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MANAGEMENT OF THE FRESH-WATER RESOURCES OF THE MEDITERRANEAN BASIN AND PROTECTION OF THEIR QUALITY

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Section 1 OBJECTIVES

1.1. General objective

The objective of the "Blue Plan" for the Mediterranean is to assist the responsible authorities of the 18 costal States of the Mediterranean Sea in making choices, by submitting to them:

- an evaluation of existing imbalances;
- a description of possible and desired developments;
- data for appraisal and evaluation of their decisions on the ecological balance and territorial harmony.

1.2. Sectoral objective

Considering water as an element of the environment and a factor in development:

- to describe the present state of knowledge concerning the waters of the sea and mainland of the Mediterranean Basin in their present relationship;
- to study possible changes in the imbalances caused by development;
- to propose desirable changes and appropriate measures in the form of a programme of research and action.

Section 2 DESCRIPTION OF THE PROJECT

2.1. Basic information

2.1.1. The Mediterranean basin comprises the sea and its littoral. The Mediterranean Sea, excluding the Sea of Marmora and the Black Sea, covers an area of 3.5 million km^2, has a volume of 3.7 million km^3 1/, a renewal period of 80 years and an average depth of 1,500 m, with maxima of 5,000 m, and extends 3,800 km from east to west. It has three important sills: at the Strait of Gibraltar (depth 365 m), the Sicilian Channel (350 m) and the Dardanelles (100 m). The first (width 15 km) separates the Mediterranean from the Atlantic Ocean and makes it an almost enclosed inland sea; the second divides it into a western and an eastern basin; the third separates it from the Sea of Marmora and the Black Sea. The average salinity is 38,000 ppm (as against 35,000 ppm in the Atlantic Ocean and even less in the Black Sea). The Mediterranean contributes by evaporation (estimated average: 1,440 mm/year) to the formation of mainland fresh water, especially in its costal zones. On the other hand, it receives, by direct precipitation and watercourses, a fresh water intake estimated at 470 mm/year. In fact, little is known about evaporation and precipitation at sea. Moreover, the contributions of coastal and submarine groundwater, which are certainly not negligible, and that of deep hydrothermal inflows, are still unknown. Despite these

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1/ km^3 = 1 billion cubic metres.

uncertainties and unknowns, the Mediterranean is at present considered to be a sea with a negative water-balance, having an output of about 5,000 km^3/year as against an imput of 1,700 km^3/year. This view of the situation needs careful revision and study and a different presentation, so that the existing imbalances can be really identified and their future trends investigated.

2.1.2. The northern littoral of the Mediterranean and the islands are relatively well watered by precipitation (400-1,000 mm/year) and by the hydrographical network, many of the rivers of which are perennial, with wide seasonal variations in flow. At a rough estimate, in 1975 there were 2,000 m^3/year of potential water resources for each inhabitant, whereas he was using 400 m^3/year of high-quality supply. On the other hand, the southern shore of the Mediterranean is essentially arid, with precipitation of less than 100 mm/year excepting North Africa (300-600 mm/year), and has a very poor hydrographical network with the exception of the Nile delta and a few rivers in North Africa. Apart from these relatively privileged areas, the potential water resources rarely exceed 100 m^3/year per head. For the littoral as a whole, the hydro-meteorological data can be described as average to very good, whereas the hydrological data in general do not permit of valid historical reconstructions, except for the major basins.

2.1.3. The Mediterranean littoral is formed almost entirely of sedimentary rock which, for the most part, constitutes groundwater reservoirs. These reservoirs can play several roles: seasonal regulation of surface water; inter-annual regulation of effects of heavy-rainfall years; water supply and large natural distribution network; emergency supply during water shortages; storage; pollution diluting agent or vector; storage of surplus water by artificial recharging; and hidden connexion with the sea via coastal and submarine springs or, conversely, through marine invasion. For all these reasons, these reservoirs should be given serious consideration. The hydrogeological information obtained in 1975 concerning most of these reservoirs is considerable and the available data are, in general, of good quality. Special mention must be made of groundwater in karst areas; limestone covers a large part of the Mediterranean littoral, where it forms privileged groundwater reservoirs with intensive circulation. These reservoirs lead to unregulated freshwater Vauclusian springs - coastal and submarine - which are often brackish, at least when the level is low. The technology for tapping, exploiting and managing these reservoirs is still rudimentary, or even non-existent in the case of submarine springs. Losses are estimated at over 3 km^3/year.

2.1.4. During the last three decades, a great effort to inventory water resources has been made throughout the coastal zone, with special emphasis on groundwater, whereas the effort to control and develop resources has been concentrated mainly on surface water. During the last decade, the effort to develop water-resources has been extended to groundwater, chiefly on the initiative of the private sector. In all the coastal countries, mainland water is "lost to the sea" as soon as it reaches the coast; from the standpoint of the countries concerned, it is an outflow, whereas for the sea it is an inflow. The basic strategy of these countries is therefore gradually to reduce their "losses to the sea", mainly by building storage dams, but also by using the supply and storage possibilities of groundwater

reservoirs. Thus, in time, fresh water inputs into the sea are reduced as a result of continually increasing consumption; and since evaporation remains constant, the imbalance of a constantly shortened water cycle increases to an extent which is becoming appreciable.

2.1.5. Water shortage is endemic in the Mediterranean coastal zone; it is seasonal (July-September) by reason of the climate, and may attain dramatic proportions in certain "dry" years, which occur once or twice in a decade. In some countries, water shortage has already become a permanent phenomenon as a result of the deficit in the requirements resources balance; other countries are on the verge of a crisis. But water cannot be transported like wheat from the well supplied to the needy countries. The shortages first occur locally, in coastal basins which receive a seasonal influx of population during low-water periods. In this situation, national solidarity has already taken over in certain countries, which have made inter-basin transfers or have resorted to the expensive technology of sea-water desalination. But in view of the rapid increase in water requirements and the relative poverty of some of the coastal countries, a solidarity of the Mediterranean Basin is becoming necessary. Inter-nation transfers, even of water should no longer be regarded as a Utopian scheme. But to plead the cause of solidarity of the Mediterranean Basin, a well prepared dossier is needed, in the form of a national water plan.

2.1.6. The first requirement for a national water plan, however, is a prospective analysis of water supply problems at the national level. Such an analysis must provide answers to the questions asked simultaneously by planners and decision-makers. These questions take the following form: If demography, the economy, environmental protection and technology show a particular trend, what problems will arise, on what time-scale and for what reasons? In these circumstances, what means and co-ordinated action could be used to overcome the difficulties? In other words, the results of this prospective analysis or "water-strategy" are intended to facilitate the choice of a plan for the development of water resources and the protection of their quality. The coastal countries of the Mediterranean which have taken such action are still certainly very few in number.

2.2. Geographical coverage

2.2.1. The Mediterranean Basin comprises the Mediterranean Sea (excluding the Sea of Marmora and the Black Sea) and its littoral. Considered with regard to water, the littoral is a conventional zone, which includes the islands and the coastal hydrographic and/or hydrogeological basins, and receives the surface and underground flows of the major basins.

2.2.2. As an indication for conventional purposes, a coastal basin begins less than 100 km (orthodromic distance) from the coast. The coastal zone of the major basins does not extend more than 100 km inland from the sea, but if necessary, the water of such basins and the development of their resources will be taken into consideration beyond 100 km from the coast.

2.2.3. At an initial meeting of experts, the limits of the conventional Basin as regards water, will be defined and marked on a map.

2.3. Activities

2.3.1. State of knowledge

(a) A common methodology (directives, questionnaire, standard forms etc.) will be developed, in order to ensure that uniform procedure is adopted for the collection of known data and data which ought to be known.

(b) Compilation of data and information on:

- the parameters of the water cycle relating to flows and reserves; the choice of parameters will be made at an initial meeting of expert consultants;
- the management and utilization of water linked with development;
- present water requirements;
- the situation in regard to pollution of inland waters;

(c) An inventory of national and regional, public and private bodies responsible for, or specializing in, water supplies;

(d) A study of methods and means of storage, retrieval and dissemination of the data and information obtained concerning the conventional Basin;

(e) Attempt to establish the present water balance and make a historical reconstruction of the trends observed; identification and evaluation of the present imbalances;

(f) Identification of major gaps in knowledge;

(g) Development of an approach to problems relating to water considered as an element of the environment and a factor in development.

2.3.2. Possible changes (prospective analysis)

(a) Fresh-water shortage situations:

- seasonal (temporary), determined by climate;
- permanent, due to an observed deficit in the requirements - resources balance;
- problem of change of climate;
- study of crisis situations.

(b) Effects of development on flows and quality of water:

- use and consumption of water, taking into consideration the north-south imbalance of resources; conflicts of allocation and use at the national and regional levels;

- development and management of storage dams and underground reservoirs; consequences for the sea;

- partial and local control of the water cycle; local and regional modifications;

- pollution load of surface and groundwater of the littoral.

(c) Requirements-resources balance of the conventional Basin:

- analysis of national options for: economic and demographic development, protection of the environment, safety of supplies and water development strategy;

- studies of water supply problems: identification of major trends, irreversible processes, imbalances, imminent dangers and potential risks.

2.3.3. Desired changes (programme of action)

The conception and formulation of activities in this phase clearly depend on the two preceding phases (2.3.1 and 2.3.2). Nevertheless, the following activities are suggested as a guide:

(a) training in water management;

(b) national water policy: prospective analysis of water-supply problems at the national level, intended to facilitate the adoption of a national plan for the development of water resources and protection of their quality, including the sea;

(c) regional water policy for the conventional Basin: definition of regional options or objectives; technical solutions (in particular transfers, transport, etc.), and legal and financial solutions for water problems;

(d) new technologies: tapping of coastal and submarine springs of karst origin.

2.4. Organization

2.4.1. The activities under 2.3.1 "State of knowledge" will be considered as a first phase of a preliminary nature, lasting about 10 months after the initial meeting of the expert consultants. They will comprise:

(a) an initial meeting of the panel of consultants composed of a hydro-meteorologist, a hydrologist, a hydrogeologist, an oceanographer and a water-management expert;

(b) experts' reports on evaporation and precipitation, surface water, groundwater, oceanography, documentation and data bank;

(c) inventory by national services of the data and information obtained;

(d) seminar for comparison of the preliminary results by the panel of consultants who attended the initial meeting;

(e) supplementary experts' report or emendations on subjects identical with or similar to those coming under (b) (c);

(f) a consolidated report comprising a trial water balance for the conventional Basin, identification of gaps in knowledge, and an approach to problems relating to water as a factor in development and an element of the environment.

2.4.2. The activities under 2.3.2 "possible changes (prospective analysis)" will be considered as the essential phase, lasting about 15 months. They will be entrusted to a group of specialized consulting engineers, who will work parallel with the permanent international team responsible for consolidation and long-term aspects of the "Blue Plan". A review mission will be undertaken in about the ninth month by a panel of consultants composed of: an expert on water resources and development, an expert on water requirements for irrigation, an expert on domestic water supply and a water-management expert. The results of this work will be described in a final report which will be submitted for consideration to the same panel of consultants. After revision, the final report will be submitted to a meeting of experts from the coastal countries.

2.4.3. The co-ordination and technical supervision of all the activities relating to water (section 2.3) and the organization of these activities (section 2.4) will be entrusted to a UNEP international consultant, who will act in close collaboration with UNDP and use its facilities in the coastal countries.

2.4.4. The activities under 2.3.3. "Desired changes (programme of action)" will be carried out mainly by the permanent international team for consolidation and long-term aspects of the "Blue Plan". One of the operational staff or one of the experts who has been closely concerned with activities under 2.3.2. "Prospective analysis" will work on a part-time basis with the permanent team.