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WATER RESOURCE PROTECTION AND MANAGEMENT: DEVELOPMENT AND PROBLEMS OF THE ITALIAN ADMINISTRATIVE SYSTEM IN THE CONTEXT OF DIRECTIVE 2000/60/EC

G.Pineschi* and E. Carlo**
* Ministry of the Environment, General Directorate for the Quality of Life – Planning Division
** Ministry of the Environment, General Directorate for the Quality of Life – Division for the Management of Water Resources

During recent years major changes in the approach to water pollution problems have occurred in Europe and Italy. Over the last 10 years Council Directive 91/271/EEC concerning urban waste-water treatment and Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources, have set a modern and flexible rule linking discharge requirements with the need to ensure the highest level of protection for certain receiving water bodies, such as those areas sensitive to the problems of eutrophication. In 1999 these Directives were completely transposed into Italian legislation by the national Law D.Lgs 152/99. The delay by the Italian government in writing D.Lgs 152/99 caused it's development to overlap with the implementation of a new and very important EU Directive, the Water Framework Directive 2000/60/EEC. Because of this overlap a great deal of the innovative aspects of the WFD were transposed into Italian legislation. The new water framework sets higher standards for the protection of and improvement in European water quality: specific criteria and objectives are fixed to be reached within specific time limits, and the involvement of citizens and stakeholders is maximised. One of the main requirements of the WFD is to assume the river basin as the principal physical and ecological unit for water management.

The end of 2004 has been a crucial moment for water management politics:

- Based on the national provisions, the Regions must approve the Water Protection Plan;
- The Member States must supply the initial technical needs foreseen by Directive 2000/60/EC, i.e. those foreseen by Articles 5 and 6 and which concern, respectively, characterisation and analysis (pressures and impacts and economic analysis) on the basin scale and creation of the Protected Areas Register.

These two events are strongly linked from the moment that the national provisions (Law 183/89, Decree 152/99, Law 36/94) at least regarding the contents of the aforementioned Articles of the WFD, put the country in a position to transpose Community requirements. In fact, it must be emphasised that although the WFD has not yet been formally transposed, the relative measures must be considered to be enforced in our country. For this reason, the approval of the Protection Plan represents an important opportunity for the re-orientation of the national water strategies towards Community objectives which consider water not as "*a commercial product, but instead as a benefit which should be protected, defended and treated as such*". Only by establishing a strong coordination between the different levels of water management is it possible to achieve such objectives and in particular to confront the critical situation concerning the scarcity of the resource. This new framework must individuate new approaches, strategies and technological tools. Therefore, the hydrological balance of the basin and the minimum flow supporting dependent ecosystems (DMV) are priority instruments. In order to supply concrete examples of such coordination, 2 case studies are proposed: management of the drought event of the summer of 2002 in the Po basin and the results of the first phase of the Cecina pilot river basin testing.

THE CECINA PILOT RIVER BASIN CASE STUDY

In 2002 a network of 15 selected European Pilot River Basins (PRBs) was established with the aim to carry out the integrated testing of the guidance documents produced within the so called Common Implementation Strategy of the water Framework Directive 2000/60/EC. The overall objective was to contribute to the implementation of the WFD directive leading in the long-term to the development of

River Basin Management Plans. The specificity of the testing versus the real implementation is that the testing should be a front-runner of the actual implementation, with a focus on Key Issues felt to be of particular relevance. The objectives of the integrated testing were set around two deadlines: the first covering the 2002-third quarter of 2003 period, and the second aiming at mid 2004. These deadlines were based on the considerations that the actual implementation of the WFD is already taking place in many countries and that reporting from Member States to the Commission on specific issues of the Directive such as Article 5 and its Annexes is required in a very short time. The Italian PRBs are the Cecina and the Tevere River Basins.

The Cecina River Basin is in Ecoregion 3 for rivers and lakes and Ecoregion 6 for transitional and coastal waters. The Cecina River Basin is located in central Italy and is situated at 1000 meters above sea level. It flows through the districts of Grosseto, Livorno, Pisa and Siena and a total of nineteen municipalities within these districts. Altogether it comprises a basin surface area of a little more than 900km² and a total length of about 79km². The river undergoes frequent periods of water stress; the quantity of water flowing through it varies from a maximum of 1030 mc/s to a minimum of 0.01 mc/s. The climate ranges from 12°c in the southeast to 15°c in the west and the average rainfall is about 900mm.

The geology of the area is classified as sandstone, limestone and jasper in the higher Cecina and Pavone valleys and as emerging ophiolite rock in Sterza and Pavona. Miocene and Pliocene sediments, referable to the Neocene complex, denote the central-north area of the valley with vast extensions of Pliocene clay from the Volterra area. Quaternary deposits form the fluvial terraces of the main valleys.

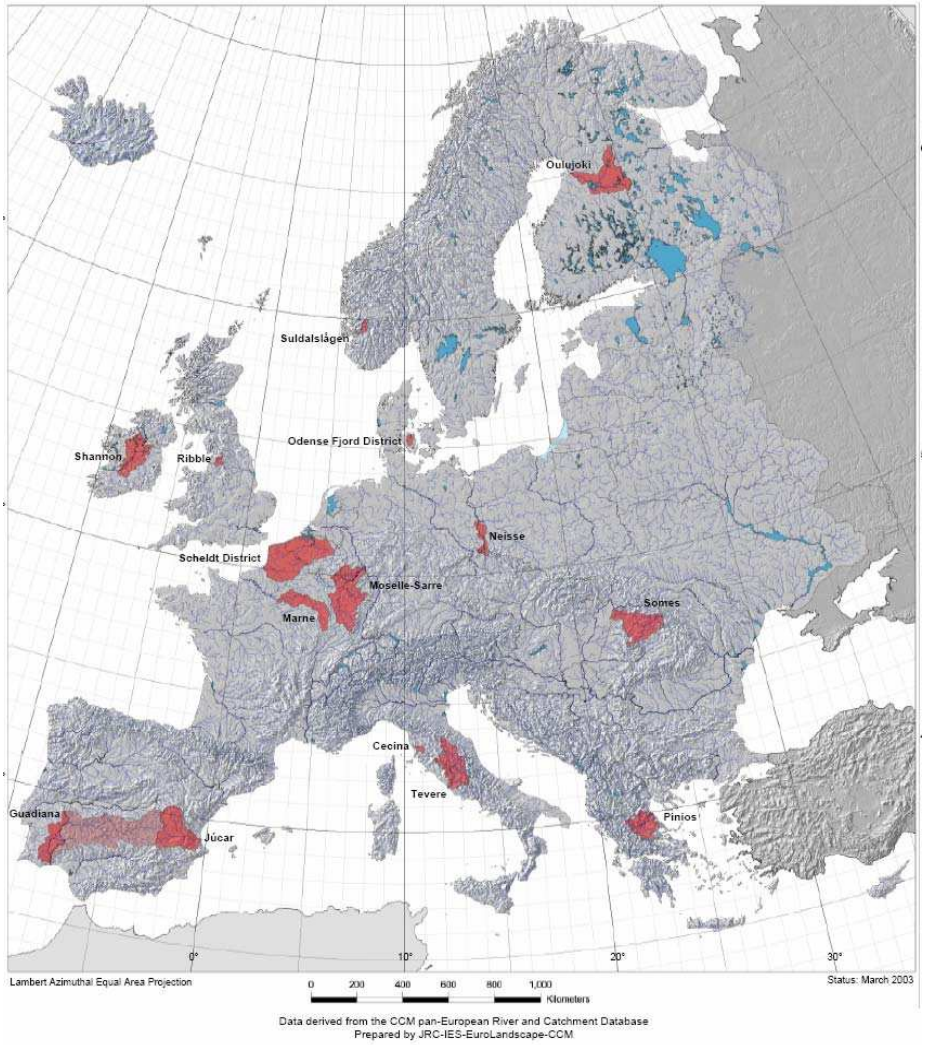


Figure 1. The PRB network

The dominant crops are cereal crops such as corn, wheat and oats, but vast areas of the catchment are used for ovine pastures. The western basin area is covered by vast areas of woodland, the dominant vegetation being Mediterranean species such as holm-oak, whilst the southwest area of the basin is used mainly as arable farming land.

The southern area of the territory has many mineral basins, from which rock-salts (in the central-west) and geothermic fluids (in the south) are mined and which, due to the associated industrial developments concentrated there, have significantly altered the natural landscape. The landscape is also very much shaped by landslides; the lower valleys of the Cecina River are frequently flooded and there are numerous problems related to groundwater scarcity. This is largely attributable to the reduced permeability of the main river channel due to the presence of minute rock fractions such as clay which restrict the recharge potential of the aquifers below the Cecina River. Mercury is present in the sediments, water and aquatic life (>50 mg/L) of the Cecina basin; this is from natural origins and from the presence of various industrial installations.

Due to the small size of the river basin it was possible to carry out a detailed investigation into water related problems in the19 Municipalities of the basin, ranging from sea level to more mountainous areas.

The GD testing has been divided into 2 stages:

- 1st stage in relation to WB GD, IMPRESS and HMWB; Tools on Assessment and Classification of Groundwater;
- 2nd stage: Classification of Inland Surface water Status and Identification of Reference Conditions; Monitoring; Best Practices in River Basin Planning.

To carry out the activities foreseen for the PRB testing exercise, on the 26th May, the Framework Programme Agreement (APQ) for the Cecina PRB was signed between the Ministry of the Environment, the Tuscany Region and the Local Authorities. The Minister of the Environment signed this agreement personally in Cecina.

This Agreement contains the measures to be taken to carry out the work successfully. In particular, the contents of this agreement focus on the following:

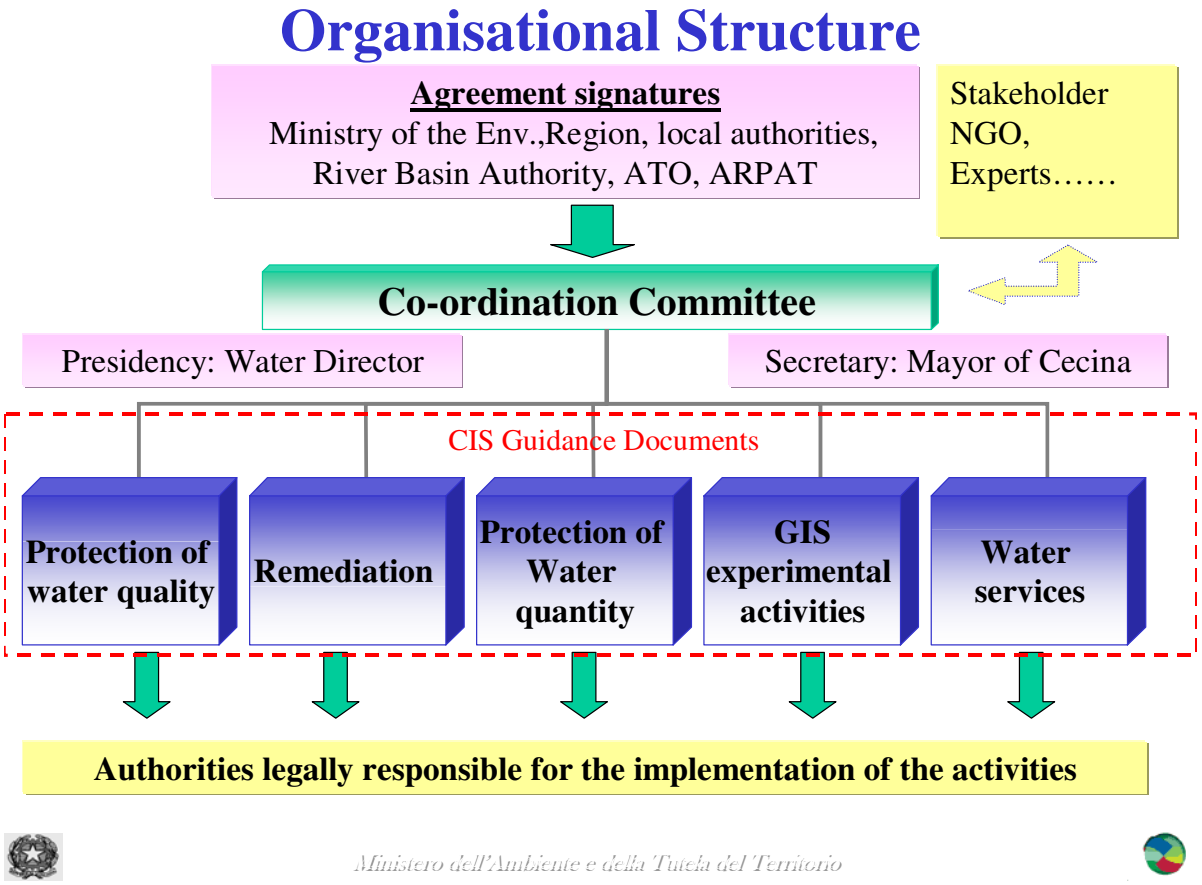
- Legal framework.
- Objectives.
- Actions.
- Tasks.
- Public participation.
- Financial resources.

The Agreement establishes a list of measures which can be grouped into key actions:

- Protection of water quantity;pollution control from discharges;diffuse pollution control;Improve and make operational water services;Remediation of contaminated soils and sediments;Carry out experimental activities;Set up GIS**.**

The Agreement also establishes the organisational work structure, making the existing informal committee, which prior to this held several meetings in order to identify the work plan, an official body chaired by the Water Director.

The organisational structure is shown in the diagram below:



Until now the activities have permitted the creation of an information reference framework and have produced from the relevant scientific results on different themes, which are:

- The nitrate contamination of groundwater;
- The sewerage infrastructure and treatment requirements;
- Contamination of water bodies by specific substances: mercury; boron and arsenic.

The activities have focused on the principle crisis of the Cecina river basin. Amongst these, that which appears to be the most damaging is most certainly the hydrological imbalance due both to natural causes and elevated abstraction rates, especially from the industrial sector.

The reduction of the flow in the riverbed and low replenishment rates of aquifers cause pollutant concentrations to amplify the crisis still further, strengthening the need for heavy limits on use (many Municipalities in the basin ration water use in the summer period).

Figure 2. Cecina River during drought conditions

It is undeniable that the presence of the massive international Solvay industry is a pressure both for quantitative aspects (Solvay consumes considerable amounts of freshwater to dissolve rock salt) and qualitative aspects (sea discharging, loss of chloride through the brine pipes).

To compare the effects of such problems 2 specific projects have been initiated in the Cecina basin. The first consists of a post-treatment plant, which treats part of the waste coming from the Cecina and Rosignano urban waste water treatment plants. This water is then reused inside the Solvay industrial plant. The recycling plant began operation in the autumn of 2004 and, at full capacity, will produce 4 billion mc/year of wastewater to be reused by the industrial sector; in this way the wastewater will substitute an equal quantity of groundwater which will be destined (2 billion mc/year), partly, for drinking water use.

The second project, which is still undergoing a feasibility assessment, consists of the use of surface water accumulated in artificial lakes during high flow in order to supply, in the summer period, mineral mining and which replaces groundwater abstraction. The water is derived directly from Cecina and accumulated in old quarries now used as basins. The project aims to realise a maximum abstraction of 2,500,000 mc with a river flow which, in periods of full flow, amounts to about 120-150 Mm^3.

THE UNIFIED MANAGEMENT OF THE PO BASIN WATER BALANCE DURING THE 2003 CRISIS CASE STUDY

The Po Basin: water resource availability

The Po River Basin (Figure 3) is unanimously considered as being rich in terms of water resources. The average meteoric flow is equal to 1108 mm (estimated on the basis of historical records from 1918 to present day) but it shows a notable variability from one year to the next. The hydrological flow volume is 77 billion m^3 per year, with an average surface water resource, estimated in terms of natural flow, equal to about 2500 m^3/s. Groundwater resources can be estimated as 9 billion m^3 per year (Source: Po River Basin Authority).

The basin is regulated through the presence of large alpine lakes, with a control volume totalling 1,25 billion m^3, and, further upstream, through the mountain reservoir for hydroelectric use, which together supply a greater volume, estimable as 1,5 billion m^3.

From the point of view of utilisation, the principle requirements are with regard to the irrigation sector, the civil and energy sectors, with a strong prevalence of the first (21,9 billion m^3 per year, corresponding to a flow of 694 $m^3/sec.$).

In total, the average used volume corresponds to 70% of natural flow (Source: Po River Basin Authority).

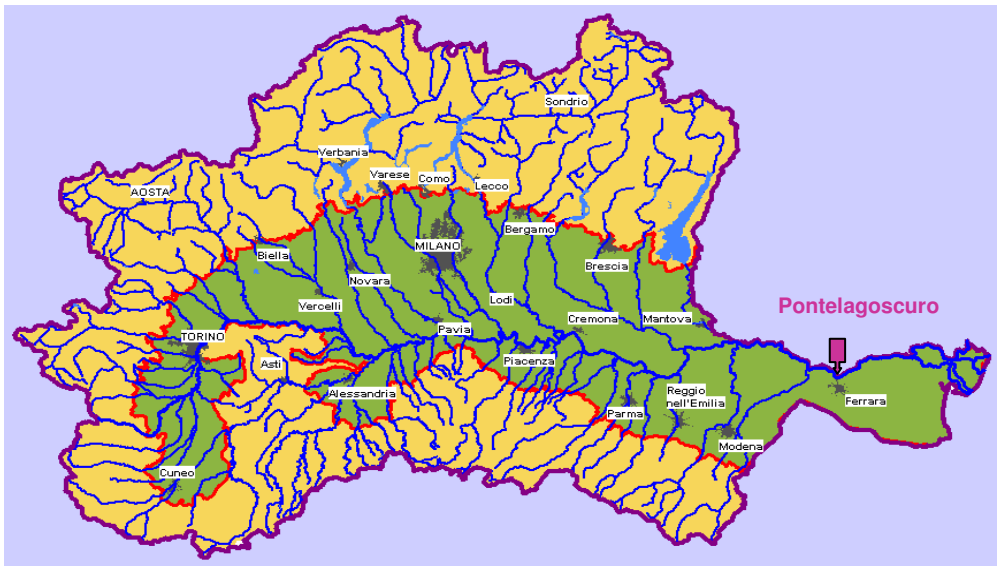


Figure 3. Po River Basin

The 2003 drought: description of the problem

In the summer of 2003 the northern regions, and in particular the Po River Basin were hit by a particularly intense period of water stress, caused in part by a prolonged absence of spring rain, and in part by the low volume of snow during the winter season. Figures 4 and 5 show the comparison between the pluviometric contributions registered in the months of May and June, 2003, and those registered, in the same months, during the last decade. The deficit appears to be between 60 and 75% in May and in the order of 50% in June (Source: Po River Basin Authority).

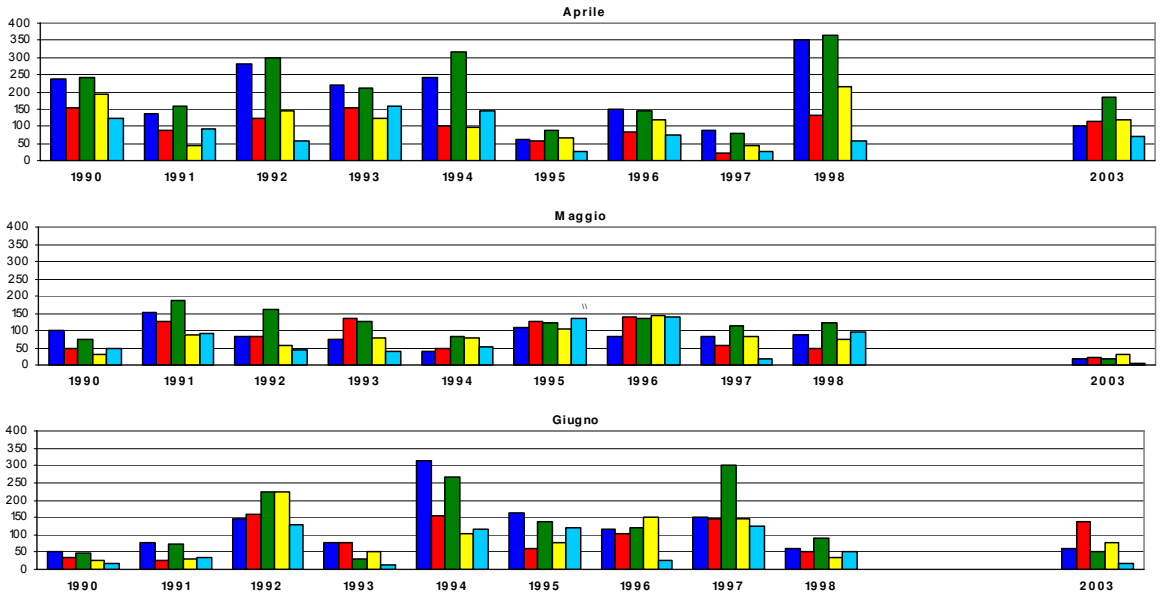


Figure 4. Cumulative monthly precipitation for April, May and June recorded in certain monitoring stations in Emilia Romagna (1990-98; 2003): Ligonchio (928 m s.m.) Ferriere (615 m s.m.) Bosco di Corniglio (842 m s.m.) Bedonia (544 m s.m.) Parma (55 m s.m.)

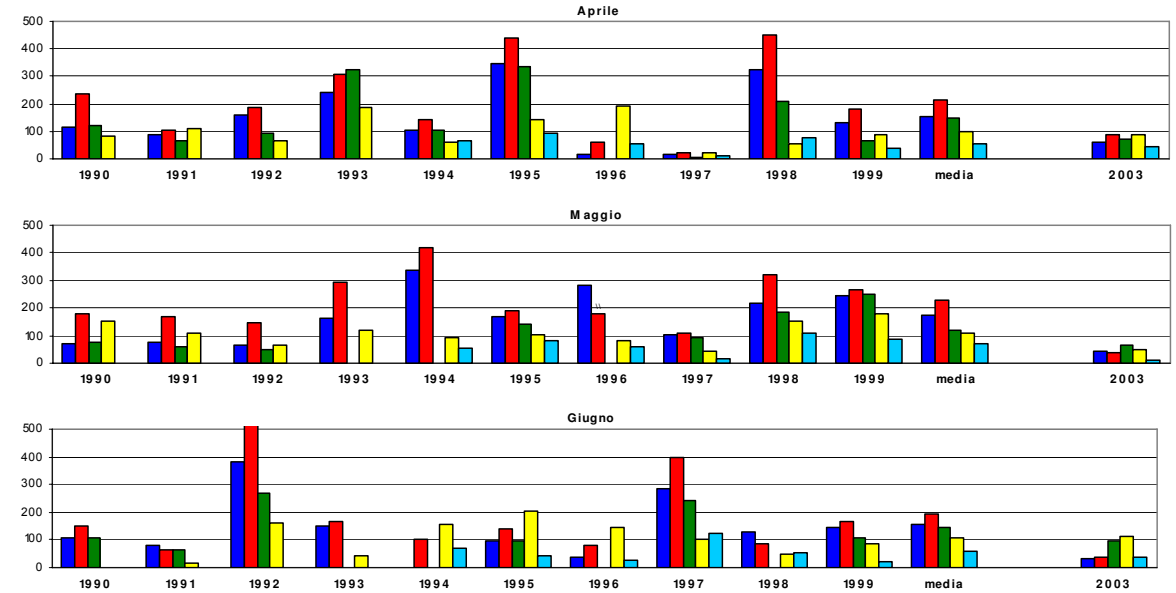


Figure 5. Cumulative monthly precipitation for April, May and June recorded in certain monitoring stations in Piemonte (1990-00; 2003): Domodossola (252 m s.m.) Varallo (470 m s.m.) Bertodasco (1120 m s.m.) M.te Malanotte (1741 m s.m.) Nizza Monferrato (138 m s.m.)

The general critical framework has been worsened by the following factors:

- mean temperature generally higher than the seasonal average;
- the start of the irrigation season;
- the increase in energy consumption (derived from elevated temperature levels).

These factors caused a diminution in resource availability, increased demand and the necessity to maintain flow levels in the lower-middle stretch of the channel, sufficient enough to guarantee the cooling process of the thermoelectric power plant.

In June, 2003, the situation became progressively worse and revealed itself in the first electrical blackout, which hit most severely the Veneto region (in fact, the Porto Tolle plant was most at risk). Throughout July 2003, the low flow was further aggravated, because of the necessity to utilise to the maximum thermoelectric power plant potential, as requested by the Manager of the National Transmission Network (Gestore della Rete di Trasmissione Nazionale) and by the Ministry of Productive Activity (Ministero delle Attività Produttive). They therefore multiplied the situation of water deficit regarding, in particular, the energy and agricultural sectors.

Protocol Agreement of the 18th July, 2003

As always happens in a situation of limited water availability facing a demand for a greater water supply, the severe water stress situation has increased the problems of conflict linked to resource; in fact, the conflicts (in terms of economics) due to water demands, already present in conditions of "normal use capacity", will certainly increase due to a situation of water scarcity, and due to a complex range of factors.

From the administrative point of view, situations such as this can be tackled through:

- the declaration of a state of emergency and the nomination of an Emergency Commissioner;
- nomination of the government regulator, however, this procedure is not practical in such a large river basin;
- the stipulation of a special Agreement, voluntary between the parties, for the unified management of the water balance in order to confront the serious drought situation.

On the 18th July, 2003, the Po River Basin Authority, Civil Protection Department, Emilia Romagna, Lombardia, Valle d' d'Aosta and Piemonte Regions, the Po Interregional Agency, the Manager of the National Transmission Network, the Lakes Authority, the National Association for Drainage and Irrigation and the Energy Production Society have signed a Protocol of Understanding to confront the critical drought situation which had manifested within the Po River Basin. This Protocol, targeted to the unified management of the river basin, is inspired by the following principles:

- voluntary involvement of stakeholders to various tasks towards the management and the use of the resource in the basin;
- absence of any derogations to the ordinary administrative procedure;
- continuous flow of information between the stakeholders participating to the Agreement.

The Protocol contained a programme of measures (figure 6) which are addressed:

- to the actual withdrawal of irrigation and drinking water immediately downstream of the great lakes or in the channels of the Po tributaries; and
- to the maintenance or increase in water levels in the main channel of the river.

The water levels should guarantee, along the same channel, a level of derivation for irrigation at least equal to 50% of the concession value, and the functioning of the thermoelectric power plant.

The activities, which began on the 18th July and were concluded the 6th August, were:

- the managers of the hydroelectric dams increased the energy production in order to increase the flow of the hydroelectric dams to a total of 3,6 billion mc per day;
- the lake consortium regulated the flow in order to control the amount leaving the lakes, in coordination with the managers of the hydroelectric dams;
- the drainage and irrigation consortiums regulated the used flow by reducing by 10% the water drawn for irrigation purposes from the tributaries on the left side of the Po river.

All these interventions had the technical objective to increase the water quantity to around 8 billion mc/d.

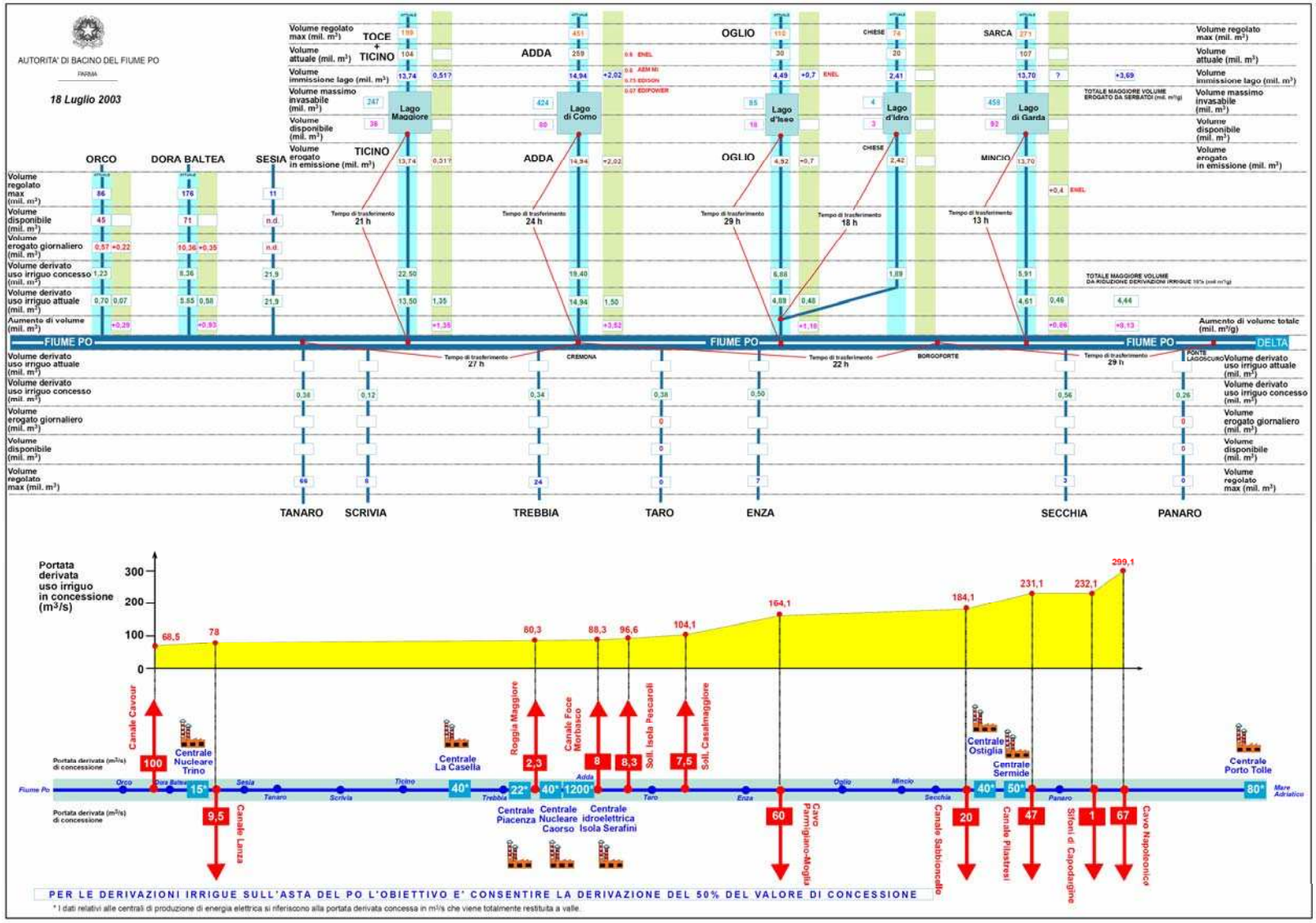


Figure 6. Programme of measures of the Protocol

Protocol Monitoring

The activity programme studied by the Po River Basin Authority to address the critical drought situation - signed by all the involved public and private subjects- was monitored daily through the flow measures of the Po and of its tributaries and the measure of the dam levels. At the same time, GRTN measured the energy production from the hydroelectric dams allowing the verification of conformity to the obligations taken by the dam owners as stated in the Protocol Agreement of the 18th July.

Through the comparison of all the data, it has been established that, in general, the dam managers have respected certain obligations. As regards the irrigation water (monitored by AIPO), there was a significant reduction in water withdrawal.

In the whole, the activity programme, which made available about 3 billion mc of water daily from the hydroelectric dams, has permitted the maintenance of the Po River flow, even though there was an absence of precipitation up to the 24th July.

Anyway, it is important to specify that the technical evaluation of the results of the Agreement has been very difficult due to the absence of monitoring on the small abstractions (not foreseen by the Protocol), the fluctuating water levels in the dams caused by the electrical plants and the lack of precision of the measuring tools (generally used for monitoring in the event of flooding).

CONCLUSIONS

The Protocol Agreement of the 18th July, 2003, was an important event relevant to the Italian administrative context. In fact, for the first time, a solution has been found, through ordinary means and through the voluntary engagement of all the economic actors interested (many of which have conflicting interests), for a situation which due to its severity and long duration could be considered an emergency. Without using special powers or derogations (typical civil protection instruments), the Po River Basin Authority has drawn a shared way forward. This has made it possible to balance the requests of the various stakeholders present in the territory and to organise the competence of the different institutions.

The work of the River Basin Authority aimed to find technical-scientific solutions, to involve the public and private actors interested in the economic, social and environmental system of the Po River Basin and to negotiate with every actor's rights and duties. This effort has demonstrated, for the first time, that an active national public body can resolve particularly critical situations with ordinary competence and instruments, considering the use of special powers (expensive for the government and of no connection to the territory) only as a last resort.

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