THE WORLD BANK - WORLD METEOROLOGICAL ORGANIZATION
Regional Project for the Mediterranean Sea and the Black Sea Basins*

DRAFT
PROJECT DOCUMENT

Number and title:	REG/../...MEDITERRANEAN HYDROLOGICAL CYCLE OBSERVING SYSTEM (MED-HYCOS)
Duration:	Three years
ACC/UNDP sector & sub-sector:	Natural Resources, Surface Water
Government implementing agency:	Hydrological Services of Participating Parties*
Executing Agency:	World Meteorological Organization (WMO)
Estimated starting date:	**April 1995**

Financing

World Bank	US $	1 700 000
WMO		2 381 000
Governments :		3 757 000
France (1 048 000)		
Others		7 005 000
Total	**US $**	**14 843 000**

Brief Description

The objective of this initiative is the establishment of a Mediterranean Hydrological Cycle Observing System (MED-HYCOS). This initiative is expected to achieve: (i) region-wide modernization of hydrometeorological monitoring; (ii) pooling of resources for data processing in combination with satellite data; (iii) a better understanding of hydrometeorological phenomena and environmental trends; and (iv) the free exchange of environmental data. In developmental and economic terms the project will provide a firm basis for water resources monitoring, assessment and management at both national and regional levels, and will contribute to knowledge of hydrological processes in their interaction with the climate and environment.

On behalf of: Signature Date Name/title

The Government*:	_____	_____
Executing Agency:	_____	_____
World Bank:	_____	_____

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***Mediterranean Sea Basin**: Albania, Algeria, Bosnia-Herzegovnia, Bulgaria, Cyprus, Croatia, Egypt, France, Greece, Israel, Italy, Jordan, Lebanon, Macedonia, Malta, Morocco, PLO for the benefit of the Palestinian Council, Portugal, Slovenia, Spain, Syria, Tunisia, Turkey, Yugoslavia (24).

Black Sea Basin: Georgia, Moldova, Romania, Russia, Ukraine, (5)

A. CONTEXT

A0 INTRODUCTION

1. To reconcile the need for good quality freshwater with environmental protection is one of the greatest challenges humanity is facing at the approach of the 21st century. The most obvious way to success is through improving water management. The Agenda 21 (UNCED, 1992) chapter 18 on freshwater and the report of the International Conference on Water and the Environment (ICWE, 1992) on which it was based, recognize that knowledge of the water cycle (quantity and quality) is the essential basis for efficient water management. Water assessment, monitoring and management is dependant on the existence of reliable water resources information systems both at national and regional levels, covering not only the collection and analysis of data but also the exchange and dissemination of these data and related information to the users, ranking from the general public to decision makers. Moreover, Chapter 18, the ICWE report and the WMO/UNESCO report on water resources assessment (1991) stress that, in many regions of the world, these information systems are not functioning adequately or do not exist at all.

2. For this reason, the World Meteorological Organization (WMO), in association with the World Bank, started in 1993 to promote a World Hydrological Cycle Observing System (WHYCOS), based on a global network of reference stations with real-time satellite-based data transmission to enable the development of consistent, high-quality and constantly updated distributed national, regional and international data bases on river flow, water quality and certain climatic variables.

3. The Mediterranean Hydrological Cycle Observing System (MED-HYCOS) is a regional component of WHYCOS aimed at covering the Mediterranean Rim.

4. However, the meeting of the riverine countries of the Mediterranean Sea decided in Montpellier (May 1995), to include the Black Sea[1] in the project, considering the important exchange of water between the two seas, the dynamic of pollution fluxes and the existence of similar water-related problems of the region. The objective of the MED-HYCOS initiative is to provide a firm basis for water resources monitoring, assessment and management at both national and regional levels, and contribute to knowledge of hydrological processes in their interaction with climate and the environment.

A1. DESCRIPTION OF SUBSECTORS

(a) Geographical features

General:

5. The Mediterranean ("Between Lands") Sea, with an area of about 3 million km^2, is the world's largest nearly enclosed sea. Since time immemorial, man has always inhabited its coasts. The greatest western civilizations originated there and it even became a symbol of power: the Mare Nostrum of the Roman Empire. Evidence of human activities is omnipresent and the typical Mediterranean landscape is in fact heavily influenced by man.

6. The Black Sea is also a large sea, communicating with the Mediterranean Sea only through the Bosphorus' Strait, Marmara Sea and Dardanelles' Strait. Its area is about 420 000 km^2 (one-sixth of that of the Mediterranean Sea) and its volume is about 537 000 km^3 (one-seventh of that of the Mediterranean Sea).

7. The Mediterranean Sea - Black Sea system is highly vulnerable to pollution and to environmental degradation

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IMPORTANT NOTE: The funds so far granted by the World Bank are earmarked for activities in the Mediterranean Sea. The implementation of the project will be extended to the Black Sea as new funds become available.

Climate:

8. The Mediterranean climate, a transition between the desert and arid climates of the North African regions and the temperate climate of the European regions, is one of the planet's major recognised types. Its main characteristics are:

- Two rainy seasons (autumn and spring),
- Hot, dry summers,
- Irregular, sometimes violent rainfalls causing destructive floods, following long periods of low water and often the drying up of a large majority of coastal rivers.

9. These characteristics are more pronounced in the south and east of the basin. The northern countries receive an average of 600 to 1000 mm of rainfall annually (with a maximum of 2000 mm or more), while the eastern ones only receive 400 to 600 mm, and the southern ones often much less than 400 mm. The number of dry months is often higher than seven. Potential evaporation being about 1 200 mm per annum, most regions have a large water deficit. Account should also be taken of the impact of a climate change that could adversely affect the existing hydrological regimes in the region. In some scenarios, drought conditions could spread in the southern zones while rainy episodes could generally be more intense. However, until now, the prediction of the effects of global climate change is not clear as some models predict a better situation for some parts of the sub-Saharan region similar to that 6000 years BP.

10. The climate of the Black Sea rim is largely similar to that of the Mediterranean Sea. There are two rainy seasons: spring (March to May) and autumn (October to November). The mean annual rainfall is about 403 mm. However, as explained in paragraph 11 below, the main rivers entering the sea originate in the continental temperate climatic zone.

(b) Hydrology

11. The basins draining into the Mediterranean Sea cover a total of about 1.9 million km^2 not counting the upper Nile basin (see **Table 1**). Only 21 river basins covering 42% of the total area exceed 10 000 km^2. This fragmentation is accentuated by the presence of numerous islands covering 110 000 km^2 (that is 6% of the basin). Geological structure of the Mediterranean basin is such that the aquifers are numerous and generally of small spatial extent; the largest not exceeding some tens of thousands of km^2. Important interconnections exist between the streams and aquifers, whether they are in karst or alluvium.

12. The drainage basin of the Black Sea (2.4 million km^2) is far larger than the one of the Mediterranean Sea. Nine-tenths of the basin is to the north and the west of the sea (see **Table 2**) and is drained by three rivers with a total catchment area of more than 400 000 km^2, covering almost 79 % of the total area. As a consequence, the input of the rivers coming from continental temperate climate zone is very important, in relation to the volume of the sea. **Table 3** gives the inflows from the different rivers. The water balance of the Black Sea is positive with a total mean annual input of fresh water of 560 km^3 (350 km^3 from rivers and 210 km^3 from rain) and an annual evaporation output of 350 km^3 (equal to river input). One result of this net input of fresh water results in a stable meromictic character of that sea: There are two very different layers of water separated by an halocline surface at a depth of about 180 meters. The upper layer contains oxygen and its salinity is about 17.5 g/l (the mean value in the Mediterranean Sea is about 38.5 g/l), the lower layer containing almost no oxygen with a salinity of about 22.5 g/l; that layer contains also H_2S gas because of the action of bacteria. The lower layer represents about 90% of the total volume. It has been said that an earthquake could release a large amount of that toxic H_2S gas and kill many people.

13. As a direct consequence of the Mediterranean climate, the stream regimes are an alternation of brief, flash floods and severe low waters. The exceptions are the large rivers whose drainage basins are partly outside the Mediterranean region, such as the Rhône and the Po. In the Black Sea basins, most of the rivers, especially those flowing from the west and the north, are large and they have regular flows, except for local and small catchments.

14. In the rivers of the Mediterranean regime, the mean monthly low-water flows are frequently less than a tenth or even a hundredth of the highest mean monthly flows. The peak flows are often several hundred times higher than the mean annual flow. The interannual variability is very high and amplifies the interseasonal irregularity.

15. The process of exchange of water between the Black Sea and the Mediterranean Sea is complicated. The level of the Black Sea is 35 cm above the Marmara Sea (i.e. the northern part of the Mediterranean Sea between the Straits of Bosphorus and Dardanelles) resulting in an annual outflow of a low salinity water (18 g/l) of about 410 km^3 through Bosphore. In the lower layer, on the contrary, the higher salinity of the Marmara Sea (35 g/l against 18 g/l) results in an annual inflow to the Black Sea of high salinity water of about 200 km^3. The water balance gives a net annual outflow to the Mediterranean Sea of about 210 km^3 corresponding to the positive balance of the Black Sea. The comparison of the input of Black Sea to Mediterranean Sea with the fluvial input in Mediterranean Sea (210 km^3/year against 477 km^3/year, or 4 times the input of Rhone river) proves the importance of the water exchange between these seas and gives reason to extend MED-HYCOS project to cover the Black Sea area, not to say anything about related pollution transfer.

(c) Water needs and availability

16. Water in great demand: The usable freshwater resources are often remote, fragile and poorly distributed in the Mediterranean region. This creates conflicting interests as well as difficulties in preserving a good-quality environment. The current total population of the countries surrounding the Mediterranean is about 360 million, of whom 193 million permanently live in the zone draining into the Mediterranean Sea and 133 million live on the coastal belt (46 000 km of coasts). The distribution of the coastal population is highly concentrated in urban centres: 9 cities alone group together nearly 32 millions of inhabitants (Cairo 12, Istanbul 10, Athens 3.5, Barcelona 3, Rome 2.8, Alexandria 2.5, Algiers 2.5, Naples 1.3 and Marseille 1).

17. The seasonal migration of tourists characterizes the basin's demographic variability: over 100 million people come to this region each year, mostly during the dry season. Urban effluents in the Mediterranean are currently estimated at 2.5 thousand million m^3 per annum, of which 1.5 thousand milion m^3 are due to tourist activities.

18. Agriculture in the Mediterranean countries often requires additional water for the irrigation. More than 16 million of hectares are currently irrigated, and are increasing at a rate of 200 000 hectares per annum. The total water consumption for agriculture is about 160 km^3 per annum, while the urban consumption is less than 10 km^3. The use of appropriate irrigation techniques would help save 30% of the amount of water mobilized. **Table 4** shows the use of water versus the renewable water resources for most of the countries of the region.

19. The population living in the 16 countries around the Black Sea is about 162 millions with a density of 74 h/km^2 compared to the density of 42 h/km^2 in the Mediterranean catchment. Black Sea basin is far more intensively exploited for agriculture and industry than the Mediterranean basin. Tourism is fairly developed. Maritime shipping is well developed linking central Europe, northern Russia, the Caspian Sea and the Mediterranean Sea through the Black Sea.

20. Improvement of the quality of life of the inhabitants of the Mediterranean basin requires sufficient good-quality water for drinking (agriculture, industry and tourism). In summer, the low rainfall causes a fall in surface resources, while the demand for water in the agricultural and tourism sectors increases sharply. At the same time, the deficiency or absence of runoff increases the impacts of discharges of wastewater and various pollutants on the quality of the surface waters. To ensure the water supply to the large coastal urban centres and irrigated plains, there is thus a temptation to tap the resources of the basins upstream. In this case, the wastewaters are most often poured into the sea and are not reused. Sometimes transfers between basins are envisaged (Spain, Israel and Libya). **Table 4** shows water availability and its probable evolution. Three large categories can be distinguished:

! Countries with considerable but under-used water availability: countries in the north or east of the basin with strong mountainous relief (France, Italy, Greece, former Yugoslavia, Albania, Bulgaria, Turkey and Lebanon);

! Countries with high but fragile water availability: countries in the west of the basin (Spain, Morocco, Syria and island of Cyprus). The resources are relatively large but their management is difficult;

! Countries with low water availability: countries in the south and east of the basin (Malta, Algeria, Tunisia, Libya, Egypt, Israel, Jordan). The demand can only be met by using unconventional resources such as fossil aquifers (Tunisia and Libya), seawater desalination (Malta, Tunisia) or the reuse of wastewater (Egypt and Israel).

21. In the Black Sea area, availability of quantity of water does not seem to be a problem (1758 m^3 per capita per year), but the deteriorating quality of water is a problem. The pollution from the Black Sea considerably affects the quality of the water of the eastern part of Mediterranean Sea (Aegean Sea). In the Black Sea region, it has been estimated that Black Sea water receives each year 20 ton m^3 of pollutants compared to with the 3.8 t/km^3 received in the Mediterranean Sea. It is important to note that these pollutants stay in the upper volume for a long time (40 to 140 years). **Table 5** gives the origin of pollution:

A2. Strategies of the Mediterranean and Black Sea countries

22. In the *Blue Plan*, the United Nations Environment Programme (UNEP) has made a projection of the Mediterranean basin's development for the year 2025 using various growth scenarios. In all cases, the imbalance between the north, south and east of the basin gets worse dramatically concerning water resources. Governments recognize the pressure of competing uses on the limited resources. The overall strategies have been derived from the *Blue Plan* which has quantified the pressure on the limited water resources by using global indices:

! The "use index", is the ratio between the total withdrawals of water and the global natural water resources, including external inputs. A use index exceeding 20% is already considered as an indicator of heavy pressure. An index of over 50% makes it both necessary and urgent to impose rigorous management. In the countries of the Mediterranean basin this index varies from 2% for Yugoslavia to over 100% for Israel and Libya. In more than half of the countries the index is over 20% and in 6 countries it is over 50% (see **Table 4**).

! The "consumption index", is the ratio of the quantity of water consumed through various uses (not returned to the land) to the global natural resources. A high consumption index is an indicator of a probable cyclical shortage. It shows the need for management of the demand and for tapping unconventional resources. It exceeds 20% in 7 countries of the Mediterranean basin.

23. The Governments realize that the growth in demand for water is essentially related to the demography and the demand is not limited by the drop in availability. Even if "re-uses" are increased, the "medium" scenario shows that critical situations will develop by the year 2025.

24. The Governments are also conscious of the existing and future problems and tensions arising from the penury of fresh water. Normally accepted threshold is 2 000 m^3/annum/inhabitant below which critical situations develop. A state of absolute penury is reached below 1 000 m^3/annum/inhabitant. However, several countries in the south are already in the latter category, such as Malta, Libya, Israel, Jordan, Tunisia and Algeria. They would be joined in 2010 by Cyprus, Egypt and Morocco, while Lebanon and Syria at the same time will be under 1500 m^3/annum/inhabitant.

25. Although there is a lack of information for the newly independent states (NIS), the "use index" mentioned above seems to be low (less than 15%) in the Black Sea basin. The Governments have recognized that the problems of environmental pollution are serious and are a limiting factor for the availability of good quality water.

A3. PRIOR OR ONGOING ASSISTANCE

26. Other than the Blue Plan and national projects, numerous subregional initiatives have emerged in the context of the negotiations pertaining to sharing of the scarce water resources. There are a number of national and regional projects related directly or indirectly to water, which have been and are being funded by the Global Environment Facility (GEF) (see **Table 6**).

27. MED - HYCOS is the first initiative designed to cooperatively help to improve water resources assessment and management in the countries of the Mediterranean region.

A4. INSTITUTIONAL FRAMEWORK OF THE REGION

28. The institutional frameworks for the water resources in each country are similar though differences appear. Generally there is a Hydrological Service (sometimes multiple: two or three services corresponding to different uses) that is in charge of monitoring and assessment of water resources under

the authority of a ministry that can be the ministry for agriculture, for water or for environment, sometimes inside a national institute of hydrometeorology. The officers of these services are often in contact between neighbouring countries, or in regional projects such as the Blue Plan or GEF project for the problems related to the Danube river basin, or through WMO programmes. However these contacts are probably not developed enough regionally and one of the MED-HYCOS objectives is to help to improve that situation.

B. PROJECT JUSTIFICATION

B1. PROBLEMS TO BE ADDRESSED: THE PRESENT SITUATION

(a) Improved estimate of "usable" water resources

29. The climatic and geographical characteristics of the Mediterranean basin lead to special run-off characteristics: brief, flash floods, extremely low waters, high inter-annual variability, heavy soil erosion reducing the reservoirs' capacities through sedimentation, etc. The Black Sea basin, on the other hand, is confronted with serious problems of pollution. A quantitative and qualitative resources assessment therefore requires, more than elsewhere, acquiring a comprehensive knowledge of the hydrometeorological phenomena and hydrodynamic processes of water distribution in the various facets of the water cycle, as well as time series of certain types of information on several sites to be able to characterize the time-space variability of the hydrological and related parameters.

30. In recent years, significant efforts have already been made in countries like Algeria, Morocco and Tunisia that have led to a more accurate estimate of the water resources, thus contributing significantly to planning economic development. It is necessary to further minimize the ranges of uncertainty by using increasingly representative long-time series of data. Of particular importance to be specified is the part of the resources that can be mobilized. It is this part of the "usable" resources that is critical for the success of a general development policy in many countries which would benefit from MED-HYCOS.

(b) Climatic hazards

31. Estimates and hypotheses for water resources management have until now been founded on the assumption of a stationary climate. According to the most recent assessment conducted by the Intergovernmental Panel on Climate Change (IPCC) changes under the impact of human activities (emissions of CO_2, methane and other greenhouse effect gases) constitute a fact. These changes would particularly affect the climate variables that condition the water cycle (precipitation, temperature and evaporation). The Mediterranean region, situated at the northern border of the great desert, is extremely sensitive to climate change. The region uses water in an unsustainable manner and the shortage of water may soon seriously limit economic growth. Even a minor change in climate can seriously endanger the fragile ecosystem, with repercussions on people and economy. The situation calls for pro-active anticipatory water planning rather than waiting for serious water shortages. Some of the long-term measures are reforestation (deforestation is often linked with increased frequency and intensity of floods) and erosion control; control of catchment land use; improved site selection and design for reservoirs, irrigation schemes and hydropower plants; flood water harnessing; underground storage of flood waters; and regulation of flow of springs, which are highly vulnerable to drought and variability in precipitation. For example the flow of the Fijch spring, the main source of water supply of Damascus, varies from 1.5 to 28 m^3s^{-1}.

32. In the Black Sea basin such future climatic changes can induce important variations of the inflows to the Black Sea with a serious risk to modify the fragile meromictic equilibrium of that water body.

33. The destructive force of climatic hazards, which manifest themselves in the form of rainstorms and severe thunderstorms, floods, dust storms and droughts, appears to increase every year. Intensive development in the region, to meet the needs of the rapidly increasing population, is apparently the main reason for the high level of damage as more people and more structures are exposed to hazards. Whether change in the climate is also a causative element is still a controversial issue, but it must be seriously considered. All Governments are determined to enhance their capabilities to protect land, property and life from such hazards. The situation varies from modern highly sophisticated flood forecasting systems in Italy and France to just a beginning of the use of such technology in Algeria and Morocco.

34. Considering the present situation and the probable future, the authorities responsible for water resources management need information on the state of the resources with an increasingly dense coverage and in real time as well as forecast for the short, medium and long-term evolution to facilitate their decisions. There is urgent need for continuous, accurate and reliable monitoring of water and climate variables.

35. There are many important shared rivers and groundwater basins which require regional cooperation for adaptation and increased integration of water "information systems" and wider information dissemination and use of drainage basin simulation and management models.

36. Regional data are *also* needed for global models which will permit an improvement of short- and medium-range weather forecasts and a long-term assessment of the impact of modifying a physical parameter (deforestation, cultivating new land, construction of large-scale works, etc.) on the dynamics of the water cycle and on climate.

37. To address these problem areas in this climatologically vulnerable, unstable and difficult environment, regional co-operation between the countries surrounding the Mediterranean and the Black Sea is needed to promote a coherent approach to measurements, their transmission and processing, exchange of techniques and methods, training of people and transfer of technology already available in the region.

(c) Information Sharing

38. Successful regional cooperation between the Mediterranean and Black Sea riparians will require that all the participants understand the importance of sharing information and knowledge at the appropriate time. Conventional development practice to date has not given due attention to this matter because of previous perceptions on, the relative availability of water resources, the stationary climate, and the socio-economic and environmental value of water, as already described in this section, ie there has never been a real economic need to share information about water. There is no doubt that the participants in this project appreciate their real collective economic vulnerability, the problem is how to catalyse the information sharing process in a reasonably controlled and non-threatening manner. More specifically, the challenge is to create the opportunity for consultation and discussion formally and informally. The MED-HYCOS data gathering and dissemination systems provide the formal information sharing network via regional protocols, but cannot provide the informal forum for participatory regional development dialogue which is necessary for the sustainability of hydrological services and this project.

39 There are many active development initiatives at all levels of civil society in the Mediterranean and Black Sea region. All have a need for water resources information to a greater or lesser degree. It is imperative therefore that in parallel with the formal MED-HYCOS information system, participants in development and MED-HYCOS must have the opportunity to interact informally. This project must therefore include a regional information infrastructure component.to satisfy the growing water and environment information sharing needs of all sectors and stakeholders.

B2. EXPECTED END OF PROJECT SITUATION

40. Benefits will accrue primarily to national services and other users of hydrological data[2], such as water resources planners, decision-makers, as well as scientists working on themes concerning environmental change. As a consequence, communities will receive improved development assistance in water resources management. Participating parties would have ready access to a transparent regional data base thus allowing them to put their national water resources planning issues in a regional context and environmental trends. In addition, MED-HYCOS will improve timeliness of reliable hydrological and related data. This process will enable national agencies responsible for monitoring and assessing water resources (usually the national Hydrological Services) in the region to meet the challenge in a sustainable manner.

41. The project will provide an umbrella facility for various regional political and socio-economic bodies responsible for integrated development of water resources of the region, to plan and implement regionally coordinated water resources development projects and to provide a basis for equitable sharing of water in the international rivers and the interbasin transfers of water.

42. Information sharing for synergizing MED-HYCOS with existing and future development initiatives will be facilitated by the creation of an informal information infrastructure.

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[2] "Hydrological data" includes data on surface water, groundwater, quality of water, sediment transport, etc.

In summary, the end product of the project will be:

- A catalyst for further improvements in national Hydrological Services;
- Up-to-date and real time data for monitoring and operational purposes;
- Improved databases for water resource development activities at national, regional and international levels;
- Integrated water resources management and related aspects of combating desertification and drought;
- Improved co-operation in international river basins;
- Trained human resources in modern computer and satellite technology.

B3. TARGET BENEFICIARIES OF MED-HYCOS

43. *At the regional level*: Regional river basin authorities will have a system for timely acquisition of much needed data for the day-to-day management and sharing of water resources of international rivers. Without such information, it will be difficult for these river basin authorities to undertake efficient integrated planning, management and investment in water resources development and water pollution protection in a rational manner, as required of them by their mandates.

44. *At the national level*: National services responsible for water resources monitoring and assessment, will not only be able to rehabilitate/improve their capacity to perform their routine tasks but will be also able to easily send, receive and exchange data and information from outside their national territories, a facility that is necessary for the decision-making process and management of their water resources in the national and international rivers. Flood forecasting systems (FFS) and the accuracy of the forecasts will improve with the data received in real-time.

45. *At the community level*: Water-related problems are among the most important that the communities in the Mediterranean and Black Sea regions have to face. National and regional level activities are targeted to permit a better management of water resources at the community level for:

- Supplying good quality, drinking water;
- Agricultural use (prediction of the plant needs, possibility of irrigation, rainwater harvesting, water for cattle, protection against erosion and sedimentation);
- Better protection against water related hazards (health, floods, droughts and water shortage);
- Better protection of sea water against pollution and consequently protection of fishing activities;

B.4 PROJECT STRATEGY AND INSTITUTIONAL ARRANGEMENTS

(a) Strategy

46. At the international meeting held in Geneva in June 1994, representatives of the Mediterranean Rim countries agreed that a Hydrological Cycle Observing System (MED-HYCOS) be established as soon as possible. The World Bank offered a grant to assist in the implementation of MED-HYCOS, with the expectation that other contributions will be made in support of the system, in cash and/or in kind.

47. As a follow up to the above-mentioned meeting, WMO conducted a survey on the project by circulating a questionnaire to the riverine countries of the Mediterranean and international agencies having related activities in the region. Within the framework of the survey WMO also conducted missions to some of the countries. The questionnaire addressed *inter alia* the following items: objectives of the project, data acquisition, regional data bank, information exchange, implementation, creation of a regional and sub-regional centres and the institutional framework.

48. The survey provided the basis for a discussion paper prepared by WMO. This document and the draft documentation plan were considered by a second meeting convened jointly by WMO and the World Bank in May 1995, in Montpellier (France). Representatives of twenty countries in the Mediterranean and Black Sea basins as well as representatives of FAO, UNEP and non-governmental organizations took part.

49. The meeting designated rapporteurs and co-rapporteurs for each of the seven points of the Draft Implementation Plan: (i) selection of stations, technical specification and equipment; (ii) data exchange and dissemination systems; (iii) regional data base; (iv) transfer of technology and training; (v) establishment of a Pilot Regional Centre (PRC); (vi) institutional aspects and establishment of a Regional Co-operating Group (RCG); and financial matters.

50. This meeting endorsed the Implementation Plan and schedule and established a MED-HYCOS Pilot Regional Centre (PRC) to, notably, assure the co-ordination of the implementation of the project and serve as a focal point of a regional network grouping of all the participating parties. The same meeting also established an initial co-ordinating team to prepare for the operational start-up phase and to participate in the definition of objectives for the PRC. Participation of parties in the initial coordination team is based on the specific contributions made in certain fields where they have an acknowledged amount of experience and competence. This team is composed of:

(i) Representatives of the following countries:

Bulgaria, France, Italy, Malta, Romania, Spain, and Tunisia;

(ii) Representatives of the organizations:

WMO, FRIEND-AMHY[3] and MEDIAS[4] France;

(iii) Institution hosting the Pilot Regional Centre: ORSTOM[5].

51. A Regional Co-operating Group (RCG), composed of officially designated representatives of the participating parties, regional organizations concerned, funding agencies and donors, as well as the World Bank and WMO, will be created. Its draft terms of reference are given in **Annex 1**. The Group will be responsible for defining strategies, making technical choices and implementing the project. Within each participating country, the agency responsible for water resources monitoring and assessment will be responsible for the operation and maintenance of the stations installed, within the regional framework.

52. The PRC and possibly other additional structures (Sub-regional Centres) which might be set up, as necessary, during the project implementation, will be responsible, together with the national agencies of the participating parties, for the implementation of the strategy adopted by the RCG.

53. MED-HYCOS, in particular its regional monitoring system, will be co-ordinated with other regional and global systems, in particular the World Hydrological Cycle Observing System (WHYCOS). This will require application and observance of internationally accepted standards and norms instituted by the Members of the World Meteorological Organization for the operation of systems for measuring, collection, processing and dissemination of hydrological, meteorological and related data and information (e.g., WMO's Global Telecommunication System, GTS). WMO has therefore been asked to be the Executing Agency for the project. WMO, with the collaboration of PRC will promote and monitor compliance with standard practices and procedures.

54. The strategy for the MED-HYCOS is to create an open Regional Centre, for coordinating and facilitating the operation of a network supported by the parties to be progressively set up. Innovative technology will be used to develop information and data exchange within the region, as a means and as an incentive to rejuvenate the national and regional agencies concerned, so that they can rectify the deficiencies and generate the products required for developmental investment at the national and regional levels. To ensure long-term support by the agencies responsible for water resources assessment, investment in the rehabilitation and operation of networks will be based on the present and future needs of the users, and will be demand-driven.

55. Locations for key stations mainly among those existing, will be identified jointly by the PRC and WMO, in agreement with the participating parties. Where required, a full range of instruments will be provided. The existing stations might need to be upgraded to meet the MED-HYCOS standards, especially to measure a core set of variables agreed upon by the participating parties. The data will be measured and recorded automatically to the extent possible. The collected data will be transmitted using Data Collection Platforms (DCPs) over the Data Collection System (DCS) of the geostationary

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FRIEND-AMHY stands for Flow Regime from International Experimental and Network Data for Alpine and Mediterranean regions, a programme developed within the UNESCO International Hydrology Programme (IHP)

MEDIAS is a Regional Research Network for the Mediterranean Basin and Subtropical Africa

ORSTOM is the French acronym for French Research Institute for Development in Co-operation

meteorological satellite METEOSAT, as part of WMO's programmes. The use of the METEOSAT DRS will allow each of the participating parties and territories and the Regional Centre to receive, in "real or near real-time", data collected by the DCPs of the monitoring network, through ground-based METEOSAT Data Receiving Stations (MDRSs) and/or through the Global Telecommunication System (GTS) operated by WMO. These techniques, based on "intelligent" sensors and satellite data transmission, will avoid many of the current problems of data collection by minimizing human errors and operation and maintenance costs.

(b) Implementation and schedule:

56. To minimize managerial issues, a phased approach will be adopted. In the first two-year stage (up to June 1996), it is envisaged that about 150 DCP stations in 28 participating parties[6] would be identified and 20 of them instrumented in the Mediterranean Sea basin[7]. The approach will be three-pronged:

- Creation of a sustainable system for the coordination of the operation and maintenance of the network located at the agreed PRC in Montpellier, France.

- Establishment of a regional data base consisting of historical data[8], data collected in real time through the MED-HYCOS telemetry system, and data collected from the conventional networks and transmitted according to the transmission schedule and protocol agreed upon by the parties and the Regional Centre;

- Establishment of a regional computer network (electronic network) which would interconnect the designated national databases and information systems with the MED-HYCOS regional data base(s) and the other regional and global systems.

57. The participating parties have agreed that the start-up phase be undertaken by a Pilot Regional Centre (PRC) operating under the auspices of WMO. For obvious reasons of economy of means and the need for the project to be implemented as quickly as possible, the PRC has been installed in one of the region's existing establishments (ORSTOM Centre in Montpellier, France), which has human and technical means that correspond to the project objectives. Later, the participating parties will agree to the operational structures needed (Regional, Sub-regional Centres, etc.) and the location of these structures.

58. The primary role of the PRC will be liaison, co-ordination and initiation of project implementation activities. The PRC is intended to serve as a focal point of a regional network grouping of all participating parties. Therefore, in association with all the programme partners, the PRC will notably:

- assist the RCG in the strategic, technical and operational conduct of the project;
- assist the national bodies in their technical tasks and training activities;
- hold regular meetings of hydrologists and water resources specialists to enhance collaboration between them.

59. WMO will provide technical and scientific support to the PRC and will supervise the implementation of the project. WMO will also facilitate access to the METEOSAT DCS and to existing segments of the GTS for data transmission, exchange and dissemination.

B5 REASONS FOR EXTERNAL ASSISTANCE

60. Possibilities of funding exist in many of the participating parties. However, these resources are not sufficient. External assistance is necessary to complement these existing possibilities.

Including the Black Sea basin countries

The implementation will be extended to the Black Sea countries as additional funds become available

In collaboration with the FRIEND-AMHY project

B6 SPECIAL CONSIDERATIONS

61. As stated in the introduction, Agenda 21 (UNCED, 1992) in Chapter 18 on freshwater and the report of the International Conference on Water and the Environment (ICWE, 1992) recognise that knowledge of the water cycle (quantity and quality) is the essential basis for efficient water management. Several other documents point out the requirements for integrated observing and information systems. The Mediterranean Conference in Barcelona (November 1995) has also identified water management as a crucial subject, needing a consistent action.

62. Discharge data for the world's streams are collected at the Global Runoff Data Centre (GRDC), which was established under the auspices of WMO in Koblenz, Germany. Similarly, there is the UNEP GEMS/Water Water Quality Monitoring Centre, which is managed by the Canadian Center for Inland Waters in Burlington, Canada. However, neither of these two centres provides adequate coverage of the world as regards both the number of countries sampled and the length of the records. The data are not sent regularly by the countries and are of variable quality. For this reason, WMO, in association with the World Bank and other UN agencies, undertook to promote setting up a World Hydrological Cycle Observing System (WHYCOS) based on a global network of reference stations with satellite-based data transmission to form a quality-controlled database on stream discharge, water quality and some climate variables. MED-HYCOS is a regional component of WHYCOS.

B7 COORDINATION ARRANGEMENT

63. The Regional Co-operating Group (RCG) supported by the Pilot Regional Centre (PRC) will implement the programme. The regional body will set up additional structures (Subregional Centres) as needed, for carrying out certain specific activities. WMO will provide technical and scientific support to the PRC and to the participating parties and will supervise the implementation of the project.

C. DEVELOPMENT OBJECTIVE

64. In developmental and economic terms the project will provide a firm basis for water resources monitoring, assessment and management at both national and regional levels, and will contribute to knowledge of hydrological processes in their interaction with the climate and environment; and the protection of the Mediterranean Sea.

65. Objective of this World Bank - WMO initiative is the establishment, in the participating parties of the Mediterranean Sea and Black Sea regions, of a Mediterranean Hydrological Cycle Observing System (MED-HYCOS). This system will comprise automated data collection platforms throughout the sub-region, as well as data transmission via satellite to receiving stations, as necessary. This initiative is expected to achieve: (i) region-wide modernization of hydrometeorological monitoring; (ii) pooling of resources for data processing in combination with satellite data; (iii) a better understanding of hydrometeorological phenomena and environmental trends; and (iv) the free exchange of environmental data such as has long been the practice within WMO's World Weather Watch Programme; and (v) regional integrated water resources management.

D. IMMEDIATE OBJECTIVES, OUTPUTS AND ACTIVITIES

66. IMMEDIATE OBJECTIVE 1: Installation of a network of key stations of multisensor-equipped Data Collection Platforms (DCPs) for the collection and transmission of several variables related to water resources monitoring.

DCPs will transmit data to the METEOSAT Data Receiving Stations (MDRS), that will be installed at the Regional Centre and at national and sub-regional centres, as necessary.

OUTPUT	ACTIVITIES
1.1 DCPs in participating parties, one METEOSAT Data Receiving Station (MDRS) at PRC and, as needed and possible, in participating parties and sub-regional centres.	1.1.1 Finalize the list of stations according to the criteria agreed upon by the relevant national agencies and obtain agreement on procedural arrangements needed to rehabilitate or upgrade the stations according to MED - HYCOS standard. The objective is to install at least 150 DCPs. 1.1.2 Prepare national and regional agreements for the implementation of MED - HYCOS, including the operation and maintenance protocols for the selected stations. 1.1.3 Prepare specifications for the supply, installation and commissioning of telemetry system, including necessary training activities to be undertaken at the national and regional levels for counterpart staff. 1.1.4 Procure and install equipment. 1.1.5 Organize and implement the day-to-day activities for the operation and maintenance of the telemetry system.
1.2 Trained personnel	1.2.1 Implement a training programme for the operation and the maintenance of the different elements of the data acquisition and telemetry system both at the national and regional levels.

67. IMMEDIATE OBJECTIVE 2: Development and implementation of the regional data base for water resources at PRC.

The database will be fed in two ways:

(a) In real-time, by the network of key hydrological stations installed by this project;

(b) At regular intervals, by national agencies operating their normal networks.

The data base will serve such objectives as monitoring the operation and the management of the regional network of key stations, the dissemination of the data to different primary and secondary users at the national, regional and global levels and the preparation of products for the regional monitoring of the water resources.

OUTPUT	ACTIVITIES
2.1 Regional database installation, implementation and operation	2.1.1 Evaluate he existing regional data bases, such as in the BLUE PLAN and in the FRIEND-AMHY Project. 2.1.2 Define the content and structure of the data base. 2.1.3 Prepare specifications of the additional hardware and software taking into account the existing systems in the region. 2.1.4 Procure and install equipment. 2.1.5 Prepare procedures for day-to-day operation and maintenance of the regional data base.

2.2 Arrangements for the exchange of data and information	2.2.1 Analyze existing systems in the region for information exchange and prepare protocols for data exchange and dissemination.
2.3 Trained personnel	2.3.1 Organize training activities for the regional, national and, as necessary, sub-regional data bases administrators.

68. IMMEDIATE OBJECTIVE 3: Implementation of a regional computer network for the monitoring of the regional water resources.

The networking of the MED-HYCOS PRC with the national hydrological and meteorological services, and other existing information networks and data bases at the national, regional and global levels will provide the region with a medium for easy and fast dissemination and exchange of data and information in the field of water resources, a prerequisite for any efficient and cost-effective operational regional monitoring system. A site will be opened on World Wide Web system of Internet to allow a free access for the public at large to selected data and information.

OUTPUT	ACTIVITIES
3.1 A regional computer network system	3.1.1 Survey of national and regional databases to be connected to the regional database, including their actual status, the available equipment and the local telecommunication facilities. 3.1.2 Devise the structure and the basic functions of the system and prepare specifications of equipment to be installed at the national and regional levels. 3.1.3 Open a site on INTERNET 3.1.4 Procure and install equipment. 3.1.5 Negotiate information exchange arrangements. 3.1.6 Operate the system.
3.2 Trained staff at the regional and national level	3.2.1 Implement training programmes for the operation and maintenance of the system.

69. IMMEDIATE OBJECTIVE 4: Improvement of national hydrological services and networks
notably through provision of new equipment and development of related training programmes.

OUTPUT	ACTIVITIES
4.1 Rehabilitated or upgraded selected hydrological stations	**NOTE:** Activities pertaining to the installation of DCPs are covered under Immediate Objective 1. 4.1.1 Procure additional equipment in consultation with the national agencies required for the rehabilitation or upgrading of the selected stations (including water quality measurements). 4.1.2 Ensure installation of equipment and their correct operation and

	maintenance by the national agencies.
4.2 New or improved national database networking	4.2.1 Procure additional hardware and software for improving national databases and their networking with other databases in allied fields.
4.3 Sub-regional centres	4.3.1 Procure additional hardware and software to improve or create subregional centres for special purposes as hydrological modelling or use of areal data (remote sensing) together with DCPs' point data.
4.4 Trained personnel	4.4.1 Organize relevant training activities for the personnel in charge of the operation and the maintenance of the MED-HYCOS network and of the national database and computer networking.

70. IMMEDIATE OBJECTIVE 5: Creation of an information infrastructure to provide connectivity between the MED-HYCOS project and other development initiatives within the region.

OUTPUT	ACTIVITIES
5.1 Network of information receiving/transmission/storage devices (tel. fax, Email)	5.1.1 Setting up of a MED-HYCOS information management office. 5.1.2 Systematic compilation of an official MED-HYCOS Information Infrastructure Directory, containing the names of the participants of the project and all interested parties from other development initiatives within the region, such as the Blue Plan and METAP, with a brief description of their role and authority plus tel. fax and Email addresses. (It is expected that equipment will be provided by the interested party.) 5.1.3 Distribution of directory either in paper or diskette or by E-mail

71. The tentative work plan for the implementation of MED-HYCOS is given in **Annex 2.**

E. INPUTS

E1.GOVERNMENTS INPUTS

72. Participating parties will guarantee to provide adequate support to the national Hydrological Services to ensure that the key stations, which form part of the MED-HYCOS network, are maintained to the required standard. In each country, the stations included in the project will be part of the national hydrological network. The hydrological authorities in each participating country will be fully responsible for the operation (including flow measurement activity) and maintenance of the stations installed within the framework of the regional network. The annual maintenance cost per station is estimated at US $ 1,500 (US$220,000 for 150 stations), including spare parts and one or two visits by the technical personnel in charge of the sub-regional support facility. This cost will be borne by the respective parties.

(a) Participating parties

The Governments will provide/allow:

! Free access to, and use of, the national database, national hydrometric stations, meteorological stations, etc., within the framework of the activities defined under D above;

! Free access to, and use of any METEOSAT Data Receiving Station, which might be operating in the country when the project starts;

! Staff to participate in the installation and to assure the operation and maintenance of the national segment of MED-HYCOS, provided that the relevant training activities would be organized by the project;

! Qualified nationals for training in specialized areas and for group training;

! Operation and maintenance costs for the stations part of the national segment of MED-HYCOS. However, in order to overcome difficulties, mainly due to transport problems and lack of the appropriate gauging equipment, some financial support should be provided by the project, if necessary (from external funds).

(b) Pilot Regional Centre (PRC)

73. The host country for the PRC will provide: office space and part of the furniture for the PRC, a scientific and technical team and its salaries, part of the recurrent costs limited to electricity, phone, water, security system of the office space. Other costs will be supported partly by the project and partly by the participating parties (see **Table 8**).

E2. **EXTERNAL INPUTS**

74. The total cost of the project, covering consulting services and equipment (for DCPs and MDRSs), operation and maintenance, training and other is about US $ 14.8 million (see tables 7 and 8).

Governments	25.3% cash/kind
WMO	16.0% kind
World Bank	11.4% cash
Others	47.3% cash/kind

75. The contribution of the World Bank Special Grant Programme to the project is US $ 500,000 in the first year and US $ 700,000 for the second year. For the third year another US $ 500,000 contribution is expected, subject to availability and approval of funding by the World Bank.

76. The equipment and the operation and maintenance activities represent US $ 9 624 000, the consulting services and other expenses (procurement and contingencies) US $ 3 165 000 and the Pilot Regional Centre US $ 2 052 000. France would support 80.3% of the cost of the PRC over the 1995 to 1999 period, representing an amount of US $ 1 648 000. WMO will contribute notably through personnel dedicated to the project and providing access to METEOSAT DCS.

77. Operation and maintenance costs of the PRC for the electronic network, training activities including travel expenses and daily subsistance allowances, assistance to the participating parties for installation and maintenance of the network and for organizing coordination/implementation meetings will be supported by external funds.

F. RISKS

F1. TECHNOLOGICAL FAILURE

78. The MED-HYCOS project uses modern data collecting, computer and satellite technology. Most of the components are well tested in the field and have successfully been used for a number of years in a number of participating parties. Therefore, the risk of the project failing for technical reasons to meet its objective of providing a working, sustainable satellite-based data collection system is limited.

F2. INSTITUTIONAL FAILURE

79. The MED-HYCOS project relies on the active participation of national hydrological services, using funds supplied from the project. However, the withdrawal or non-participation of some parties does not jeopardize the success of MED-HYCOS as a whole; it merely means that those parties will not be able to enjoy the benefits of MED-HYCOS, and that data from those parties will not be available through MED-HYCOS, although they will have the "umbrella" system available for use when they are prepared to do so. The MED-HYCOS database is intended to be available to all bona fide researchers and development projects. Some parties, however, may be unwilling or unable because of legislation to release hydrological data to third parties. It is proposed that countries can only participate in MED-HYCOS if they are willing to make their data available to third parties or other countries, under conditions discussed with the MED-HYCOS bodies concerned.

80. This is a technologically advanced regional project, but simple in concept and in implementation. Moreover, the experience from numerous projects implemented by WMO and other agencies is very convincing in assuming that MED-HYCOS can be successfully executed. Another major obstacle to the project development can be the lack of trained personnel, which is not the case here, since an effort has been made by WMO and others to develop trained manpower in this particular sector, for operating both meteorological and hydrological data collection systems. A number of participating parties already manufacture, own and operate such systems and they have the required expertise at all levels. Moreover, the training required for specific systems within MED-HYCOS is incorporated in the proposed project itself.

81. A regional project, such as MED-HYCOS, has inherent risks of natural, political, social, financial, economic and other origins, which should be pointed out whenever possible. However, the MED-HYCOS proposal has considerable flexibility which should minimize risks arising from these sources. In fact, this project has been proposed because many countries, in the past, have not been able to escape from these risks in their regular programmes. The main risks and their probability of occurrence are:

Risks	Probability
Lack of counterpart funds for infrastructure.	Small, since most of the infrastructure is already in place, and Governments are already bearing the operation costs to a large extent.
Lack of trained staff.	Little since the project integrates relevant training activities.
Delays in project implementation.	Possible but avoidable if the schedule of activity is correctly implemented.

Little use of project's products.	Products are actualy required for investment and economic development. The project is demand driven.
Failure by parties to assign permanent staff to run the project at the regional level.	Little, since similar regional initiatives for international waters already exist

G. PRIOR OBLIGATIONS AND PREREQUISITES

82. No preconditions are envisaged. The signatures (approval) by the 28 participating parties in the original terms of reference and the establishment of the Regional Cooperating Group (RCG) clearly defined roles, indicates the obligations and prerequisites to meet the requirements as specified in section E above.

H. PROJECT REVIEW AND REPORTING

83. The project will be subject to regular review of the progress of the implementation of MED-HYCOS by the RCG, which will met twice a year. The RPC shall help WMO to prepare and submit progress reports as stipulated below.

H1. REPORTS

84. The following reports shall be submitted during the project:

85. Progress reports prepared by the PRC and WMO shall be submitted on a yearly basis; they will include progress made during the twelve previous months and will draw attention to activities which may be falling behind the programmed time, giving reasons for delays and remedial action to be taken or proposed to be taken. The reports shall be concise and include a bar chart programme.

86. One copy of each report shall be made available by WMO to each members of the Initial Coordination Team, three weeks in advance of their meetings. All reports shall be reviewed by the ICT together with the RPC Team and WMO.

87. After revision the reports will be presented to the Regional Co-operating Group and to external funding institutions.

(a) A draft copy of the final report will be submitted to the Regional Cooperating Group 40 months after beginning of the project and will present all the elements intended to be published in the final report and the propositions to ensure the durability of MED-HYCOS after the end of he initial project. It will be examined and commented upon by the RCG and modified, thereafter, as mutually agreed upon within six months.

(b) This report is to be submitted by WMO to the Governments of the participating parties six months after the approval of the final draft report. Five copies shall be distributed to each of the Governments of the participating parties.

I. LEGAL CONTEXT

88. The project document duly signed by the Governments of the participating parties and the external financing agency shall be the instrument referred to. Revisions which do not involve significant changes in

the immediate objectives, outputs or activities of the project but are caused by the re-arrangement of inputs already agreed to without increasing expenditure, may be made by the RCG under the supervision of the Executing Agency.

89. WMO will be the Executive Agency.

90. A special agreement with financial arrangements will be established between WMO, as Executive Agency, and ORSTOM, as host institution, for the management of the Regional Pilot Centre.

J. BUDGET

91. The total project cost is estimated at US $ 14 841 000 from which 1 700 000 from World Bank, 2,381,000 from WMO, 7 005 000 from other external donors and 3 757 000 from participating parties. The details of the budget and of the financial inputs are shown respectively in **Table 7** and **Table 8**.

Table 1. Main rivers in the Mediterranean Sea basin

Name	Area in km^3	Length in km	Annual average flow in million m^3	Annual average runoff ** 1 000 m^3/km^2
Nile*: total : Aswan	3 030 700	6 671	89 247 89 247	29 59
Rhône*	98 845	812	53 611	542
Ebro*	86 000	930	43 330	504
Po*	74 300	676	46 926	632
Moulouya*	53 700	450	1 583	29
Meriç-Evros Ergene*	52 450	490	9800	187
Chelif	45 000	700	1 200	27
Büyük Menderes	24 976	450	3150	126
Axios-Vardar*	24 662	388	4 220	171
Asi-Oronte*	23 933	570	2 470	103
Medjerda*	23 700	484	1 000	42
Ceyhan	21 982	509	7 250	330
Seyhan	20 450	500	5 920	289
Gediz	18 000	270	2 270	126
Jücar	17 876	506	1 460	92
Tiber	17 169	405	7 380	430
Strimon*	16 553	430	3 460	209
Segura	14 925	240	230	15
Neretva	12 750		11 900	933
Drin*	12 368	151	11 258	910
Adige	12 200	415	6750	553

Table 2. Main rivers in the Black Sea basin

Name	Area in km^3	Lenght in km	Annual avearge flow in million m^3	Annual average runoff** 1 000 m^3/km^2
Danube*	817 000	2 850	198 000	242
Dniepr*	500 000	2 200	52 034	104
Don*	420 000	1 870	27 436	65

* International river
** 1 000 m^3/year/km^2 = 1 mm depth of runoff per annum

Table 3. Inflows to the Black Sea

River	Annual flow km^3	% of total inflow
Danube	198	53
Dniestr	10	3
Youjny Bug	3	1
Dniepr	52	14
Don	28	8
Kouban	13	3
Russian and Georgian	41	11
coast	25	7
Turkish coast	3	1
Bulgarian coast		

Table 5.Nutrient pollution in the Black Sea

Origin	**Nitrogen**	**Phosphate**
Domestic waste wate	25 to 35%	40 to 50%
Industrial waste water	10 to 25%	10 to 20%
Soils and agriculture	25 to 40%	10 to 20%
Atmospheric deposition	25%	5 to 10%
Marmara Sea	5%	5 to 10%

Table 6.Water related projects in the region

Country/region	Project/number	Implementing agency
Czech Republic	Biodiversity Protection (TF 28617)	GEF/WB
Romania	Daube delta Biodiversity (TF 28660)	GEF/WB
Slovak Republic	Biodiversity Protection (TF 28644)	GEF/WB
Turkey	In-situ Conservation of Genetic Biodiversity (TF 28632)	GEF/WB
Ukraine	Transcarpathian Biodiversity Protection (TF 28654)	GEF/WB
Ukraine	Daube delta Biodiversity (TF 28654)	GEF/WB
Algeria	Le Kala National Park and Wetlands Management (TF 28641)	GEF/-
Jordan	Conservation of Dana & Azraq Protected Areas	GEF/WB
Regional (18 countries)	Environmental Management & protection of the Danube River Basin (RER/91/G31)	GEF/EU/UN
Regional (6 countries)	Environmental Management & protection of the Black Sea (RER/93/G31)	GEF/UN

Countries and territories	renewable resources km^3 per year	date	water used km^3 per year	water used as % of avaibility	water used per capita m^3 per year	domestic use % of water used	industrial use % of water used	agricultural use % of water used	Surface irrigated 1000 ha	population for 1 ha irrigated	% of agricultural lands that are irrigated	renewable resources m^3 per capita per year 1990	renewable resources m3 per capita per year 1994	renewable resources m3 per capita per year 2010	population 1990 million	population 1994 million	population 2010 million
Lybia	0.70	85	2.83	404	623	15	10	75	242	18.1	11.3	154	134	80	4.6	5.2	8.7
Egypt	58.00	85	56.40	97	1202	7	5	88	2585	19.8	100.0	1112	997	755	52.4	58.5	77.3
Malta	< 1	78	0.02	92	68	76	8	16	1	351.0	7.7	70	67	62	0.4	0.4	0.4
Israel	2.15	86	1.90	88	447	16	5	79	214	21.1	49.4	370	319	256	4.6	5.3	6.6
Cyprus	0.90	85	0.54	60	807	7	2	91	35	19.8	22.4	1280	1165	1003	0.7	0.8	0.9
Tunisia	4.35	85	2.30	53	325	13	7	80	275	29.1	5.9	532	497	385	8.2	8.8	11.3
Jordan	1.10	75	0.45	41	173	29	6	65	57	55.6	15.2	274	260	145	4.0	4.2	7.6
Spain	111.00	85	45.25	41	1174	12	26	62	3360	11.6	16.5	2840	2840	2761	39.2	39.2	40.3
Morocco	30.00	85	11.00	37	501	6	3	91	1265	19.3	13.7	1197	1130	790	25.1	26.5	37.9
Italy	187.00	81	56.20	30	983	14	27	59	3100	18.6	25.8	3277	3263	3323	57.1	57.3	56.3
France	185.00	84	40.00	22	728	16	69	15	1160	48.4	6.1	3295	3190	2924	56.1	58.0	63.3
Algeria	19.00	80	3.00	16	161	22	4	74	336	72.3	6.0	765	686	462	25.0	27.8	41.3
Lebanon	4.80	75	0.75	16	271	11	4	85	86	31.1	28.6	1778	1619	1271	2.7	3.0	3.8
Romania	208.00	80	25.40	12	1144	8	33	59	3450	6.7	33.3	8938	9146	9274	23.3	22.7	22.4
Greece	59.00	80	6.95	12	720	8	29	63	1190	8.4	30.3	5836	5659	5576	10.1	10.4	10.5
Syria	36.00	76	3.34	9	449	7	10	83	670	18.0	12.2	2833	2562	1502	12.5	13.9	23.6
URSS**	4684	80	353	8	1330	6	29	65	21064	13.6	9.1	16230			288.6		
Bulgaria	205.00	80	14.18	7	1600	7	38	55	1253	7.2	30.2	22752	24254	24963	9.0	8.5	8.2
Yugoslavia***	265.00	80	8.77	3	393	16	72	12	168	141.0	2.2	11130	25287	23909	23.8	10.5	11.1
Albania	21.00	70	0.20	1	94	6	18	76	423	7.5	59.8	6554	6313	5304	3.3	3.4	4.0
Turkey	203.00	85	15.60	8	317	24	19	57	2220	24.7	8.0	3633	3318	2514	55.9	61.2	80.7
Moldova	*68.17**		4.09	*6**	939								*15642**	*15422**		4.4	4.4
Ukraine	*575.00**		34.50	*6**	660								*10993**	*10629**		52.3	54.1
Georgia	*77.17**		4.63	*6**	841								*14023**	*13586**		5.5	5.7
Bosnia																4.4	4.9
Croatia																4.8	4.8
Macedonia																4.4	4.4
Slovenia																2.0	2.0
PLO for the benefit of the PNA																	

*evaluated value, **former URSS, ***former Yugoslavia

Table 4. Water use in the MED-HYCOS region (from Water in Crisis, Edited by Peter H.Gleick. Stockolm Environment Institute)

	year 1998					year 1999					
items	World Bank	WMO	Other donors	countries	**total 98**	World Bank	WMO	Other donors	countries	**total 99**	**Grand total**
Equipment investment											
DRS											4 845
DRS											372
Spare											
DCP											252
DRS											70
Field operation hardware,											
memory reading modules											44
hydrometric stations upgrade											1 100
E-mail, Internet network equipment &software											230
Sub-regional centres											
equipment											275
support facilities& national data bases											250
Regional Pilot Centre											
Equipment strengthening											216
Consulting services											
Detailed concept preparation)											60
Detailed preparation											
country visits											150
technical specialists			40		40			40		40	150
Procurement (10% equipment)											777
Installation, supervision											170
Training											260
Sub-total 1			40		**40**			40		**40**	**9 221**
Contingencies (10%)			4		**4**			4		**4**	**922**
Operation & maintenance											
DCP				90	90				90	90	248
DRS				38	38				38	38	107
sub-regional support facilities				45	45				45	45	124
satellite transmission fees											
DCP		405			405		405			405	1 519
DRS		45			45		45			45	171
E-mail, Internetl		4			4		4			4	16
Pilot Regional Centre											
building space				50	50				50	50	250
services, utilities				15	15				15	25	113
equipment											69
Personnel		150		276	426		150		276	426	2078
Sub-total 2		604		514	**1 118**		604		524	**1 128**	**4 695**
Total		604	44	514	**1 162**		604	44	524	**1 172**	**14 840**

Table 7. (cont'd) Detailed Budget for MED-HYCOS in 1,000 US $

Table 8. Financial inputs
1 000 US $

1 Equipment, operation and and maintenance

	World Bank	WMO	Other donors	Countries	total
1995	465	71	612	631	1779
1996	569	273	2197	513	3552
1997	261	454	1969	355	3039
1998		454		173	627
1999		454		173	627
Total	**1295**	**1706**	**4778**	**1845**	**9624**
total %	***13,5***	***17,7***	***49,6***	***19,2***	***100,0***

2. Pilot Regional Centre (equipment strengthening, building space, services, utilities, maintenance and personnel)

	World Bank	WMO	Other donors	Countries		total
					among which France	
1995	19		110	284	*284*	413
1996	46		194	341	*341*	581
1997	15		20	341	*341*	376
1998				341	*341*	341
1999				341	*341*	341
Total	80		324	1648	1648	2052
total %	3,9		15,8	80,3	80,3	100,0

3. Consulting services and others

	World Bank	WMO	Other donors	Countries	total
1995	129	100	386	128	743
1996	139	125	810	86	1160
1997	55	150	619	50	874
1998		150	44		194
1999		150	44		194
Total	323	675	1903	264	3165
total %	10,2	21,3	60,1	8,3	100,0

General total

	World Bank	WMO	Other donors	Countries		Total
					among which France	
Total	**1698**	**2381**	**7005**	**3757**	**1648**	**14841**
Total %	**11,4**	**16,0**	**47,2**	**25,3**	**11,1**	**100,0**