

WATER ECONOMY

THE WATER PROBLEM IN CATALONIA IS ATTRACTING MORE AND MORE ATTENTION, BOTH FROM THE RESPONSIBLE ORGANISMS IN THE PUBLIC ADMINISTRATION AND FROM SCIENTISTS AND TECHNICIANS WHO ARE DEVELOPING RESEARCH PROGRAMMES AND PROJECTS TO SOLVE THE VARIOUS PROBLEMS. THESE MOVES ARE FULLY COMPATIBLE WITH THOSE BEING MADE IN OTHER EEC COUNTRIES AND FIT IN TO THE UNITED NATIONS PLANS FOR THE MEDITERRANEAN.



© ELOI BONJOCH

RAMON PARÉS PROFESOR OF MICROBIOLOGY
BARCELONA UNIVERSITY



© ELOI BONJOCH

The configuration of the *Principat de Catalunya* is determined by the Pyrenean system, occupying about half the national territory, the flat land of the Central Depression and the hills of the Mediterranean System. The hydrographic system is made up of rivers that flow directly into the Mediterranean and those that flow into the Ebro after crossing the Central Depression. There is a wet Catalonia, made up of the Pyrenean region and the isolated rainy areas of the Mediterranean System, and another, drier Catalonia, formed by the Central Depression and the coasts. In the former, annual rainfall exceeds 700 mm and can reach more than 2000 mm, while in the latter, the average annual rainfall is about 500 mm. In keeping with the Mediterranean climate, the rainfall tends to be heaviest at the equinoxes, with a spring maximum in the wet part and an autumn maximum in the dry zones. Another characteristic is the violence of the local storms. The rivers of the Catalan hydrographic system are fast-flowing in the higher reaches, but later, except in the case of the Ebro, they become relatively sluggish. As well as this, there are pluvial water courses, called *rieres* or *rambles*, which

are dry for the better part of the year, but which occasionally carry considerable spates. Nevertheless, the flow of the rivers is generally fairly weak, irregular and very variable, especially in those that start at the lower altitudes. The rivers that start in the Pyrenees are fullest in summer and the others in winter.

The only tributary the Ebro receives from Catalonia is the Segre, and the Catalan climate therefore has little influence on it. Its size depends far more on the rainfall in the mountains of Cantabrica and the contributions from the Pyrenees and the Iberian System outside Catalonia. Its volume at Tortosa exceeds 600 m³ per second.

The Catalan hydrographic system also includes numerous Pyrenean lakes, coastal marshes and scattered ponds of different origins, as well as a considerable number of widely scattered reservoirs. The most important Catalan lake is that of Banyoles. One also has to take into account the karstic effects in the Éssera and Garona rivers, the karstic underground springs and the widespread mineral springs. The underground waters form streams of varying volume, sometimes close to the surface and sometimes at a considerable depth. Many of them are in-

tensively exploited through different types of wells which provide water both for industry and agriculture and also satisfy urban and domestic needs.

The Catalan coast, from Portbou to the river Sènia, is 552 km. long. One part of it is made up chiefly of rocky cliffs, such as along the Costa Brava, and the rest of deltaic alluvial plains, partly taken up by marshland. The low coast makes up 62 % of the total. The continental shelf is relatively small and also varies a lot between cape Creus and the Ebro delta. The central part contains very steep walls which become less pronounced off the Costa Brava and, especially, off the Ebro delta. Off Barcelona, depths of 300 metres are found some 30 km. out to sea. In the so-called Catalan sea, there is only one regular current, which comes from the Gulf of Lyon and flows in a north-east to south-east direction, not very far from the coast. The other currents are irregular and have little effect. The tides are practically non-existent. The sea water shows a high level of salinity, varying between 37 and 38 per thousand. In other words, it is 20 % more concentrated than the Atlantic. Overall, it can be considered biologically poor, both in variety and in quantity,



© ELOI BONJOCH

with a correspondingly meagre population of plankton, except in the areas where waters meet.

The population of Catalonia is about six million, half of which lives in Barcelona, while the rest is concentrated mainly in the Mediterranean region. Furthermore, this area sees the greatest variation in population, as a result of the tourist trade. This variation can reach twenty percent over the whole year, with the highest figures corresponding to the summer season. Industry is relatively developed, again, especially in the Mediterranean area.

The circumstances outlined above lead to the need for a considerable supply of drinking water, especially in Barcelona and the towns along the coast and in the Mediterranean System. The main problem is the scarcity of available water and its poor quality. The problem has not yet been solved in all the towns and there are particular instances both of shortage and of excessive salinity.

The industrial areas use a considerable amount of water and produce highly contaminated residual water. This has led to the development of a policy for the elimination of toxic waste and the treatment of residual water, this last in conjunction with

the treatment of residual water in the towns.

The underground water of Catalonia has also suffered the consequences of human activity. For one thing, it has diminished the wealth of the underground deposits through excessive extraction, which can be alarming as a result of the increase in direct catchment, both for industrial use and for irrigation. Also, there has been contamination of underground water due to uncontrolled dumping of industrial waste. The large increase in livestock farming, particularly pigs, has also created a difficult problem of residual water.

The increase in residual water, both urban and industrial, has had repercussions in the quality of the water of the coastal strip because originally a large proportion went directly into the sea. Due to the importance of maintaining this area in the best possible condition for swimming and water sports, an important project is under way to watch over and study the situation and develop purification programmes in coordination with those of the river basins involved. As a result of this work, the situation is now fairly well under control, but there is still a lot left to do.

The water problem in Catalonia is attracting more and more attention, both from the responsible organisms in the public administration and from scientists and technicians who are developing research programmes and projects to solve the various problems. It must be pointed out that these moves are fully compatible with those being made in other EEC countries and fit in to the United Nations plans for the Mediterranean. All in all, it allows a glimpse of an important change in the future, when the use of the available water will be profoundly rationalized so as to contribute to an acceptable standard of living. Within these changes, it is certain that an important part will be played, not only by a properly developed strategy for the treatment of residual waters, but even by the specific reutilization of some of them. It is also to be hoped that biotechnology will allow considerable progress in the elimination of heavy metals, poisonous organic micro-pollutants and pesticides, as well as an appropriate use of the sludge from treatment plants. There is no doubt that a positive development in the global water economy will play an important part in the future of Catalonia. ●