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TRANSBOUNDARY MANAGEMENT OF WATER RESOURCES: THE ITALIAN EXPERIENCE IN BASILICATA AND APULIA

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SUMMARY – This paper describes the background and contents of the "Accordo di Programma" (in the text referred to as "Agreement") between Apulia, Basilicata and the Italian Ministry of Infrastructure and Transportation (signed on 5th August 1999), in order to solve the critical problem of water scarcity in Apulia. This experience is an excellent example of "Transboundary Water Management" and how the environmental laws, Italian Galli Act and EU Water Framework Directive, can be implemented to promote economic and social development and assure long-term prospects for sustainable development. Although the "Agreement" needs further implementation, it represents a positive example of how to address complex situations using a valid methodology with a positive approach in order to share objectives and solve conflicts.

Keywords: transboundary water transfer, institutions, cost recovery, economics

1. INTRODUCTION

The problem of water supply in the south of Italy has been addressed since the end of the eighteenth century, when, following the national reunification, it became evident that the scarcity of resources affecting the region represented a constraint on social and economic development and had to be solved.

A large canal (Canale Principale) was built in the first half of the nineteenth century in order to transfer larger volumes of water from Campania and Basilicata to Apulia, laying the groundwork for one of the largest water transport and distribution networks in Europe.

The rapid economical development, the changes in traditional agriculture practices and land use, the extensive extraction of groundwater (with consequent intrusion of sea water into water tables) have caused frequent water scarcity in Apulia and in the coastal areas of Basilicata which has led to frequent conflicts between the two regions.

Over the last four decades, in order to solve these problems, several improvements in the water supply infrastructures has been made together with construction of large reservoirs, meant to regulate resources earmarked for uses other than drinking water (irrigation, hydroelectric, industrial).

The introduction of new legislative instruments at the beginning of the nineties, made it possible to define an integrated water policy - involving political, social, economic and technical aspects - regarding management and transfer of water resources.

The experience described in this paper is a good example of Transboundary Water Management that could contribute in finding solutions to similar problems in countries of the Middle East.

2. TERRITORIAL CONTEXT

Apulia (Fig.1), the easternmost region of Italy, has a surface area of roughly 19,350 sq. km and is predominantly flat or only slightly hilly, with mountains occupying only 1.5 % of its area. Precipitation is very low (400 mm/year), and the hydrographical system is very limited, with no significant watersheds and only two major water bodies: the river "Ofanto", which flows into the Adriatic sea after having crossed Campania and Basilicata, and the river "Fortore", which crosses Campania, Molise and Apulia, flowing into the Adriatic sea.

The population numbers approximately four million inhabitants, concentrated in the major towns or in smaller urban settlements scattered throughout the territory.

Apulia has a significant level of economic development for southern Italy, with agriculture (despite the difficult climatologic conditions) still constituting the primary economic resource. Industry is based on large steel and petrochemical infrastructures although significant growth has recently been registered in the small and medium-sized industry sector.

Tourism represents an important source of income with good prospects for the future, limited mainly by the restraints of insufficient infrastructures.

Basilicata (Fig. 1), which territory covers approximately 10,000 sq. km, has radically different climatic conditions from Apulia, given the effect of its major mountain ranges and the influence of three seas (Tyrrhenian, Adriatic and Ionian). Precipitation ranges from an average of 500 mm/year (with a minimum of 220 mm/year) along the Ionic coast to a maximum of some 2,000 mm/year in the Tyrrhenian area. The region can count on major rivers (Bradano, Basento, Cavone, Agri, Sinni, Noce and Ofanto) with significant watersheds and flows of water that have made possible the construction of major reservoirs, allowing multi-year regulation of various uses (domestic, agriculture and industrial).

Figure 1. The territorial context

The region exports approximately 1/3 of its water resources to neighbouring regions (especially Apulia). At the same time Basilicata has been forced to implement a water conservation and environmental protection programme, in order to prevent qualitative and quantitative impoverishment of its water resources.

The population numbers roughly six hundred thousand inhabitants, concentrated in major towns and rural villages.

The economy of Basilicata is based on agriculture, construction and the public sector, with only minor industrial infrastructures.

Tourism has good prospects for growth, given the remarkable natural and cultural resources that the region possesses.

2.1. Water providers and users

Management of the water system for the two regions (drinking water and irrigation) is assigned to the following organisations:

- Acquedotto Pugliese S.p.A., managing the integrated water system in Apulia.
- Acquedotto Lucano S.p.A., managing the integrated water system in Basilicata.
- The EIPLI, or Authority for Irrigation and Land Transformation in Apulia, Lucania and Irpinia, responsible for the management of the facilities used to accumulate and transport water earmarked for irrigation.

The main users of water resources are:

- In Apulia: six Drainage and Irrigation Consortiums (Gargano, Capitanata, Terre d'Apulia, Stornara and Tara Arneo, Ugento and Li Foggi). The total surface area covered by the six consortiums – equal to 1,743,591 hectares – covers practically the entire regional territory;
- In Basilicata: three drainage and irrigation consortiums (Bradano-Metaponto; Vulture Alto Bradano; Alta Val d'Agri) which, taken altogether, cover 76 municipalities with a total surface area of 634,795 hectares equal to 63.5% of the region's territory.

3. WATER SCARCITY IN APULIA

The two areas in Apulia suffering particularly from water scarcity are the "Tavoliere" plain and "Salento" (Fig. 2).

- Tavoliere

The sources of supply, used primarily for irrigation, consist almost exclusively of groundwater. 70% of the water necessary for irrigation (estimated at 290 million m3/year) comes from groundwater. This has led to over-abstraction of the Tavoliere aquifers (average supply deficit is more than 100 million m3/year). Over the last 15 years declining groundwater levels (more than 15-20 m) has been registered in the central eastern portions of the coastal area.

- Salento

The only available water source consists of groundwater, which is extracted to satisfy demand (drinking water, irrigation and industrial) estimated at a total of 300 Million m3/year.

The coastal aquifer, due to over-abstraction, shows evident signs of progressive saline contamination. As a consequence, in the near future, it will be impossible to use the water even for most part of irrigation. This phenomenon is already a reality in many places along the Ionian coastal strip.

The situation has been aggravated by the recent years of drought. It has therefore become more urgent to increase the quantity of water transferred from Basilicata, in order to replace what's produced locally.

Figure 2. The critical areas in Apulia

In order to overcome the critical situation described, and to reduce the abstraction of groundwater, different solutions have been analysed:

- Tavoliere. The regions involved (Molise and Apulia) are currently analysing the possibility of transferring water from the Biferno basin. Feasibility studies and the related operating procedures have reached an advanced stage, also taking into consideration an eventual agreement between Molise and Apulia. Under this proposal, resources would be drawn from the Occhito reservoir that offers the necessary storage and regulation capacity. Not only the new facilities, scheduled for construction, would be used, but also the infrastructures of the Fortore system, designed for vectoring and multi-purpose operations (the drinking-water purifier in Finocchito, the irrigation networks of Capitanata Drainage and Irrigation Consortium etc.).
- Tavoliere. Through restructuring of the Santa Venere barrage and related pumping facilities, it will become possible to increase the volumes extracted from the rich Ofanto basin.
- Salento. Further resources can be generated by increasing the volumes available in the Sinni-Pertusillo system, as stated in the “Accordo di Programma” signed by Apulia and Basilicata. This could lead to the use of the multi-use Sinni-Salento aqueduct (including the facilities for the regulation of the irrigation networks), reaching the lower Salento area through a large-diameter conduit. Apulia and Basilicata have already reached a preliminary understanding within the “Accordo di Programma” for the use of resources from both Fortore and the Sinni – Pertusillo system.

Other possible solutions, that due to their complexity and costs will need further analysis, could be:

- The construction of an aqueduct connecting the Abruzzo and Apulia coasts, by means of underwater conduits, that would transfer water from the rich water recourses of Vomano, Pescara and Sangro rivers. These conduits would flow into a collector at the drinking-water purification plant in Finocchito. The project estimates that a volume of approximately 200 Million m3/year could be transferred. Two procedures for collecting water from the three rivers have been planned, one during the summer period and one for the remaining months of the year.
- Transfer of water resources from Albania to the Salento area. A 212 km-long pipeline would be built, with 127 km on land (108 in Albania and 19 in Italy) and 85 under water, running along the bottom of the Adriatic Sea. The connection would provide increased resources of approximately 150 Million m3/year.

Figure 3. Solutions to overcome water scarcity

The recent infrastructure projects, together with initiatives of water demand management, are important to assure long-term prospects for sustainable development. This need is felt particular in the following sectors:

- Tourism: the number of structures, and consequently the demand for water services, are forecasted to increase notably, even in areas of elevated naturalistic value, urging the need to address the applied constraints on pumping from water tables;
- Agriculture: the sector will become more competitive, especially as the elimination of duties in the Mediterranean basin draws nearer (2010). In this framework, it is essential to assure water supply and maintain low water rates to remain competitive. Additionally it is very important that the real impact of the “Common Agricultural Policy”, linked to the implementation of decoupling (shift funds from product to producer support), is thoroughly analysed.

4. LEGISLATIVE FRAMEWORK

The goal of the Galli Act is the industrialisation of the sector, eliminating its excessive fragmentation through integrated management of water supply networks, sewerage and sewage treatment plants (economies of purpose) within an optimal territorial area (economies of scale). The law is fundamentally based on following principles:

- All surface and ground waters are to be considered a public resource that must be protected and preserved for future generations.
- Drinking water use has priority over other uses.

The law implements separation between activities involving guidelines, supervision and control and those regarding the operations of water services, in order to improve the quality level and economic efficiency (fees recovering costs and investments).

Art. 17 of the Galli Act sets the criteria and guidelines for transboundary water management. Art. 17 also states that basin authorities of national importance as well as the pertinent regional governments (while stakeholders of the powers of the basin authorities), can promote “programme agreements” (under the provisions of art. 27 of Law no. 142 of 8 June 1990, n.142). The purpose of

these agreements is planning the use of water resources for human consumption, entailing transfers of water between different regions with crossing of the watershed districts (as indicated under Law no. 183 of 18 May 1989).

The following bodies have been created for the management of water resources on the watershed level, in implementation of the guidelines contained in Law 183/89 (Fig. 4):

- The Inter-Regional Basin Authority of Basilicata;
- The Basin Authority of Apulia.

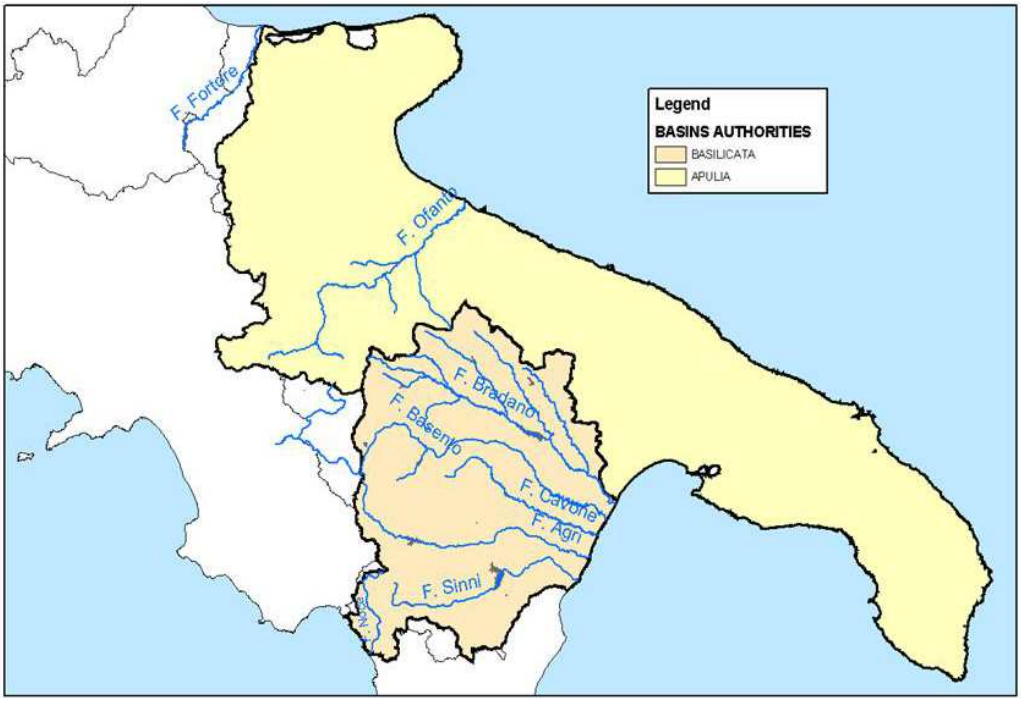

Figure 4. Basin Authorities

These authorities, in order to govern the watersheds under their jurisdiction in a uniform manner, orient, coordinate and control the implementation of the initiatives through:

- formulation of the Basin Plan;
- calculation and updating of the water balances, plus enactment of the measures for economic water-related planning, (in implementing art. 3 of Law 36 of 5 January 1994);
- supervision and control of the implementation of the plans;
- studies, surveys and background research;
- coordination of planning initiatives involving actions of land-protection.

5. THE "ACCORDO DI PROGRAMMA"

It was in the context of the Galli Act that the "Accordo di Programma" (from now on referred to as "Agreement") between Apulia and Basilicata and the Ministry of Infrastructure and Transportation was signed on 5th August 1999. This agreement is extremely wide-ranging and elaborate, introducing an integrated approach to the management and distribution of water resources in the two regions.

5.1. The "Agreement" contents

The most important contents of the "Agreement" are:

- define the balance of the water resources shared by Basilicata and Apulia;
- select projects of common interest;
- implement the guidelines regarding development activities (planning and monitoring);

- define guidelines regarding the ongoing development of water service providers;
- determine the costs of wholesale water production;
- initiatives for water recovery, reuse and savings;
- protect and safeguard of aquifers in the Ionian coastal districts;
- identify measures and initiatives to permit full utilisation of reservoirs and to complete the water systems;
- verify feasibility of new transboundary initiatives;
- define shared procedures in order to cope with both water scarcity and drought.

Figure 5. Interconnected water systems

The “Agreement” places a particular focus on the interconnected water systems of Sinni-Pertusillo, Basento-Bradano and Ofanto. The available water resources, looking only at surface flows, have been estimated at approximately 1 billion cubic metres a year. The size of the territories involved in the procurement and utilisation of water supplies is approximately 20,000 square kilometres.

Other resources and uses not covered by the agreement, as they are located in the neighbouring regions of Campania and Molise, are to be involved through an extension of the “Agreement”.

Under the “Agreement”, the two regions committed themselves to apply different forms of water savings with the objective to recover 20% of the resources by 2015. Water savings will be pursued by working on the planning and control of consumption, reconverting and modernising existing irrigation systems, installing meters by end-users, undertaking initiatives focused on the reduction of consumption and the monitoring of leakage in the network and making use of non-conventional resources.

The initiatives have been selected with priority given to those involving the completion and optimisation of the functional features of existing facilities, which can ensure additional supplies of water stored in reservoirs amounting to more than 100 million cubic meters yearly. Taken as a whole, the efforts are expected to produce economic, social and environmental benefits for both Apulia and Basilicata – in particular regarding the progressive saline contamination in the Salento area and along the Ionian coastal strip.

5.2. The "Agreement" Organisation

An authority for the management of water resources has been established, in order to coordinate and oversee the "Agreement", consisting of the presidents of the two regional governments and the Ministry of Infrastructures and Transportation.

The organisational structure for the management of the "Agreement" can be outlined in the following figure.

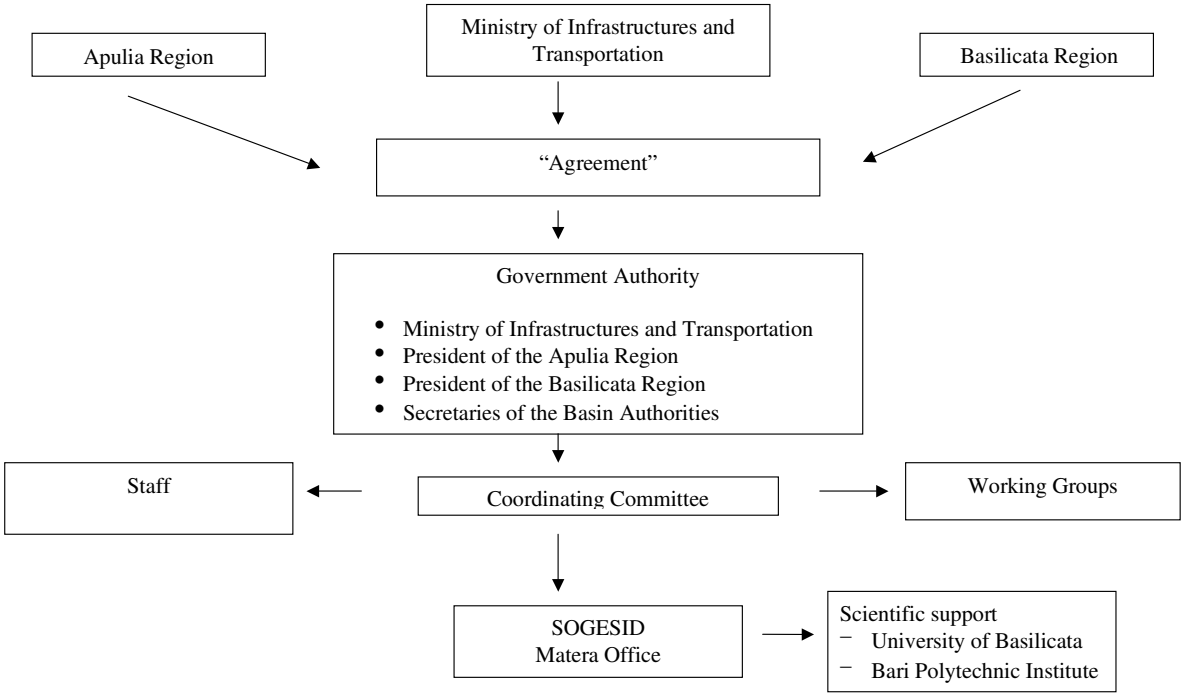

Figure 6. Organisational structure for the management of the "Agreement"

The two regions have agreed to use the services of SOGESID, which has formed a technical team in Matera (Basilicata). The main activities of the team are:

- promotion of initiatives to improve rational management of water supply and demand;
- definition and implementation of an integrated information system on water resources and related networks;
- improving cooperation between the different parties involved in the water management;
- start-up of monitoring of costs that determine wholesale rate;
- monitoring of water balance in order to define territorial allocation and use of resources.

6. THE WHOLESALE RATE FOR WATER

Art. 15 of the "Agreement" sets the criteria for determining the costs of primary supply of water resources to be allocated to the different sectors of use (households, agriculture, and industry).

Following factors have been taken into consideration:

- operating expenses and ordinary maintenance costs;
- annual depreciation related to extraordinary maintenance costs;
- costs for anti-erosion soil maintenance, in order to counter the silting of reservoirs and the resulting loss in accumulation capacity;
- costs for maintaining water quality of the reservoirs;
- costs for restoring environmental balance (minimise the impact of large pumping plants; reclaiming the territory affected by the infrastructures; recovering the ecosystems downstream of the reservoirs; countering the erosion of the Ionian coast);

- definition and implementation costs for qualitative-quantitative monitoring of water systems;
- costs due to the loss of potential natural energy that could be used on site but is utilised in a different manner (pumping).

With the support of the Working Group, on May 27th 2004, the Coordinating Committee for the Implementation of the "Agreement" reached the following conclusions regarding the wholesale rate for water:

- fees for 2000-2002: the commitment to cover wholesale water costs with grants from the Ministry of Economy and Finance;
- fees for 2003-2005: a provisional model was approved for experimental, lump-sum determination of the wholesale water rate, not including industrial costs (equal to € 0.055/m3 for the years 2003 and 2004 and € 0.075/m3 for the year 2005). The rate applies to the volumes supplied to Apulia (243 M cubic meters) and Basilicata (156 M cubic meters);
- definition of measures and operating procedures regarding industrial costs for 2004-2005 (within July 2004);
- agreement on the plan for the use of water resources in the year 2004;
- revenues shall be used to finance activities needed for the protection of water resources.

The estimate of environmental costs was carried out, in collaboration with the Basilicata Basin Authority, by systematically gathering data from the main water supply systems of the territories involved and projects financed in these areas in recent years.

- "Direct" environmental costs were determined for initiatives in the portions of the basin from which water supplies were taken. In these areas the uses of the soil, the activities and construction development have a direct influence on the water bodies from which supplies are drawn. The initiatives include maintenance of the water-forestry systems and the water shed grid, as well as work on sewage treatment, plus the qualitative-quantitative monitoring of waters.
- "Indirect" environmental costs were also taken into consideration. These costs include maintenance of streambeds and riverbeds downstream of reservoirs and for the protection of the seashore against coastal erosion.

The criteria defined within the "Agreement" are coherent with those stated in the European Water Framework Directive (2000/60/EC). The WFD promotes sustainable water use based on long-term protection of available water resources: the Directive, in order to stimulate the efficient use of water resources, sets the principle of recovering the costs of water services (financial[1], environmental[2] and resource[3] costs).

By 2010, Member States must ensure that water pricing policies provide adequate incentives for users to use water resources efficiently and thereby contribute to the environmental objectives of the Directive.

Member States may in so doing have regard to the social, environmental and economic effects of the water service cost recovery, as well as the geographic and climatic conditions of the region, or regions affected. The economic analysis is based on long-term forecasts of supply and demand for water in the river basin district.

[1] Financial costs of water services include the costs of providing and administrating these services, plus operating and maintenance costs and capital costs (principal and interest payments; return on equity, where appropriate).

[2] Environmental costs represent the costs of damage that water uses impose on the environment and ecosystems and on those who use the environment (e.g. a reduction in the ecological quality of aquatic ecosystems or the salinisation and degradation of productive soils).

[3] Resource costs represent the costs of foregone opportunities which other uses suffer due to depletion of the resource beyond its natural rate of recharge or recovery (e.g. linked to over-abstraction of groundwater). (Source WFD CIS)

7. CONCLUSIONS

The activities leading up to the stipulation of the “Agreement” were lengthy and complex. The procedure, under which the consensus was reached, has been characterised by an awareness of the need to jointly manage water resources according to solidarity-based criteria and the principle that water should be considered an economic resource available in limited quantities.

The representatives of Apulia were required to meet the growing demand of the agricultural sector (which traditionally shows a scarce capacity of cost recovery) and to manage groundwater resources in a sustainable manner. The representatives of Basilicata had to closely evaluate the needs of their own territories, protecting their resources and obtaining reimbursement of related costs.

Within this framework the Ministry of Infrastructures has played an active role without interfering in regions autonomy and contributing to the negotiation process and to resolve disagreements. In any event, the two Regions played the leading roles in the negotiation process.

The agreement on the plan for the use of water resources in the year 2004, together with the definition of the provisional wholesale rate, constitute an initial important result. It also demonstrates how it is possible to define a common policy that promotes economic and social development of the two Regions.

The Italian experience – although the “Agreement” needs further implementation – represents a good example of how to address complex situations using a valid methodology with a positive approach in order to share objectives and solve conflicts. Italy offers its know-how in this area as a contribution to start-up of agreements regarding Transboundary Management of Water Resources.