifteen or so plants. This resource represents 20 % of the regional energetic consumption and above all enables a flexible and rapid management of peak periods. It also contributes in this way to the limitation of the over construction of the other sources of electricity (thermal, nuclear...)

These installations have therefore enabled the Region to shelter from the large droughts long and accelerate the economic development over the past fifty years.

### 3.2.4. The terms and conditions for the management of the water of the Durance

If on all the non-developed tributaries of the Durance, the extractions remain each year subjected to the whims of the climate and organised in case of drought by public authority (Prefectoral drought bye-laws), on the Durance axis itself, a special regulatory framework, guarantees the uses of water.

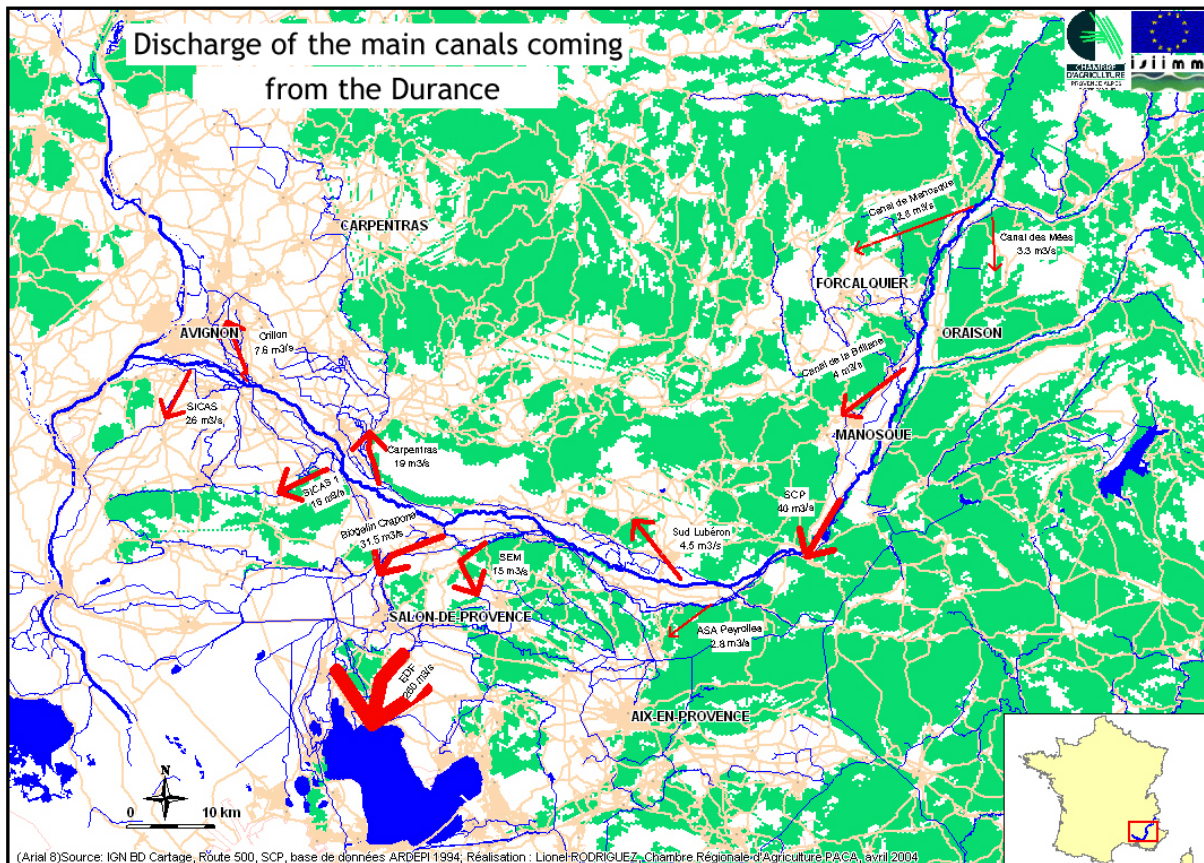
Since the completion of the Durance-Verdon installations, all the needs in water which had justified these works have been satisfied. This thanks to the technical relevance of the installations and the managers, but also thanks to the conditions for the regulatory implementation for sharing the water.

The installations were granted to EDF by a decree signed 28 September 1958 to which was annexed a schedule of requirements fixing the rights and obligations of EDF.

EDF had firstly to re-establish the supply of the irrigation groupings of the Lower and Middle Durance for a total maximum discharge of  $128 \text{ m}^3/\text{s}$  (modulated in relation to according to the periods of the year).

Moreover, the law provided for supplementary water rights which could be granted within the limit of the available resources. Thus a number of modern networks were able to be created in the Middle Durance.

The schedule of requirements for the hydroelectric installations also fixed the obligations in terms of reserved discharge to be left in the Durance opposite the installations.



Map 8. Discharge of the main canals coming from the Durance

*a) An organisation inherited from the past which has proven its relevance: The intervention of the CED*

The concessions granted in the course of the 19<sup>th</sup> century caused large tensions in the whole of the Lower Durance and beyond throughout Lower Provence. Indeed, how is it possible to satisfy all these allocations which exceed the 100m<sup>3</sup>/s while the low level discharge of the Durance was less than 50m<sup>3</sup>/s?

This situation incited the legislator to create the CED by a law text in 1907 the functioning of which was specified by a decree in 1908. The main mission of the CED was to manage the shortage between the various canals of the Lower Durance.

The CED is composed of 10 elected members (5 from the Bouches du Rhône and 5 from the Vaucluse) as well as 5 members nominated by the administration. Monsieur Robert LONG, the current Chair of the CED discerns two phases of the functioning of this instance.

From 1907 until the beginning of the 1960s when the CED should above allocate the low summer discharges and avoid uncontrolled extractions.

At the beginning of the 1980s, the hydroelectric development of the Durance provided security and regularity to the discharges of the off-takes of the canals. This second period oriented the CED towards a mission a little different which is to manage the distribution of the summer agricultural reserve of 200 millions cubic metres reserved in the Lower Durance.

This commission has provided the proof of its effectiveness and thanks to good preventive management and the deliberate and shared savings from all the canals of the Lower Durance, the PACA Region did not have to suffer the droughts of 1997, 2001, 2003 and 2006.

*b) The Plan for the Durance: towards a new sharing of the water*

While agricultural, urban and industrial uses may be good year bad year guaranteed, two evolutions today bring into question the current sharing of water.

- The development of tourism around the large reservoirs: to manage the repeated droughts (1989-1991 and 2003-2006) the CED had to “extract” out of the 200 million m<sup>3</sup> which were allocated to it. This de-stocking harms strongly the tourist activities which have developed strongly around the lakes of Serre Poncon and Sainte Croix. While these installations may not have been built for this use, the Alpine departments, the *Hautes Alpes* in particular, henceforth request that this use be incorporated in the water management policy.
- The strong environmental constraints (regulatory or social) also lead the councillors and administrations to question themselves over the very strong increase in the reserved discharges of the Durance and the Verdon as well as the implementation of rules for the sharing of water on the areas which are not safeguarded and which risk seeing their development stopped or their natural environments degraded.

These new stakes have led the French State to organise the implementation of a new overall scheme called “Plan for the Durance” which should define a management policy of the resources and the uses to enable the current functioning to be adapted. This plan which kicked off in 2005 is only today at the stage of preliminary studies and negotiations between the main players.

## 4. THE STAKES

After having undertaken an analysis of the two French sites, we believe that the stakes which will most strongly influence the management of irrigation in the future are:

- Questioning of the current systems for sharing water resources,
- The evolution of regulations and their impacts,
- Taking into account of new users of the irrigation networks.

...and through these stakes, the capacity of current water management institutions to adapt, to maintain or reinforce themselves.

The two sites of the Têt and the Durance present certain similarities in the way in which they currently manage water.

Firstly, the tributary valleys of these two rivers do not benefit from hydraulic installations which have spared the areas in the proximity of the water courses from drought. In these valleys, the repeated droughts (1998 and 2006 on the Têt, 1989-1991 and 2003-2006 on the Durance) have led to important restrictions which have both harmed the economic result of the agricultural exploitations and more especially marked the spirits, leading to a questioning of the agricultural uses and therefore the rights to water. In these “non-safeguarded” areas, no collective management is really established on the watershed scale even if mechanisms, rules or laws apparently enable the shortage to be shared in the event of a crisis; but this sharing is never the fruit of local compromise. On certain water courses, the authorisations for extraction are sometimes questioned by the administration, with direct threats to the very existence of the irrigation installations.

In the areas on these two sites referred to as “safeguarded”, the authorisations to extract from the different canals are well established and recognised. On each site there exists a system of surveillance and regulation, the role of which is to prevent shortages by sharing the water between the different managers in such a way as to ensure irrigation until the end of the season. On the Têt, a commission which brings together all the players (industry, collectivities, users, administration...) meets so as to make the point on the resources and where necessary all the ASAs, and organises the restrictions. On the Durance alone, the lower valley has such a system (CED): this commission (century old) has proven its effectiveness even if the absence of regulations on the Middle Durance makes both a wider discussion between agricultural users and more especially the other water users difficult.

As concerns the irrigation installations, management is essentially collective through two radically different institutional forms, the Syndicated Associations with their public type management mode, with networks of very variable size and a good number of canals and the SARs (*Sociétés d'Aménagement Régionales*), which resemble a private mode of management, and their very large size pressurised networks (Durance site).

### 4.1. DOUBTS ABOUT THE SHARING OF WATER RESOURCES

The current approach to sharing water resources in these two valleys (authorisations or water rights and the systems of regulation) has certainly proven its effectiveness in the past (event recent past) by sheltering the areas concerned from the dramatic shortages and providing a certain protection of the natural environment, but the demands for a renewed approach to the



management of water resources have made themselves much more strongly felt in the past twenty years or so.

#### **4.1.1. Tourism**

Tourism linked to water has, in the past 20 years, become a preponderant activity for the *hinterland* areas of the Mediterranean while at the same time the agricultural activity has heavily regressed here. On the Têt, it is above all water sports activities which request more water in the river. On the Durance, these same players would like to see the “reserved discharge” of the Durance and especially the Verdon increased, but it is above all the tourist activities which have developed around the artificial lakes (Serre Ponçon and Sainte Croix) which request, with the backing of the local collectivities concerned, that the management of water take into account the need to maintain a sufficiently high level in the dams to safeguard these tourist activities (yachting, restaurants, rentals...). A first version of the SAGE of the Verdon (happily since abandoned) even recommended that the management of shortages be, as a priority, centred on the maintenance of a pre-determined level; in 2005, an already influential association called “Cote 770” was created in the *Hautes Alpes*; the latter is fighting for the maintenance of this level and for it to be incorporated into in the CED, clearly in order that a right of access to water be granted to it. It is politically and socially difficult not to taken into account the demands from areas whence the water comes even if legally the rights and the management are already well established. The main orientations of the work of the Plan for the Durance (an initiative from the central and regional administrations) concern this “emerging” tourist use referred to and therefore the search for savings in water, in particular on the gravity-fed irrigation networks.

#### **4.1.2. Angling**

This activity experienced an important boom in the 1980s: in the *Alpes de Haute Provence*, for example, in 1995 nearly 6,000 fishing licences were issued (often from outside the Department), while the number of agriculturists was fewer than 2,000. On all the Mediterranean waterways, the angling federations, very influential politically and with high human and technical means, are present in all the local organisations and debates, both Departmental and Regional. Local conflicts regularly oppose agriculturists and anglers whose interests converge with the missions of policing water. In particular, the non-respect of the holier than holy “reserved discharge” is often the occasion for anglers to undertake judicial procedures against the extractors, as well as the EDF. The law of 29 June 1984, called the Fishing Law, introduced the notion of “reserved discharge”. It specifies that “*any installation in a water course should leave permanently a minimum discharge which guarantees the life, the circulation and the reproduction of the species*”.

This principle of respect for the “reserved discharge” was to be bolstered in the new water law adopted at the end of 2006. The increase of this “reserved discharge” will make savings in water necessary and therefore changes in the management of the networks and water rights.

#### **4.1.3. The needs of the natural environment**

It is clear that the policies to come will be oriented towards a much greater appreciation of the needs of the fauna and flora of the water courses. Concretely, projects to increase the “reserved discharges” of water courses are underway; for Mediterranean irrigation, adaptations will be necessary, but the question of maintaining current uses has been posed. Initially, these adaptations will concern the small irrigation structures on territories which are not supplied by the large reserves stocked in mid mountain areas. On these water courses, by letting the “reserved discharge” pass (as it is defined today) would often be equivalent to closing the canal from mid-

July and these canals have neither the financial nor the human means to modernise their management or their installations.

#### 4.1.4. Drinking water

The example of the expert survey of the Lentilla illustrates perfectly the new rules that irrigators must introduce with users and protectors of the river (see below) as well as with the local collectivities responsible for satisfying the water requirements of the various populations. This same issue is to be found within the very different historical and sociological contexts on certain tributaries of the Durance (Calavon, Bléone) where urban development is such that new arrangements had to be made between agriculturists and collectivities.

Certainly, technical solutions have to be found when requirements exceed resources whether structurally or not; but the main obstacles to the introduction of new rules for water sharing concern essentially the consensus between all the water players, even if the prerogatives of the collectivities and the administration may appear to be preponderant.

The intention of the new law on water (December 2006) is, moreover, to favour the collective management of extractions through watershed institutions which would manage, for the account of the holders of water rights (collective and individual), the totality of the volumes of water which they extract.

#### **THE LENTILLA BASIN: SHARING PART OF THE POWER SO AS NOT TO LOSE THE TOTALITY**

The Lentilla is a tributary on the right hand side of the river Têt which joins it just upstream of the Vinça reservoir and does not benefit from re-stocking. The major canal, which has held the water rights since the 13th century, irrigates 500 ha spread over 5 ASAs and was modernised by the creation of a pressurised network derived from the canal in the middle of the 1980s. The Lentilla supplies, through its accompanying aquifer, the drinking water networks and contributes to the dilution of the effluents from outdated and ill-adapted treatment stations as a result of the increase in the summer population. The major canal furthermore supplies the tourist reservoir of the Escoumes and its different branches play an important role in the evacuation of rainwater.

The regime governing the level of the Lentilla provokes a low water level which may be severe from mid July to mid September, penalising irrigation, the discharge of the water course, the capacity of the effluent to dilute and therefore the aquatic environment, as well as making the drinking water supply fragile. To remedy this situation, the 5 canal management ASAs, in consensus with the borough councils and the anglers' association are planning the creation of a system of extraction from the Vinça reservoir with a delivery back to the canal upstream of the off-take station for the pressurised irrigation network.

In this situation, the local players are voluntarily working together, without the intervention of the administration, at a smaller scale than the SAGEs or river contracts, but more closely adapted to the hydraulic and social realities. While putting forward local and consensus management of the resource and the environment, the greatest difficulty is to establish a consensus between the State services and the establishments and the collectivities, each of which claims its share of competence in matters of water management. The conditions laid down by the public powers to finance the project are double: conserve in the river a discharge very largely greater than the regulatory "reserved discharge" and introduce a management structure associating all the local players.

It is real institutional laboratory which could lead to a modification of the "centralised and top-to-bottom administrative practices", which is interesting in the perspective of the introduction of the WFD. Another important aspect is the approach of the ASAs which have chosen to share with other users of the resource a part of their power over the management of water with the objective of not losing everything.

## 4.2. THE EVOLUTION IN REGULATIONS AND THEIR IMPACTS

The national and local laws and regulations have, since the end of the 1980s, evolved in two main directions: the preservation of the natural environment and the protection of drinking water resources. This evolution is of course linked to the marked degradation of the quality of water in France and the recurrent problems of a drop in natural resources following the uncontrolled development of irrigation in the other French regions.

In 1992, the water law established the principle of watershed management and introduced the procedure of the SAGE, (*Schéma d'Aménagement et de Gestion de l'Eau*), which is both used to make local rules (enforceable on the decisions of the administration and, from 2007, on any private individual) and to introduce local water parliaments, the CLE (*Commission Locale de l'Eau*) in which the collectivities and the Administration (Prefect and Water Agency) nominate 75 % of the representatives; on the two French study sites, these SAGES are only introduced on small water courses but this new governance is being established on a larger scale through other texts in particular the Water Framework Directive (WFD).

The introduction of the European directive started in France in 2003 and should be completed in 2009, with the aim of defining over the whole of the French territory and by water mass (concept close to the watershed for surface water), management objectives which will completely orient the policies of the administration and the Water Agencies: on the regulatory level, the authorisations for extractions and water rights could be discussed again to achieve the objectives fixed by this programme. The whole of the national financing is to be devoted to reaching these same objectives.

The Mediterranean irrigators should therefore organise themselves so as to better defend their rights and their activities, as well as adapting technically and economically to maintain their tools in functional order.

The law on water and the aquatic environment (LEMA) adopted at the end of 2006 once again introduced supplementary legal and financial tools to achieve the objectives of "good status for all water" as defined by the WFD; legally, even if the Mediterranean areas would not seem to be concerned today, it will be impossible, on certain water courses with a chronic quantitative imbalance, to obtain or conserve the authorisation to extract water without the collective organisation of all the extractors. Other provisions come in reinforcement of the role of the SAGES. Financially, the fees for the extraction of water could increase strongly and conversely aid could encourage a reorientation of the systems of production for example by moving towards "de-irrigation" that is to say the conversion of irrigated systems to non-irrigated productions.

In the French Mediterranean regions, the water managers have attempted to take account of the artificial nature of the aquatic environment arguing that the fact that the untreated water transport canals conveyed much more water than the water courses themselves and that it was therefore necessary to incorporate this dimension into the DCE management programmes and in the future SDAGE (*Schéma Directeur d'Aménagement de Gestion des Eaux*) of the Rhone-Mediterranean hydrographical district.

These Mediterranean specificities (among others) have been taken into account in the overall guidelines of this SDAGE, but the translation in terms of objectives and management tools is still to be carried out.

Other evolutions in regulations, this time concern the management of the Syndicated Owners' Associations (*Associations Syndicales de Propriétaires*), essentially the ASAs. A legislative text (bill for

the administrative simplification of the ASP of 01 July 2004) obliges these ASs to adapt their status and their internal regulations before 05 May 2008.

#### **TOWARDS THE ADMINISTRATIVE AND TERRITORIAL SUSTAINABILITY OF THE SYNDICATED OWNERS' ASSOCIATIONS (ASPS)**

The ASPs are groupings of owners constituted so as to enable the execution and upkeep, with shared expenses, of work and installations, of both collective and public utility, which particularly concern agriculture and irrigation.

Their fundamental and regulatory basis is to be found in its attachment to obligations to the land or landed property and not to persons, uses or the activity undertaken. These founding principles, which have been the strength of the former texts and which have provided the sustainability of these structures until today, have been conserved in the new texts in force, written in the context of the administrative simplification undertaken by the French government, that is the Bill of 1 July 2004. The latter presents a certain balance, conserving both the founding principles which had been the strength of the former texts and contributing the material necessary for the associations to evolve in a context where their relationship with their owner members, the collectivities and the administrative authority are more and more complex.

The updating of the articles of association of the ASPs should be at the origin of a reflection on the functioning of the association and what it is to become. The Bill provides the possibility for the associations to actualise documents at times too far removed from their "era". Those responsible should then analyse the evolution which has taken place up until now within their boundaries so as to incorporate or not the principles in their future articles of association and where appropriate in the internal regulations, and at best provide for the provisions which will enable the associations to continue to evolve with stability and coherence.

The results obtained during the surveys carried out by certain Departmental ASP federations of the P.A.C.A. Region underline, in the same way as in the Department of the *Alpes de Haute Provence*, that a majority of the associations consider that they are not in a position, nor do they have the capacity to update and write their "new" articles of association themselves.

A tool proposed by the FDSIC 04 was therefore developed to satisfy the needs and the demands of the associations, but also in the perspective of acting as a support to the federations themselves, especially during the sessions of collective accompaniment or during individualised support. This methodological guide is available to all the ASPs.

### **4.3. NEW NETWORK USES AND USERS**

While the irrigation networks only were of benefit to the agriculturists until the beginning of the 1970s, the regression of this irrigated agriculture and the strong development of urbanisation have fundamentally modified the territories serviced by the agricultural canals and brought supplementary constraints to the managers of these installations.

#### **4.3.1. Taking account of the drinking water needs of the boroughs**

It has been seen that the potential conflicts between irrigated agriculture and collectivities could be found at the level of a watershed or an aquifer. But the importance of re-stocking the aquifers by the agricultural canals also led the collectivities, who benefited from this contribution, to monitor very closely the re-stocking of this aquifer. On the Crau, as well as in certain other sectors, it would be difficult, given the stakes, for the very management of the gravity-fed irrigation networks not to adapt to the needs of these collectivities. Conversely, it may be thought that a fair participation (financial or other) of these boroughs in the functioning of the ASAs may be envisaged by the latter.

In another domain, the borough councils are very concerned by the supply of untreated water to the future areas to be constructed to enable the newly arrived to water their plot of land without "drawing" on the network of municipal drinking water (see below).

### THE CRAU PLAIN, NEW RELATIONS BETWEEN THE ASAS AND LOCAL COLLECTIVITIES

The Crau is above all a bio-geographical denomination which applies to the fossil delta of the Durance which met the sea before taking up its present course around 12,000 years ago.

Thanks to its river origin, the Crau takes the form of a layer of pebbles carried from the Alps by the Durance and deposited on the sea's edge in the midst of a mass of finer alluvia. The natural vegetation corresponding to this type of very stony soil under a Mediterranean climate is a sort of grassy steppe without trees, characteristic of this type of ecosystem, moreover called "a Crau", that is to be found in other French Mediterranean river deltas (Lez, Têt, Fare, Gapeau...).

In 1559, an engineer from Salon-de-Provence, Adam de Craponne, directed the construction work of the first canal bringing into the Crau the waters of the Durance, via the Lamanon channel. A good number of other canals were then built until the middle of the twentieth century, thus providing irrigation by gravity submersion of a large part of the Crau.

From 1955, it was from this canal managed by EDF that water intended for the irrigation of the Crau was extracted. The water rights held by the Crau irrigators were re-negotiated at this time and since then an agreement links EDF to the main irrigators' associations of the Crau. It provides for a free but modular allowance, according to the periods of the year: nothing in winter, progressive in the spring, maximum in summer and degressive in the autumn. The quasi-totality of the irrigation networks of the Crau plain is managed by Authorised Syndicated Associations (ASA).

This ancestral organisation around the management of water resources has been upset for nearly a year since a new structure has seen the light of day: **Syndicat Mixte d'Etude et de Gestion de la Nappe de la Crau (The Mixed Syndicate for the Study and Management of the Crau Aquifer)**. This syndicate brings together the main water players within the boundary of the Crau aquifer (borough council, administration...) with the aim of studying the management of water resources and subsequently proposing better quantitative and qualitative management.

A number of players from the agricultural profession and ASAs are, in fact, contesting very vigorously their integration into this new structure as consultative and not decisive voices and very strongly claim a much more important place in terms of power, highlighting their fundamental role in the management of the aquifer. The very large climate of tension during the definition of this structure, linked perhaps to a traditional opposition between the two centres of interest of the Crau (Arles and Istres) has a lot to do with it.

#### 4.3.2. Taking into account the canals and their role in the protection against flooding

With the explosion in urbanisation in the territories serviced by the agricultural canals, these installations play, more than previously, a role at times fundamental in the evacuation of rainwater and thus, in the protection of the newly urbanised areas.

These canals were not designed for such a service even if this function has always existed.

The problems posed for the Syndicated Associations are of three types:

- Firstly, in terms of legal responsibility, the Syndicated Association may be designated legally responsible in the event of a serious accident linked to the insufficient capacities of the canal to evacuate the necessary discharges, poor maintenance or bad management of the installations.
- Then, in terms of the possible appropriation, by the borough councils of these installations which at times no longer use 100 % of their water rights. On the Vernet and Pia (site of the Têt) the collectivity would like to expropriate the syndicated association.
- Finally, in economic terms, will the Associations be able to find the resources to manage their installations by integrating this function; on numerous canals, the response is clearly negative today; on the Middle Durance or on the Têt, most of the Associations do not alone, have the technical and financial capacities to undertake such modernisation and the

slow but continual drop in agricultural activity will aggravate this situation. The borough councils which will be the main beneficiaries (development and extension of the urbanisation) will be called upon and will probably request their integration in the management instances of the canals.

#### **VERNET AND PIA CANAL: PROBLEMS POSED BY URBANISATION WITHIN THE BOUNDARIES**

The Vernet and Pia canal is the main irrigation installation on the left bank of the lower valley of the Têt. Built at the beginning of the Middle Ages to supply energy for the mills, it has at all times satisfied multiple uses: irrigation, drinking water, waste water disposal, timber rafting, hydraulic energy ...

During the course of the past 40 years, the urban development of Perpignan and some surrounding boroughs has very largely infringed the boundaries. Housing estates have been built, shopping centres and industrial estates have been developed, new road and rail axes have been created, leading to an increased impermeability of the land and a modification and acceleration in surface run-off. The ASA of the Vernet and Pia canal has more than 1,000 members, with a serviced boundary of 1090 ha, of which 436 ha are irrigated. Agreements have been made with the collectivities for acceptance of the syndicate taxes corresponding to the urbanised parts of the boundary and agreements concluded in return, from the ASA agreement, to receive the waters from the urban run-off.

For the past 5 years, relations between the ASA and certain collectivities have become degraded. Basing his ideas upon its competence in matters of protection against flooding, the new Chairperson of the *Syndicat Intercommunal d'Assainissement Têt Agly* (Têt Agly Intercommunity Syndicate for Waste Water Disposal) unilaterally decided to take back from the ASA the management of the installations that the syndicate had financed on the canal and to engage a procedure of expropriation against the ASA. In this peri-urban area which is experiencing a decline in agriculture, this canal has become a strong stake for the collectivities. In a perspective of the pursuit of urbanisation, it represents both a network for rainwater disposal and a resource for watering green spaces and private gardens. The determination of the Chair of the SIA to directly control the canal may be explained by the idea that the ASA, by wanting to conserve the agricultural role of the canal, could hinder urban development.

Is it still possible today to reconcile agricultural uses and urban uses for a thousand year old canal? How can an ASA and local collectivities intelligently manage hydraulic installations of common interest? This conflicting situation on the Vernet and Pia canal, which will be subjected to the judgement of the administrative tribunals, is representative of the new stakes with which the managers of irrigation canals are confronted in peri-urban areas.

#### **4.3.3. The place of the users of non-agricultural water in the canals**

This urbanisation has profoundly changed and will continue to change in the years to come, the use of water from the canals; once agricultural, these installations very often supply users who, in number, are in the majority non-agricultural users who use water to water small gardens, as well as the collectivities who need irrigation water for their parks and gardens. Of course, this evolution only concerns the canals close to urban areas and much less the mountain canals.

The multiplication of these users poses very complex problem to the agricultural canals, but also represents a considerable asset if the ASAs place themselves in a situation to respond to these demands.

The needs of these urban users are very different to agricultural needs: above all, they would like to have water permanently (without a water tower) and are prepared to pay a higher price compared with the agricultural rates; without this water resource the urban users would have had to abandon watering their garden or use the borough's drinking water, which would have considerably increased their water bill. But this comfort irrigation is perceived by users as being part of the life style which they have chosen or which they want to preserve.

The comparison between the Carpentras and Manosque canals has shown very clearly how, on the one hand, the use of water rights has enabled the agricultural prices of gravity-fed water to be “saved” by increasing the financial contribution of the new users (urban as well as agricultural), while, on the other hand, the non-satisfaction of urban needs (and the needs for agricultural modernisation or agricultural needs beyond the original boundary) has led to a degradation of the installations as well as the resources of the ASA.

Attention should be drawn to the fact that the collectivities are the first interested in the modernisation of the service of the canals to the urban users (old and new): indeed, this modernisation enables the borough councils to avoid heavy investments in the reinforcement of their drinking water networks or even the construction of twin networks (irrigation and drinking water) in the new housing estates.

It is therefore necessary for the Syndicated Associations to be in a position to propose to the collectivities, within or outside their boundaries, as the SARs do, development projects which will enable them to satisfy the new needs. In Carpentras, the Association had to acquire technical capacities and recruit technicians and engineers capable of designing, building and managing these installations. The Associations of a more modest size will not be able to acquire these means alone, a mutualisation of the means or a grouping of the structures should be considered as was the case at the creation of the Departmental AS federations (in the years 2000-2004).

**COMPARATIVE ANALYSIS OF THE MANAGEMENT OF THE SYNDICATED ASSOCIATIONS OF  
CARPENTRAS AND MANOSQUE: THE CONDITIONS OF COLLECTIVE AND PUBLIC MANAGEMENT OF  
THE IRRIGATION NETWORKS**

Here we are interested in the history of the Carpentras and Manosque canals. These associations played and still play a major role in the territories that they irrigate, well beyond the strict boundary irrigated that they have a vocation to service in irrigation water. These two irrigated boundaries are located in the Durance watershed, separated by a hundred or so kilometres.

Over several decades, the two canals underwent similar evolutions in their governance, linked to the evolutions in the national and regional socio-economic context. While initially their managers limited their actions to a strict operational management, the 1970s marked a turning point in the management of these two associations, which took the shape, at the end of the 1970s, of a issue common to the two structures.

The association of the Carpentras canal was to make the choice of maintaining and rehabilitating its gravity-fed network, and then launching programmes of modernisation on its former boundary and extension.

The Manosque canal association was to make the choice of abandoning in time all the gravity-fed network, and launching an ambitious modernisation programme on the scale of the boundary.

Once these choices were assumed, the technical innovations which they brought with them were to necessitate prior institutional innovations.

The Manosque canal association was to entrust the management of its network to the SCP in 1977, delegating to it its technical and administrative management, as well as the reflection as to the future development of the boundary and the network.

The Carpentras canal association was to reform its system of watering rights (1981-1983), and more generally would make the effort to introduce the boundary of its syndicate.

These two associations therefore underwent different channels of development, punctuated by opportunities grasped by one and difficult projects for the other, which would lead them to present situations which have become incomparable.

By retracing the history of these two canals, independently one of the other, then comparatively, it would appear that these associations have gained in maturity in the course of time, by having to assume choices in the face of crisis situations where breaks in their management modes were necessary.

It would then appear that the socio-economic and institutional environment surrounding these associations plays an essential role in the problems which emerge and in the solutions which are adopted. The choices which were then made have a considerable influence for the future of these associations. Finally, one can see the central place that these innovations play in the evolution of these associations – whether technical or institutional, undertaken or introduced – and the context in which these innovations intervene.



## 5. THE SOCIAL AND INSTITUTIONAL INNOVATIONS FOR FRANCE

### 5.1. STRUCTURING THE NETWORK MANAGERS AT THE DEPARTMENTAL AND INTER-REGIONAL LEVEL

The origin of the creation of the Departmental federations of collective irrigation network managers, from the end of the 1980s, is to be found in the need for a good number of ASAs to join forces to introduce a service indispensable to all of them, but too costly for each one of them. Most often it was the need for an administrative service (establishment of roles) or technical (operation and maintenance of a pressurised network). These federations may take a variety of legal forms: unions of ASAs, mixed syndicates, associations under the 1901 law, but the services provided to the members remain identical: assistance in contractual undertakings, administrative services, technical and legal support. Over the years, these federations also acquired a growing role in the representation of the interests of the ASAs in the different water management instances and in particular, in the local water commissions and the Departmental drought committees.

With the development of the pressurised networks and the increasing complexity of administrative procedures and management rules for the resource, the ASAs henceforth need competent personnel that these federations enable them to recruit. The federations also represent a privileged place for meeting, exchanging and sharing of experiences, particularly interesting in the context of the reform of the ASAs and the introduction of the WFD.

The same reasons are at the basis of the creation of the *Association des Irrigants des Régions Méditerranéennes Françaises* (AIRMF) (Association of the Irrigators of the French Mediterranean Regions) in 2002. The objective of this association, which brings together the Chambers of Agriculture, the ASAs, their Departmental federations and the 2 SARs of the two regions *Languedoc-Roussillon* and *Provence-Alpes-Côte d'Azur*, is to assert to the State, the parliamentarians, the territorial collectivities and the water agency the specificities of irrigation in the Mediterranean area. The reform of the ASAs and the new law on water and the aquatic environment were for the AIRMF occasions for intervening with the public authorities to adapt the regulatory provisions to the Mediterranean conditions.

The drawing up of the new SDAGE and the programme for the intervention of the Water Agency in the context of the implementation of the WFD represent two major stakes for the irrigators, for which the AIRMF will be called upon to intervene to defend the interests of the irrigators and the network managers. In the face of the de-multiplication of the public players in water and new users, the grouping of the ASAs into federations is indispensable to have available competent personnel and to provide a legitimate representation of irrigators so as to weigh upon the orientations and decisions in terms of management of the resource.

### 5.2. TOWARDS THE COLLECTIVE MANAGEMENT OF THE RESOURCE IN A PERIOD OF SHORTAGE

#### 5.2.1. The Durance Executive Commission is 100 years old and remains a modern and effective institution

The Durance watershed is characterised by the presence of very large hydraulic installations which have been built over the centuries according to the resources available and the ambitions of the regional entities.

From the 12<sup>th</sup> to the 16<sup>th</sup> century a number of canals were to be built throughout the Durance valley: mainly intended for the supply of a driving force to the mills, the larger are located in the Lower Durance (Canal de Saint Julien dug from 1171), as well as the Middle (the La Brillanne canal) and the Upper Durance.

While these mill canals could be used secondarily for watering, it was not until the 16<sup>th</sup> century that the first large canal projects appeared, with an object increasingly turned towards the irrigation of the land. In the 16<sup>th</sup> century an installation for the transfer from the Durance to outside its watershed (Crau), was built, a transfer which would continue towards the *comtat Venaissin* with the completion of the large installations in the Vaucluse in the 19<sup>th</sup> century (Canal de Carpentras).

The irregular regime of the Durance and the development of the authorisations for extractions would rapidly complicate the sharing of water and the management of the installations.

During a good number of years the conflicts between mills and agriculturists, between agricultural canals as well as between agricultural canals and large towns would succeed each other, with the low summer level of the Durance being insufficient to satisfy all requirements, in particular on the Lower Durance.

Thus all the canals of the Lower Durance represented in 1890 a maximum level of discharge of 70 m<sup>3</sup>/s; but the natural summer low levels (around 40 m<sup>3</sup>/s) did not provide a guarantee, in the Lower Durance, of water rights, especially since half of the derived water “left” the Durance watershed (Crau and Lower Rhone Valley) and was therefore not “recycled” in the river for the benefit of those downstream. Important droughts in 1895 and 1906 were to give rise to local troubles which constrained the legislators to intervene in 1907 by creating the **The Executive Commission for the Durance (*Commission Exécutive de la Durance*) (CED)** charged with managing the shortage situations by imposing and monitoring reductions in extractions on the canals of the Lower Durance.

The law of 11 July 1907 decreed the introduction of public administration regulations intended to prescribe measures to be taken to ensure the sharing of the water from the Durance between the off-takes downstream of the Pont Mirabeau (Mirabeau Bridge), when the discharge of the Durance reaches the minimum thresholds fixed by the regulations, as well as the creation of a “*Commission des prises d'eau de la Basse-Durance*”, also called “*Commission Exécutive de la Durance* (CED)” charged with its application.

Its role was to ensure the sharing of the water resources available in the Durance at the Pont Mirabeau between the irrigators so as to prevent conflicts. Its role was also to control the strict application of this procedure; the CED was even able, under the law of 11 July 1907, to exercise a policing power by issuing summonses for those who contravened. Of course, these decisions were based on internal regulations which fixes, in the event of a shortage and perfectly fairly, the volumes of water of each structure in proportion to its requirements (surfaces irrigated).

This CED is composed of 15 members, the 10 canals having their off-take downstream of Cadarache and five representatives of the regional administration and the two Departments concerned (Vaucluse and Bouches du Rhône).

At the end of the 19<sup>th</sup>, beginning of the 20<sup>th</sup> century, the mills were disappearing to the benefit of agricultural irrigation and the supply to the towns. This abandoning of the driving force by the canals enabled a renewal of the hydro-electrical amenities at the beginning of the 20<sup>th</sup> century.

This renewal led to an important development in the surface areas irrigated. Thus, several companies turned towards “*la houille blanche*” (hydro-electricity) by creating the first plants to produce electricity. As for the irrigators and the towns, it quickly appeared indispensable to create reserves.

The necessary development of the totality of the range of uses in 1923 led to the constitution of reserves on the Durance and the Verdon to be envisaged. The legislative texts of this period laid the bases for the transfer of water outside the Durance watershed by subordinating them to the respect of the water rights of the users downstream and the improvement in their conditions of use. While the installations built enabled an extension in the surface areas serviced, the latter remained at the mercy of the summer low levels of the Durance and the conflicts between users continued. During these years, the CED organised the sharing of water or rather the shortage of water between the canals of the Lower Durance.

Finally, it was decided to develop the Durance Verdon, declared of public utility by the law of 5 January 1955 called the “law for the development of Serre Ponçon and the Lower Durance” thus marking the determination of the legislators to coordinate the energetic and agricultural uses, a determination reinforced by the agreements between EDF and the Ministry of Agriculture, concerning the agricultural reserves, the re-stocking of the agricultural canals and the granting of supplementary rights for the canals of the Lower Durance and new rights for the development of the Middle Durance.

The present uses of the Durance are therefore to a large extent safeguarded by the installations created since the 1950s.

The safeguarding of the Lower Durance is therefore almost completely provided by a summer storage of 200 Mm<sup>3</sup> on the Serre Ponçon dam but the CED has continued to function since 1907; in 50 years, only 4 years have seen the canals of the Lower Durance impose self-rationing to safeguard the other uses, but since 2003, an important drought has persisted and the CED is, in close collaboration with EDF in the context of a partnership, permanently on a tightrope.

Especially since the pressures, coming from the tourism sector which has developed around the reservoirs, are strong, in particular in the *Hautes Alpes* around Serre Ponçon. During the last large drought (1989-1991), the level of this reservoir had dropped so low that tourist activities had suffered decidedly adverse effects.

Since, EDF manages the refilling operations very finely and more especially the emptying of these reservoirs, via the production of electricity (by turbine).

An agreement of exchanges was signed between EDF and the CED. The aim of this agreement is to reinforce, throughout the year the controlled management and economy of the water resources of the Durance, thanks to the hydraulic installations operated by EDF a part of which is extracted by the irrigators of the Lower Durance.

This agreement contributes to the optimised economic and joint exploitation of water resources. Its provisions, founded on the consensual and forecast management of water, constitute one of the essential responses to the orientation of the Plan for the Durance on the management of resources in periods of drought.

The Durance Executive Commission is responsible for the distribution of water resources available in the Durance between the off-takes (maxi agricultural discharge 114 m<sup>3</sup>/s) and the

agriculturist irrigators downstream from the *Pont Mirabeau* (1,000 km of canals and 80,000 ha irrigated).

The CED continues its work of discussion and negotiation between the canals of the Lower Durance and organises, between the holders of rights, measures of self-restriction to prevent serious shortages in the region and protect the use of water as much as possible. This management has been able to shelter a good part of the *Provence Alpes Cote d'Azur* region from the damage of drought, despite four consecutive years of rainfall deficit.

### **5.2.2. The Têt Dams Management Commission (*Commission de Gestion des Barrages de la Têt*)**

After the Vinça dam was filled in 1977, the first shortage situation was produced in the summer of 1989. A crisis unit met in the *Prefecture* to initiate measures to restrict extractions from the canals on the Têt. Faced with the difficulties of identifying the measures to be taken, the Chairperson of the ADASIA (*Fédération Départementale des ASA*) proposed to bring together all the canal managers to share not the resource but the shortage between the different ASAs by using the interconnections between the canals. After lively discussions, the Chairs of the upstream canals accepted to reduce their extractions to enable the water to reach the canals downstream. In the course of the following years of drought, the system was to be gradually perfected with the identification of the points for the re-injection from one canal to another. Certain years, the water is made to circulate in the right bank canals to put it back into the Têt just upstream from the off-take of the last canal on the left bank so as to short circuit the river losses. Until 1998, it was the ADASIA which organised this informal consultation, which had become almost weekly in crisis periods, between the ASAs, the administration, the County Council, the Chamber of Agriculture, BRL and the town of Perpignan.

After the drought of 1998, the County Council undertook a study to improve the operation of the dams which it owned. A fine analysis of the 20 years of operation of the Vinça dam was used to perfect the filling strategy and the complementarity with the management of the releases from the Bouillouses dam. It was henceforth the County Council which organised this consultation with which is also associated the representatives of the angling community (Departmental Federation and the CSP). The discharges released downstream of the dam and the terms and conditions for the distribution between canals are determined collectively in relation to the volume stored, from the discharge arriving from upstream, from the melted snow, the requirements for the crops and the state of the aquatic environment. It happens that in crisis periods there is a derogation from the discharges planned by the water regulations. The commission still has no legal existence, but it is implicitly recognised by all as the consultative commission of the General Council for the management of the dams.

Under the pressure of the Ministry of Ecology and Sustainable Development, the year 2006 saw the enactment of the first Departmental bye-law on drought in the context of the national plan against the rarity of water. The Departmental Drought Committee has been formed and meets 4 times in the course of the summer to examine the hydrological situation and take restrictive measures. These meetings take place immediately after those of the *Commission de Gestion des Barrages* (Dam Management Commission) which presents to it simply for information purposes the decisions taken just a few minutes previously. The Departmental Drought Committee, an official instance chaired by the Prefect recognises therefore in this local and informal instance the competence to decide on the management of the installations and the distribution of water between the canals.

The institutional innovation of this *Commission de Gestion des Barrages de la Têt* may be understood at two levels:

- In the capacity of the local water management organisations to collectively apply measures of solidarity and self-restriction with a view to share fairly the shortage of water resources,
- In the implicit recognition by the administrative authority, charged with applying national measures, of the relevance of this local organisation that it has incorporated in a *de facto* fashion into a regulatory system.

### 5.3. RENOVATION OF THE ASAS: THE BILL OF 1<sup>ST</sup> JULY 2004

In the context of the administrative simplification approach undertaken by the State in 2003, the 2004 bill - 632 of 1<sup>st</sup> July 2004 reformed the provisions governing the syndicated associations of owners: Free Syndicated Associations (ASL), Authorised (ASA) or Officially Constituted (ASCO).

The origin of the ASAs goes back to the Late Middle Ages. They are the expression of a community phenomenon, traces of which can be seen in the majority of civilisations. Since the Gallo-Roman era, hydraulic installations have contributed to the shaping of the French agricultural space. Work was undertaken to supply water to plants or, on the contrary, to evacuate surplus water from the ground or protect land from flooding. Associative structures were created to undertake the work and to provide the management and the upkeep of the amenities. Thus the “Waterers” of Roussillon going back to Wisigoth legislation may be quoted, as may the “*Wateringues*” of the *Nord-Pas-de-Calais* region (who still exist in the form of an ASCO), administered by Philippe d'Alsace's Bill of 1169.

The great undertakings to exploit the land and the territories have always been a part of vaster and more strategic policies. A multitude of regimes were introduced, with the intention of favouring associative groupings. They were grouped under the former regime, under the Latin designation « **Domat** »: an assembly of several people made into a corps formed by permission of the Prince, distinguished from other people who compose a State and established for the common good of those who are members of this corps and which may also have a relationship with the public good.

With the Revolution and the appearance of the Nation which was to abolish all the corporations, this regime was maintained and legalised (laws of 12 and 20 August 1790, 21 April 1803, 16 September 1807). Despite the multiple changes in the regime, numerous texts were to give birth in the 19th century to structures to undertake large undertakings. Under Napoleon III, the exploitation of the land was a constant preoccupation, and unifying measures were taken: a codifying law of 26 articles was promulgated on 21 June 1865, instituting three categories of syndicated associations: **free**, **authorised** and **officially constituted**. According to the preamble, the government intended to “give a boost to the spirit of private enterprise and initiative”.

Despite multiple evolutions, the General Inspectorate of the Administration and the Official Audit Office, in a report of November 1983 commented on the necessity for modernisation, especially desired since the importance and the usefulness of these entities were in no way questioned. The Bill of 1st July 2004 therefore replaced the texts of the law of 1865 and the decree of 1927. It cleaned it up by initiating as the basis for common law syndicated associations of owners and, under the terms of the preamble, managed to modernise the law of the ASAs, with the intention of clarifying and simplifying it.

Despite the fears raised by the first versions of the project, the syndicated associations were in the end to be bolstered by the Bill, which reasserted the founding principles of the syndicated associations (the attachment of the obligations to the plots included within the syndicate boundary) and the public establishment character of the ASAs and the ASCOs, whose treasury function continues to be provided by an accountant of the Treasury. The removal of property from the boundary is only possible on the condition that the plots have definitively lost all interest in the work or the collective installations. The long list of possible attributions of the ASPs provided for by the 1865 law is both simplified and widened to the creation and the management of the installations which contribute to the prevention of risks, the management of natural resources, the development of the water courses, roads and various networks, and finally the exploitation of the properties. The sharing of competence between the assembly of owners, the syndicate and the Chair remains globally unchanged.

Even if the announced administrative simplification is not always present, in particular for the control of legality, the Bill opens the possibility of mergers of ASAs and broadens the field of competence of the unions of ASA. It provides for the possibility of the consultation of the assembly of owners by correspondence, as well as the simplified procedures for minor modifications to the articles of association or the syndicate boundary. The possibility is open to the ASAs to attribute certain installations to members of the association when they are the sole beneficiaries of it. The question of the status of the personnel of the ASAs and ASCOs (that the decree compares to the function of the territorial civil service) is not totally solved and should be the subject of future clarifications.

The syndicated associations should therefore update their articles of association, their boundaries and their internal regulations, before 5 May 2008. This compliance constitutes a formidable occasion for the local managers to adapt the rules, at times seemingly obsolete, to the present context, as well as reaffirming *vis-à-vis* the administration and the collectivities their legitimacy and their know-how in the management of water resources. They should still remember the well – reasoned advice of François Jaubert de Passa, who inspired the 1865 law, “By seeking to improve upon the work of our forebears, we should beware of the temptation too hastily to give in to the spirit of innovation, which fires the imagination of some and could work against the march of the private administration of water and weaken the policing measures which protect irrigation...” “

Institutional innovation consists at times in knowing how to conserve and reinforce organisations which have proven their effectiveness.

## 6. CONCLUSIONS AND RECOMMENDATIONS

### 6.1. THE OWNER'S ASSOCIATIONS: LOCAL ORGANISATION AND MANAGEMENT

The technical management of irrigation networks involves the existence of a structure on the hydraulic unit scale to distribute the water resources between users by providing the maintenance and the operation of the different installations. The example of the French syndicated owners' associations (ASA and ASCO) shows three imperatives for the local associations:

- Firstly, the necessary liaison between the location of the plot of land within the syndicate boundary which profits from the collective installations and membership of the association which determines the right of access to water for the irrigator,
- secondly, the public establishment character of these associations which confers upon them a recognition and a legitimacy *vis-à-vis* the administration, the collectivities and watershed organisations and also gives to the fees the status of taxes which may be collected by the same means as other taxes, which guarantees the financial solidity of the associations,
- finally, the operational rules internal to the association (technical, financial, administrative, democratic, disciplinary, ...) which provide a fair, equitable and transparent distribution of the resource and the financial charges.

***We recommend that these three broad principles (which are also characteristic of the irrigators' associations in Spain and in Italy) be retained for the constitution of irrigation network users' associations in the Euro-Mediterranean regions.***

### 6.2. DEPARTMENTAL AND REGIONAL STRUCTURING OF THE MANAGERS: TECHNICAL AND LEGAL SUPPORT/POLITICAL-SYNDICATE REPRESENTATION

The ASPs are characterised by the size, the competence, and the relatively different means from one structure to another. There are the large, well-organised, irrigation structures, which possess sufficient means to enable them a certain technical, financial autonomy, and local representativeness.

This kind of structure is overall in the minority on the Mediterranean territory since here are found mainly small Syndicated Owners' Associations with very limited means: many do not have technical and/or administrative personnel, the most often they are a few agriculturists who take care of the functioning of their ASP benevolently.

We have observed that these small structures may no longer continue to manage themselves alone within the limit of their boundary.

It becomes necessary for the ASPs to form groupings in the aim of mutualising their competence, their technical, legal and human means. It is for this reason, that Departmental Federations saw the light of day in the past few years (ADASIA in the *Pyrénées Orientales*, FDSH in the *Bouches du Rhône*, FDSIC in the *Hautes Alpes*...).

This grouping is also fundamental from a political point of view. An ASP confronted with the collectivities, the State, or other water players, may not alone vindicate its stakes and its role, in a changing regulatory context and one of sharing water resources between the water users.

This structuring of the ASPs is necessary at every level of governance, it is for this reason that the *Association des Irrigants des Régions Méditerranéennes Françaises* (The Association of Irrigators of the

French Mediterranean Regions) saw the light of day, to bring the political channel of its structures at regional, watershed, national, and Euro-Mediterranean level.

***We recommend that this grouping of ASPs be generalised and encouraged at Local, Regional, National and Mediterranean levels.***

### **6.3. REGULATION AND WFD: ARTIFICIALISATION AND TERRITORIAL APPROACH NECESSARY**

Despite the evolution in the regulations which tend to privilege the preservation of the natural environment, it must be confirmed that today in the Mediterranean region the aquatic environment is no longer natural but very widely artificialised.

The multiple hydraulic amenities created in the course of the centuries have had as a consequence the storing, the transfer and the sharing of water in territories which were once arid. The masses of water are interconnected by these networks which contrary to the natural water courses which concentrate the run-offs, spread the resource over vast territories of use: the overspill basins.

Limiting the scale of the management of water to a water way and its tributaries would only be an incomplete and unsuitable approach. It is indispensable to consider the *water course/reservoir/canal/groundwater aquifer* system in its globality to apprehend fully all the factors which come into play.

***We recommend that in the public policies for water management, and especially within the context of the implementation of the WFD, the watershed organisations, the administration and the collectivities deal with the management of the hydro-systems in their globality: that is to say by incorporating into them the masses of natural water and the hydro-agricultural installations (artificial masses of water), as well as the watersheds, the overspill basins and the inter-relations which exist between them.***

### **6.4. INCREASE IN REQUIREMENTS FOR WATER LINKED TO CLIMATE CHANGES AND DEMOGRAPHIC PRESSURE IN THE MEDITERRANEAN AREA: IN SEARCH OF A DETERMINED POLICY OF HYDRAULIC AMENITIES (WATER STORAGE AND TRANSFER)**

In the decades to come, the water managers will have to face up to a strong increase in needs for water:

- Global warming (increase in temperature and risks of drought) will lead to an increase in needs for water from irrigated crops, as well as human requirements.
- The population of the French Mediterranean regions, in particular, has strongly increased. It is certain that this trend will be reinforced in the years to come.

The satisfaction of these new requirements will only happen through the mobilisation of new water resources and hence the construction of new dams and the transfer of water towards the regions with a water deficit; however, the current policy strongly dissuades the implementation of such amenities (financing, regulations, Water Agency programmes ...).

If this “anti-dam” dogma were to persist, there could be fears of inflation in local and regional conflicts and even a degradation of the aquatic environment in areas with deficits (multiplication of individual drilling ...). Indeed, the hydraulic amenities of the French Mediterranean regions have proven their total effectiveness over the past four years of drought (2003-2006): only the areas safeguarded by these installations have not been impacted by these droughts.



**We recommend that the mobilisation of new water resources and their transfer to the demanding areas remain water management tools in the Mediterranean regions.**

## **6.5. TOWARDS A MORE BALANCED SHARING OF GOVERNANCE BETWEEN AGRICULTURISTS, OTHER WATER USERS AND THE COLLECTIVITIES**

The Mediterranean irrigation networks are less and less agricultural and they contribute more and more to satisfying other uses: non-agricultural irrigation, drinking water, evacuation of rainwater... To ensure the sustainability of their installations, the Syndicated Associations should therefore incorporate these urban uses and these councillors into their managing instances, as fair compensation for their new financial contributions.

**We recommend that the Syndicated Owners' Associations integrate urban users of water and the borough councils into their managing instances.**

Conversely, the agriculturists are insufficiently represented in the local institutions created by the water law of 1992 (SAGE) and in the river committees. These institutions are mastered and controlled by the local collectivities (borough councils) and the administration; but they may orient policy or the local regulations and thus question agricultural activity, in particular the very existence of irrigation.

***We recommend that the representation of the agriculturists and the irrigation network managers be reinforced in the local water management procedures (SAGE and Environment Contract).***

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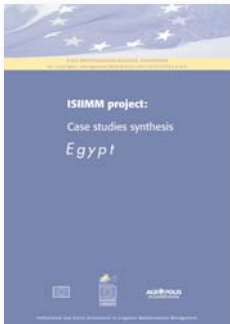
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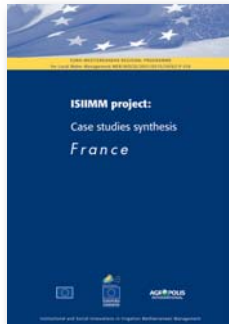
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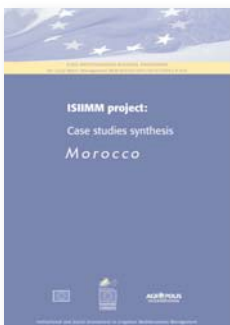
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