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## MANAGEMENT PROBLEMS OF WATER RESOURCES IN THE SETÚBAL PENINSULA

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ABSTRACT

The importance of water resources for the Social-economic development of Portugal is analysed as well as the necessity of a management policy for these water resources.

The general principles that a correct Water Management policy should follow pointed out, as well as the importance of the pollution control of through the setting up of rules.

A resume of the problems related with the water resources in the Setúbal Peninsula is also included. Mention is made to the fundamental role played by the Municipalities launching this process, namely the "Setúbal-Project" (Co-operation Project Between Portuguese Government and the United Nations Programme for Development), a pionner work in Portugal of a systematic analysis of an Aquifer in a costal and estuarine area applied to its development and management.

## RÉSUMÉ

On analyse l'importance des Ressources en Eau dans le développement économique et social du Portugal, ainsi que le besoin d'une politique de gestion de ces ressources en eau.

On souligne les principes qu'une politique correcte de gestion de l'eau doit suivre en mettant en évidence l'importance du contrôle de la pollution à travers l'établissement de règles.

On fait aussi un résumé de la problématique des Ressources en Eau dans la Péninsule de Setúbal et du rôle que les Municipalités ont joué dans le déclenchement de tout ce processus surtout en ce qui concerne le "Projecto Setúbal" (Project de Coopération entre le Gouvernement du Portugal et le Programme des Nations Unies pour le Développement - PNUD), ce travail peut être considéré comme un travail d'avant garde au Portugal en ce qui concerne l'analyse systématique appliquée à un Aquifère dans la zone côtière et d'estuaires.

## RESUMEN

Se analiza la importancia de los Recursos Hídricos en el desarrollo Económico-Social del País y como consecuencia lógica la necesidad de una política de gestión de esos Recursos Hídricos.

Se apuntan los principios generales a que obedecerá a una política correcta de Gestión del Agua, salientándose la importancia del control de la polución por la elaboración de normas.

En seguida se hace un pequeño historial de la problemática de los Recursos Hídricos en la Península de Setúbal y del papel fundamental que tendrán las Autarquías Locales en el desarrollar de todo el proceso fundamentalmente el "Projecto-Setúbal" (Projecto de Cooperación entre el Gobierno de Portugal y el programa de las Naciones Unidas para el desarrollo - PNUD), trabajo pionero en Portugal de análisis sistemática de un Aquífero en la zona costera y de Estuarios aplicada a su desarrollo y gestión.

Water is a natural resource essential to Man's subsistence and activities. It is not only an essential element to life. According to its quantity and quality it is also a conditioning factor for economic development and social welfare.

The present problems raised in the field of water resources make us try to avoid that the growing scarcity of water becomes an obstacle to the social and economic development.

In Portugal the water resources play a relevant role in the natural resources available in the country. In the last decades, the policy for the use of natural resources, and particularly of water resources, has not always taken into account the real interests of the populations and of the National Economy.

The Democratic situation created in Portugal after April 1974 led to new perspectives to surpass this situation, not only because of the population's and technicians greater awareness and capacity of intervention concerning water problems but also because of the changes occurred in the country.

We must stress the Constitutional principles that establish the "collective appropriation of natural resources", the right common to everybody, to a human environment, healthy and ecologically balanced and the right of defending it being a duty of the state to promote the rational good use of natural resources, safeguarding its capacity of renewing and its ecological stability as well as the progressive and hasty improvement of the quality of life of all the Portuguese.

The solution of the problems of water resources can only be reached through an adequate management policy having as its aim not only a better use of the available water but also a good planning of the use of the water resources.

Briefly speaking it may be said that the water resources management aims at the practice of techniques which allow to obtain a maximum advantage for the society from the use of those resources, assuring at the same time, that the water remains in good condition for an indefinite period of time.

The need of water management is mainly a consequence of the very particular characteristics of water resources, among which the principal ones are:

- Water is essential for Man's survival;
- Water is an indispensable production factor and quite often impossible to replace in economical activities;
- Water is a renewable natural resource although in limited quantities;
- Water is a moving resource;
- Water is a resource of intersectorial use as it is used both in the primary sector, and in the secondary one, as well as by the Services.

When conceiving a policy for water management there are factors of institutional nature which condition to a certain extent, the principles that water management must follow.

Among these principles, the most important one is probably the one that stipulates the need to consider the hydrographic Basin as the water management basic unit since the several forms of occurrence and use of the water in several points of a certain basin are, generally, interdependent. The water management of a hydrographic basin must have a public entity as responsible although it should not exclude the convenience of a decentralization which allows the municipalities to go on with the actions that belong to their sphere of influence concerning water management.

A water management policy must take into account the overall perspectives of the development and, particularly the limits set up by the land-use planning and the conditioning aspects existent situations. Concerning this point the policy to be defined in relation to the installation of new activities of use, must prevent the existent situation from being aggravated, and in relation to the already installed users, it must establish programmes of progressive regeneration of the water resources until the aimed quantity and quality levels are reached.

Some of the principles to be included in a correct policy of resources management are mentioned below:

- All the water resources must be public property and under the administration of the State (progressive disappearance of private propriety of water);

- Rational and integrated use of water resources with priority to the provision of potable water for domestic use;
- Observation, inventory and permanent control of water resources and inventory of its uses;
- Prohibition of opening new installations that are not equipped with the necessary means to prevent water pollution;
- Active participation of the population in all the actions that aim at the rational use and the maintenance of water resources;

More specifically, we think that Local Authorities should have the following responsibilities:

- Home distribution of potable water;
- Home collection of waste waters;
- Collection and drainage of storm waters;
- Water impounding treatment, delivery and reserve;
- Transport, treatment and final discharge of waste waters;

Impounding delivery done by Municipalities should be submitted to the appreciation by the competent departments of the Central Administration, as well as the cases of treatment and final discharge of waste waters.

#### Water pollution control. Standards, charges and subsidies

A common system used for pollution control is to set up standards to define the maximum limits of pollution for effluents.

For an easier control, the standards should mention the characteristics of the effluent waters and not the characteristics of the receiving waters after having received the effluent.

The disregard of a standard should be punished with a fine proportional to the degree of the infringement. It should be proportional to the degree of the load discharge in excess. To discourage the attempts of infringement the fines must be rather high, much higher than the amount needed for the necessary treatment.

The application of those fines must not interfere with the civil responsibility of the offender for damage to third parties.

### Economic incentives. Charges and subsidies

The necessary information for the correct definition of the pollution standards is very wide and complex, thus the installation of a standards system may lead to considerable expenses. For this reason it is preferable to adopt economic incentives that can take the form of exaction, from the agent responsible for pollution, of charges whose amount increases according to the pollution caused or the form of payment, also to the polluting entity, of subsidies that will increase according to the degree of reduction of the pollution.

Although it is possible to prove that charges and subsidies systems are theoretically equivalent, in fact the subsidy systems may cause inconvenient distortions and may cause difficult administrative problems.

Besides, the subsidies systems is not psychologically accepted by public opinion.

Another advantage of the charge system is to assure automatically the financing of expenses caused by maintenance of the structure responsible for the water management and the construction of necessary collective works.

### Water Resources in the Setúbal Peninsula

After the 25<sup>th</sup> of April 1974, the municipalities started to develop an activity more adequate to their natural tasks. A deep connection to the wishes of the populations was urged upon the Local powers management. A deeper engagement for the search of the correct solutions of the most urgent problems was felt.

In October 1974, the municipalities of the District of Setúbal analysed the urgent problem of water supply to the District, which was studied in detail in November of the same year, a decision was taken to submit the subject to the Minister of Social Equipment and Environment, to the Secretaries of State of Public Works, Housing and Town Planning, Subsecretary of State of Environment and General Director for Hydraulic Services.

The problem of water to the District of Setúbal appeared to be the consequence of our knowing that a work was done according to the directing line given by Council of Ministers for economical affairs of December 3, 1968, whose aims were as follows:

1 - Analysis of water availability in the Continent:

- Hydro-Ecological conditioning aspects;

Natural Resources and their characteristics

2 - Analysis of the water consumption in the Continent, considering a period up to the year 2010;

- Populational, industrial and agricultural development;

- Comparative analysis of availability and consumption with the aim of defining the areas of the Continent with lack of water.

Such results were published only in 1972, and the following conclusions were drawn:

- a) The total quantity of water available in the Continent is 21 375 millions of cubic meters per year, whereas the consumption expected for the year 2010 is 11 167 millions of cubic meters per year. At a national level the situation is satisfactory, if we consider the period until the year 2010.
- b) At a district level and for the above mentioned period, only the District of Lisbon, Leiria e Setúbal will have a deficit.
- c) More exactly a deficit of 1080 millions of cubic meters per year is expected in the District of Setúbal, in the year 2010.

Aware of these facts, the municipalities of the District of Setúbal pressed the Central Government towards the creation of preventive measures for the contention of the over exploitation of the aquifer (1).

The legislation about water impounding reflected this aspect and the Decree-Law nº 367/77 was published reformulating all the legislation on this matter and taking into account the need to control the water use.

The referred Decree-Law adopted a regime of previous licencing for the opening of wells and impounding holes reinforcing the restriction of underground water use in the Setúbal Peninsula:

- (1) - The mio-pliocenic aquifer system of the rivers Tejo and Sado corresponds to an underground reservoir composed by tertiary deposits belonging to the basins of those rivers. This reservoir is limited to North and West by formations of the Paleogene and Cretaceous which constitute an impermeable boundary, or by the calcareous formations of the Jurassic which correspond to a permeable boundary. To East and South, the tertiary formations are in touch with the paleozoic socle which forms equally an impermeable boundary. At last, in the Setúbal Peninsula the southern limit of this reservoir is formed by the oligocenic marls of the Arrábida Mountain.

In spite of considerable improvement in the situation due to the revision, of the Law situation of injustice still take place, caused by the over exploitation of underground waters by means of private holes, as it is the case, in the District of Setúbal, of Quimigal (public enterprise in the area of Barreiro whose main activity is the production of chemical products, fertilizers, etc.) that often uses more water than all the population of Barreiro, Socel (public enterprise in the District of Setúbal that works in the cellulose branch) and National Siderurgy (public enterprise in the area of Seixal that works in the production of steel), only to refer the most significant cases, although there are a lot of similar situations.

Contrasting with this there is the case of Lisnave in Almada (enterprise that deals with ship repairs and building - nearly 10 thousand workers) that was not allowed to open its own wells, having to use the normal services of the Municipality and paying for these services, as usual.

This situation must be analysed by the Central Government, as such private wells contribute in a larger scale than Municipal ones to the exhaustion of the aquifer.

In financial terms we can conclude that well in those circumstances is easily paid off as the water price is very low. This does not give place to great restrictions and, on other hand, it creates a situation of inequality between the population living in the District and the existent industries.

One possibility to surpass this situation would be to define a system of charges to be paid by private entities that collect water from, their own impoundings a price being fixed to be paid to the local authority per cubic meter of collected water.

Nowadays in Almada, industrial and commercial entities have to pay a price (14\$00/m<sup>3</sup>) similar to the second price for domestic use (13\$50/m<sup>3</sup>).

We do not think this is the most correct situation, as the real average price for m<sup>3</sup> is nearly 20\$00. Some studies are now being done so



That large and middle industries and large and middle commerce are accordingly charged.

A seminar took place in Almada, to examine those questions, under the topic "Study of Water Resources of the Setúbal Peninsula", promoted by the District Municipalities sponsored by the General Directorate of Water Resources.

One of the most important points revealed in this seminar was done by Mr. Quang Trac, UNESCO chief technical adviser of the Setúbal project, who informed that the aquifer system existing along the low Tejo and the low Sado rivers (from Fomar to Grândola) is one of the most important, quantitatively, of the ones existing in Iberian Peninsula.

So it will be possible to go on with the hypothesis of using the conduit of Castelo do Bode (1) (now being built) to meet the increase of development in Lisbon and the Northern shore until the year 2010, and to cover the increase in the Setúbal Peninsula with underground water.

Besides being technically feasible alternative of supplying urban and industrial demands in the Setúbal Peninsula at short, medium or even long term, it is also possible from an economical point of view, as the cost of underground water will be nearly half the price of the alternative water transported from Castelo do Bode.

As a conclusion, we must stress the importance that the Local Authorities had in all this process as they largely contributed to the "Setúbal Project" becoming a reality. According to the analysis of all the water resources problems in the Setúbal Peninsula, the advantages are clearly shown which a correct cooperation between the Central Administration and Local Authorities will have for the development and implementation of a water resources management policy.

- (1) - The conduit of Castelo do Bode is basically formed by: a 4,9 km long tunnel from the water impounding us to Portela, a pumping station, a water treatment plant and a conduit between Asseiceira and Vila Franca de Xira about 80 km long. Initially, it was expected that the linkage with the supplying conduit of the Setúbal Peninsula would be done in Vila Franca de Xira. This conduit would go along the Southern shore of the Tejo estuary up to Almada, with a pumping station in Porto Alto.

BIBLIOGRAPHIC NOTES

This work done having as a support "A Gestão das Águas" (Water Management), by L. Veiga da Cunha and others, as well as the communications presented the "Seminar on Water Supply and Drainage in Portugal" and the "Seminar on the Study of Groundwater Resources in the Setúbal Peninsula".