EP

United Nations
Environment
Programme

UNEP(OCA)/MED WG.124/Inf.6
15 April 1997

ENGLISH
Original: FRENCH

MEDITERRANEAN ACTION PLAN

Second Meeting of the Mediterranean
Commission on Sustainable Development

Palma de Majorca, Spain 6-8 May 1997

PRELIMINARY REPORT ON THE THEME: "MANAGEMENT OF WATER DEMAND"

Task Managers: Tunisia and Morocco

UNEP
Athens, 1997

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WATER DEMAND IN THE MEDITERRANEAN COUNTRIES: CONCERN POINTS

From the beginning of history, the civilizations that flourished around the Mediterranean showed great mastery in developing water uses, in urban life as well as in agriculture with remarkable in genuity channels, aqueducts, fountains, hammams and public baths have always been part and parcel of the life of the Mediterranean peoples. running water was the first source of power and hydroelectricity still remains a major source of energy in several Mediterranean countries, such as France, Italy, Turkey. The terrific demographic and economic boom which characterized the modern period, as well as the uncertainties of climate change alter the picture.

The corresponding water needs, which for a long time had remained stable had been covered exclusively by developing and using the water found n nature, without bothering to evaluate the resources so long as they were adequate. The increased variety of uses did not modify this traditional approach. The result was increased development and exploitation of water resources.

The degree to which irregular flows are controlled with dams reservoirs or underground water collected and pumped out still varies. It is already high in several countries where the sites that can be exploited are becoming scarce or where the use of underground resources has started to produce undesirable consequences.

Preliminary remark

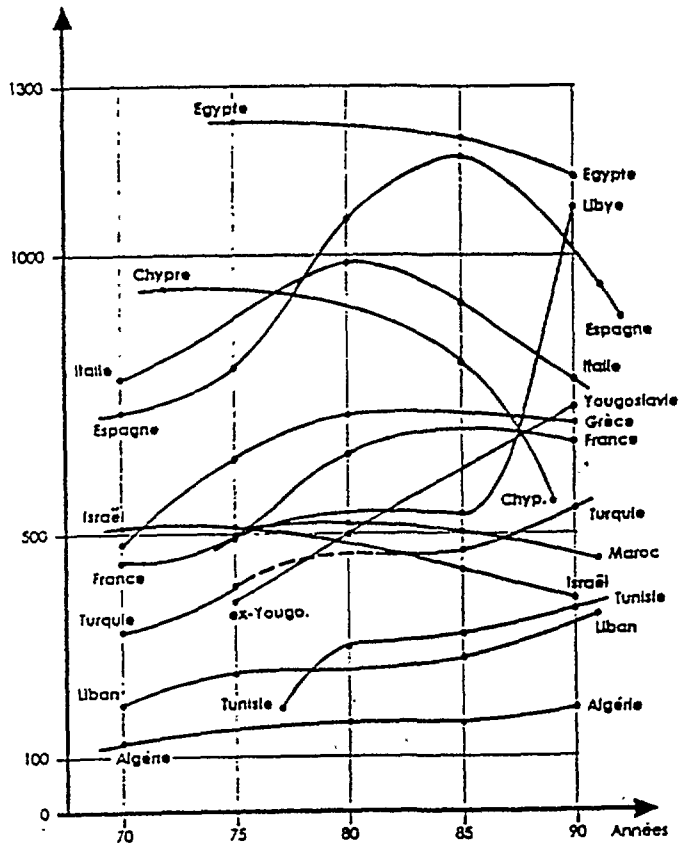
Water demand from the point of view of uses is not always equivalent to the need strictly defined by the activities they carry out. It also depends on the means of uses and the condition of supply. Water demand can be higher in case of wastage or lower in case of recycling.
Satisfied demands is covered by water production: taking of water, which includes use of fissile water (non-renewable production), to which non-conventional sources of water must be added (re-use, desalination). it is understood that water taking is defined as the average flows of water taken from the natural environment and channeled into the distribution system, or used directly.

Large disparities and the role of irrigation

It has been calculated that in 1990 approximately 270 km^3 were globally in the Mediterranean region, of which 99% came from natural resources. Demand has doubled in the 20th century, and increased by 60% in the last 25 years. However,in the last decades, water demand per capita (for all users) progressed differently in the various countries, depending on the conditions of demographic and economic development. Generally, demand per capita increased in the 60s and 70s but started decreasing in the 80s in most countries. There is continuous moderate demand increase in those countries where it still does not match the need (Algeria) and a larger increase where large-scale development and production efforts are being deployed (Lebanon, Libya, Turkey).

Figure 1: development in water demand per capita between 1970 and 1990

Figure 1 : évolutions de la demande en eau par habitant des années 70 à 90.



Large disparities among countries: quantities of water used per capita vary between 100 m^3/year (Malta) and more than 1100 m^3 (Egypt and Libya) or by more than 1 to 10. The countries that use less per capita (a fact due mostly to water supply scarcity) are after Malta, the Territory of Gaza, the West Bank of Jordan and Algeria, none of which exceeds 200 m^3/year. The European countries all use more than 600 to 700 m^3/year, but the countries where per capita use is the largest (exceeding 1000 m^3/year) are those where irrigation accounts for the largest use with the least savings (Egypt, Libya). Irrigation is predominant in most of the countries (with the exception of France and the countries that made up the Former Yugoslavia). It accounts for 64% of the demand, 80% in the South and is followed, by order of relative importance by covering the needs in drinking water of towns and cities (13% of the demand) and the needs of industry (10% of the demand). The energy sector is important only in France where it is predominant.

Water for cities, priority sector

The production of drinking water to cover the needs of urban populations, high in quality but low in cost, has sharply increased in the 20th century under the triple pressure of the demographic boom which generates new needs, of urbanisation and the progression of distribution rates. The production of drinking water exceeds today 34 billion m^3 per year for the whole region, unequally distributes among sub-regions, with 60% for the North, 210% for the East and 20% for the South.

Even if on the whole this production is higher than the real demand for drinking water (a fact due to loses in the distribution system which often reach 1/3 of production), it still does not match the demand equally. The disparities in the development of production of drinking water per capita in the various Mediterranean countries and if compared to other countries with different degree of development in other parts of the world point to real contrast between the Northern Mediterranean countries with a high rate of development of water resources (Spain) or lower rate of development (France) on the other hand and the Southern Mediterranean countries with a much lower rate of development of water resources (Maghreb) or with a negative rate of development of such resources, either because of water-saving efforts (Israel) or because of a lag in developing the infrastructure in countries where there is strong urban population expansion (Egypt).

Irrigation and Tourism: two Mediterranean characteristics

Irrigation, which has been a characteristic feature of the Mediterranean civilisation for many centuries, is needed almost everywhere to ensure agricultural production both in order to cover an much as possible the increasing needs for food of the growing populations - since self-sufficiency is an objective officially or unofficially for several countries - and, in order to raise export crops - a major goal for others, irrigated areas have dramatically increased in the 20th century and more so after 1950 in many countries especially Spain, France, Morocco. Irrigated land on the whole exceeds today 16 million hectares.

However, depending on the region the objective, modalities, yields and needs for irrigation water differ greatly. Variation from year to year is greater in the North where it is a supplement to rainfall than in the south where it is the main and sometimes the only water input. Different irrigation techniques, traditional and modern coexist. As a result water demand per hectare varies a great deal: from 2000 to 2000 m^3/year.

The annual agricultural use of water amounts to 14% of the average renewable resources, but percentages vary among countries. Pressure is further aggravated by the strong seasonal character of agricultural uses: to maximum demand correspond minimal resources. In the North and the South, irrigation is the main incentive for intensive exploitation of underground resources. In many cases, extreme exploitation, especially of the underground water resources of coastal plains, has led to an invasion of sea water (Spain, Greece, Morocco, Libya, Israel, etc).

On the other hand, such pressures have brought about the recession and in some cases the disappearance of natural wetlands, which from an environmental point of view cannot be balanced by the extension of the artificial wetlands made up of irrigated areas.

In terms of water quality, the impact of irrigation is equally serious, because of the fertilizers and pesticides used and the resulting increased loads in the underground waters and the surface waters which receive run-off and leaching from irrigated soils. Thus, lower quality is another form of resource consumption.

Furthermore, irrigation faces other constraints, i.e.:

- natural: some arid countries (Tunisia, Libya) are very poor in surface water, but rich in underground water. They therefore intensely exploit these underground resources, which in some cases are non-renewable fossil aquifers.

- geopolitical: the development and use of international water resources (Nile, Tigris, Euphrates, underground aquifers in the Maghreb) require agreements upstream/downstream to reduce tensions;

- financial and social: development costs for infrastructures up-stream (dams, channels) and equipment of each irrigated hectare are high. The time needed for recuperating the cost of investment may not be available if water is scarce and divested to other uses (urban or tourist areas).

With 250 million national and international tourists annually, the Mediterranean region as a whole is the first tourist destination in the world. Tourism increases the demand for drinking water in the reception areas: 500 to 800 liters per day per capita for de luxe hotels which is a lot more than for the permanent residents. But more than that, tourism engenders service and leisure activities which use large quantities of water and requires great expansion of the water distribution and sewage networks. For instance, golf links which continue to be built consume as much water per hectare as well irrigated areas (10,000 m^3/year).

Agriculture and tourism in the Mediterranean draw up a lot of water resources with a strong summer demand and a coastal concentration. This increases the pressures on the water resources of the hinterland and promotes population movements towards the costs, a phenomenon which has already occurred in several countries (among which Spain, France, Greece, Israel, Libya).

Strong and increasing pressures or water resources

In many countries, water use is approaching, in order of magnitude, the resources in an average year, i.e. a fortiori in a dry year. Exploitation indices [1], as total for each country, show that in 8 Mediterranean countries the use of non-renewable water resources has already exceeded 50%. That means tensions at least locally or at certain times. When such rates reach or even exceed 100%, the balance is broken and either there is deliberate but not sustainable resource to non-renewable resources (Libya), or part of the resource is used more than once (collection and re-use of wastewater or returned draining water in, for instance, Egypt and Israel). Furthermore, the picture is somewhat biased because the indicators refer to the totality of natural resources; the situation would appear more critical if the indicators referred only to those resources considered exploitable (obviously the criteria vary from country to country).

Full consumption indicators refer to the water used and not returned after utilisation. They too are high in the Mediterranean countries, where two factors also affect them: the relative importance of farm uses which consume large quantities of water and the high proportion of discharge into the sea of waste waters from cities, industries and tourist establishments (which are all concentrated on the coast) resulting in decreased return of water to the rivers or underground aquifers.

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[1] Cf. annex for information by country

Currently, final resource consumption for the whole region is estimated at more than 130 million m^3/year (or 48% of quantities taken), the majority for the Southern and Eastern Mediterranean countries (60% of the total) because of the high consumption of irrigation.

Naturally, pressures in quantity are followed by impact on the quality of discharges of wastewaters (approximately 15 billion m^3 discharged in the continental waters of the Mediterranean basin alone, a substantive part of which is not treated). There are also other pollution sources. pollution sources. The Southern countries are less industrialized than the Northern countries, but with scarcer water resources and equally affected by the impact of such forms of pollution treatment of wastewaters, waste management and prevention of diffuse pollution have not generally been pursued as actively as resource exploitation, the same as in other parts of the world, but the consequences are more serious in the Mediterranean region where water resources are both scarcer and more in demand.

Despite resource scarcity and the frequent restrictions in the water quantities produced and/or distributed per capita, the yields to use are far from satisfactory both in drinking water production and irrigation.

Evaporation in the reservoirs, loses in the transport and distribution networks, leaks in domestic and industrial users, low efficiency in irrigation all combine to reduce the efficiency in water use, and that does not account for uses that are not necessary or uneconomical - another form of wastage. To sum up, real water demands are partly higher than theoretical needs which would correspond to perfect efficiency of use.

Up to now, the increasing water demands have been met with efforts to increase the supply through intensification of the use of conventional resources, rather than with efforts to moderate and manage the demand. This is exactly what cannot be sustained and must be revised in the future.

Increasing scarcity

In this recent prospective work on water demand, the Blue Plan used existing national projections and focussed on two extreme hypotheses: a pessimistic hypothesis of high demand increase with extension of irrigated areas and small water savings in the various sectors, and an optimistic hypothesis of low water demand which could be called "sustainable water use". Generally speaking, the pressures on water resources are expected to grow, the past used for agriculture is expected to decrease, while that for urban consumption is expected to increase.

The various indicators show that the "future water shock" will occur when almost half of the Mediterranean population will have reached the water scarcity threshold in 2025. At that point, even in the optimistic scenario, the pressures on the resources are expected grow and become both more extensive and more serious at local level in countries from Morocco to Syria, as well as in the islands. In the pessimistic scenario, more than 13 countries will use more than 50% of their resources and 6 more than 100%. This last figure will imply recourse to non-renewable or non-conventional resources (re-use, desalination).

In an expanding part of the Mediterranean region, the management of small resources will become management of scarce resources (pollution, excessive demand etc.). Scarcity could threaten development and exacerbate conflicts among sectors of uses, regions in the same country (rivalries upstream/downstream, opposition to transfer projects), among countries, among generations (short-term concerns versus long-term ones). However, some scenaria show that long term stabilisation of pressures is conceivable if adjustments are made in respect of uses.

In a generation of margin of manoeuvre wither has disappeared or will disappear: demand will depend on limited natural resources and limited control opportunities which will become even more costly. The perspective of developing new resources are promising but will not meet the demand. Gone is the time when an area with incipient scarcity could quickly cover its needs with resources from other areas. Scarcity will have to be managed more and more at local level. In particular, agricultural water which accounts for 3/4 of the Mediterranean consumption must soon give way to water for household needs and industry which is more profitable and a better investment.

Such a course is defined and pursued through a political will be to implement policies of integrated management of water resources. The main axis of such policies would be demand management to satisfy the needs of the populations for drinking water, to optimise the various uses of a finite resource and to respect the other functions of this resource: maintaining the ecosystems and the quality of life in the Mediterranean peoples.

In the following pages we shall analyse in greater detail the situation in 4 large groups of countries classified according to water demand/resources by the year 2025. After a description of the characteristics of the demand, we shall give some elements for action concerning the management of water demand in those countries.

1. The group of countries where total water demand per capita exceeds 500 m^3/year and where resources remain considerable until 2025 and even beyond, allowing increased per capita consumption. These are France, Italy, Greece, Former Yugoslavia, Albania and Turkey.

2. The group of countries where total water demand per capita exceeds 500 m^3/year and where currently available resources will cover the total water demand up to the year 2025 (if per capita demands remain stable). These are Morocco, Spain, Cyprus, Syria, Lebanon (with per capita demand lower than 500 m^3/year).

3. The group of countries where total water demand is lower than 500 m^3/year and where, starting with the year 2000, per capita water use must decrease to meet global demand. These are Malta, Tunisia, Israel, Algeria and the Territory of Gaza.

4. The group of countries where demand exceeds 500 m^3/year and where water use per capita must decrease starting with the year 2000 to meet global demand. These are Egypt and Libya.

1. HIGH DEMAND AND LARGE WATER RESOURCES

In this group we have classified the countries of the Northern Mediterranean which together account for more than two thirds of the water resources of the region (928 out of 1135 km^3/year). Most of these resources come from the territory of each state, with the exception of the countries which were part of the Former Yugoslavia where 45% of the water comes from neighbouring countries. Correlated with population figures (1995), per capita resources reveal the abundance of this natural resource: they range between 3000 m^3/year and 15000 m^3/year. In this region, water needs are covered to a rate of 100% by renewable resources and will be fully covered in the future as well.

However, two sub-groups must be distinguished in respect of the role played by irrigation: major in the purely Mediterranean countries, such as Italy and Greece, minor in countries such as France and the Former Yugoslavia, where demand is greater in

the industrial and energy fields. Putting the two sub-groups together creates some distortion in the comparisons.

Uses: current situation and trends

Demand represents on average a volume of approximately 700 m^3/year/per capita, with a range of between 544 m^3/year/per capita in Turkey, to more than 900 in Albania and almost 2000 m^3/year/per capita in Monaco. Agriculture is the dominant sector for use, covering 48, 16% of the region's demand, but 90% of the latter is concentrated in just three countries: Greece, Italy and Turkey. Second place goes to the energy sector: it accounts for 21% of demand, 90% of which is concentrated in France and the Former Yugoslavia. Drinking water demand and industrial demands, that are not met, each represents an average of 15% of the total. (It is between possible that industrial demands are underestimated). The correlation of total use figures with average annual renewable resources gives a use indication of 15.15% with a minimum of 6% for Albania and a maximum of 24% for Italy, followed by France with 20%. The average indicators of agricultural use is 7% with a minimum of 0.35% in the Former Yugoslavia and a maximum of 17% in Italy. Here are some remarks on the main consumers:

- Power plants use a lot of water for cooling, but the final consumption in this sector is low (less than 1.5% of the volume is used up).

- For household needs, it is estimated that the average unit need figure (after the lost/unused volumes have been calculated) is 77 m^3/year/per capita: 79 for urban households, 50 for rural. The average distribution rate is 86% in urban areas versus 63% in rural areas. The disparity between urban and rural areas is much greater in Albania, Greece and Turkey. In those three countries, the distribution rates in rural areas range between 30 and 50%. These average figures hide differences among cities, but precise information is not available.

- For the agricultural sector, it is estimated that the average unit need figure (for all crops and after calculation of volumes lost/not used) is 2815m^3/year/per capita. In the networks, it is estimated that the average yield of transport is 80%. Efficiency in irrigation (estimated on the basis of the known or putative parts for the various irrigation methods) is approximately 70%. Irrigation techniques which reduce water volume per hectare vary in their development from country to country: 60% of irrigation is carried out with the sprinklings technique in France and more than 90% is gravitational in Turkey (detailed information on the subject is not available). Irrigation is complementary to rainfall input in this area and there is thus substantial interannual variation, but also variation depending on the crops planted and techniques used. It would be useful to carry out such analysis in greater depth with calculation of yields, efficiency and losses depending on irrigation systems, crops and climate zones.

  Per capita demand was generally on the increase in the 60s and 70s, then started decreasing in most of the industrialised countries (France, Italy, Greece), while still increasing in some countries, due to large efforts to develop and produce water resources (Turkey). The same holds for the development of production of drinking water per capita. Irrigated areas increased greatly in the 20th century, at an accelerated rate after 1950 for most of the region's countries (with the exception of Albania and the Former Yugoslavia). How will demand progress? By 2025 it is estimated that water demand as compared

with the 1990 situation, would increase by - 23% according to the low demand scenario (i.e. would decrease) in France, Italy, Greece, or by +24% according to the high demand scenario with a decreasing rate of speed, except in Turkey. Agriculture will continue to play a major part, but its importance will slightly decrease.

Sectoral actions in respect of water demand

Water is abundant in most of these Mediterranean countries. However, locally there are water-poor areas, problems linked to the conservation of wetlands and finally the need to manage "quality demand", discharges of wastewater and pollution. In all countries there are many government structures that share the responsibilities for such tasks or share in the management. Often it is the Ministry of Agriculture which managers water demand for agricultural uses (except in Turkey where The Ministry of Public Works manages urban water); drinking water is managed by local authorities (which often contract it out to private companies, as is the case for instance in France and Italy), or public authorities as in Greece. Such dispersion of competences makes more imperative the need for an adequate legislative framework for water which would promote the objectives of national policies on the rational use of resources and environmental protection. Thus in France, the Water Act of 1992 is inspired from the principle of the public domain and stipulates that for each large basin a master plan for the development and management of water must be established to define the main axes of the policy to be followed. It confirms the "polluter pays" principle which establishes that the polluter must cover the financial implications of his acts. The same principle is formulated in the relevant Italian legislation of 1994.

A considerable part of water taken is little used or badly used. The figures for losses in distribution networks and leakages in the consumers' premises are not precise, but it can roughly be calculated that the co-efficient for non-used water is 20% (for urban water and water for agricultural uses). The above percentage represents a financial drain. In such an analysis, two aspects of sectoral policies must be assessed: correction efforts aimed at utilisation problems and strategies bearing a direct or indirect impact on water demand. Here are some elements for reflection:

- Tariff policy in the various sectors is one of the main aspects to consider in this connection, since it can promote water savings. Generally, in all these countries, prices for irrigation waters are very low. For the other sectors, the situation differs among countries and within each country among different towns. In France, tariff policy does not promote water savings, but through sliding price scale, favours the large consumers.

- Sewerage and wastewater treatment policies are indicative of efforts to preserve resource quality. Because of the local management system, most countries do not have reliable statistics on sewerage networks. The rate of connection to public sewerage systems varies: it is high in France (77%), Italy (52.4%), Greece (50.65) but lower than 30% in the other countries. No information is available on private sewerage systems which are considerable in countries with low/moderate population density. For the same reason of population density, the number of treatment stations varies a great deal from one country to

another. There are 12000 stations in France serving 68% of the population, 11.4% of the people in Greece are covered by such stations, while the percentage for Turkey is 6.3%. However, the figures are for access only and they do not indicate the type of station, operational aspects and whether they treat diffuse sources of pollution. Generally, diffuse agricultural pollution is not included.

2. RICH WATER RESOURCES BUT REGIONAL CONTRASTS AND OCCASIONAL SCARCITY

This second group of countries is rich in water with more than 1000 m^3/year or 16% of the renewable water resources of all the Mediterranean countries. However, there is strong intra and inter annual variation and the water resource is unequally distributed within each country: in Spain 81% of the resources are in the North; in Morocco, the two main catchment areas, Oum-er-Rbia and Sebon cover one tenth of the land but provide 50% of flows. The irregularity of flows of surface waters requires important infrastructure projects to control them. Thus Spain, Cyprus, Morocco and Syria have developed considerable infrastructure of reservoirs and transferring systems at national scale (450 dams in Spain with useful capacity of 39800 hm^3 and 85 in Morocco with total capacity of 10000 h^3/year). The location of the development sites of the resource as compared to the areas where it is used makes imperative the establishment of costly transport systems, including the cost of energy, such as the systems to pump the water out (Spain). Further problems are the dependence on external resources (especially in Syria) and limitations on the reserves downstream (Syria, Spain, Morocco and Lebanon). Demand is covered to a rate of 99.8% by renewable resources (underground and surface waters). Some desalination efforts have been deployed in the Balearic islands in Spain and in Cyprus but such efforts are rather marginal.

Uses: Current Situation and Trends

The average, per capita demand exceeds 700 m^3/year but varies from country to country: from 388 m^3/year/per capita in Lebanon to almost 900 m^3/year/per capita in Spain. Agriculture is the predominant user and accounts for 77% of the total water demands for this region (88% in Cyprus, Syria and Morocco). Drinking water is second with 13% of the demand. Tourism accounts for a sustainable part of this volume: in Cyprus it is estimated that it accounts for 11% of total demand. Next is energy with 7% of the demand, mostly in Spain. Industrial needs that are not met come up to only 4.6% of the demand (but the relevant data are quite incomplete). The correlation of total quantities used with the annual average of renewable resources gives an average use indicator of 31% (ranging from 25% in Lebanon to almost 42% in Cyprus). Pressure is linked to agriculture demands to come to 24% of renewable resources (ranging from 19% in Lebanon to 37% in Cyprus). It is necessary to carry out a more detailed analysis of the two main sectors of use, i.e. irrigation and drinking water supply, in order to assess how efficient the use of water resources is.

- The development of irrigation techniques, such as sprinkling and dripping which reduce consumption per hectare is not equally developed throughout: they are used in 90% of irrigated land in Cyprus, less than 25% in Lebanon, 15% in Spain, 10% in Morocco and 3% in Syria. With the exception of Cyprus where

considerable efforts have been made to enhance efficiency in use of water for agricultural purposes, gravity technique remain predominant: efficiency is low and consumption per hectare high. The average unit need has been estimated at 4500 m^3/year/ha in Spain and Cyprus. However, there is another factor that increases the consumption even further, that has to do with cultural choices: in Spain and Syria a large part of irrigated land is put to cotton and maize. It is also necessary to calculate losses in the transport and distribution systems which are estimated at 20% in Spain and Cyprus. Unfortunately there is lack of data on these issues.

Needs in drinking water are covered at a rate of 100% in the urban areas. In rural areas, the situation is less satisfactory, especially in Morocco (14%) and Syria. Distribution yields in the drinking water sector range between 70% (Damascus, Syria) and more than 80% (Rabat, Morocco, Barcelona, Spain, Nicosia, Cyprus). It is estimated that the average unit need figure for drinking water is 96 m^3/year/per capita in Cyprus (after calculation of volumes lost or not used).

Per capita demand has started decreasing from the 70s onwards in countries with low or nil population growth such (Spain), where population increases faster than water supplies (Morocco) or where substantial water savings have been obtained (Cyprus). However, demand continues to grow in Lebanon and Syria where it is necessary to develop and supply drinking water. On the other hand, in most of the countries, even Spain, the evolution of the production of drinking water per capita is still on the increase. Irrigated land has sharply increased in the 20th century and at a very fast rate after 1950 in most of the regions countries.

What are the trends in terms of water demand? By 2025, it is estimated that water demand would increase in comparison with the 1990 situation by +27%, in the low demand scenario (with the exception of Spain where demand would decrease) and by +130% in the high demand scenario. Demand would double in Cyprus, Syria, Lebanon. For Morocco, the low demand scenario gives a lower rate of increase after 20%. The same scenario gives for Syria an accelerated increase in water demand after the year 2010. Agriculture will remain a major sector but its importance will decrease slightly. The countries that are poorer in water resources will join, as of the year 2010, group 3 with crises in respect of water resources which would amount to less than 1000 m^3/year/per capita. Cyprus, according to the high demand scenario will join this group by 2025 and Lebanon will approach the same situation by the year 2025.

Sectoral actions in respect of water demand

Prospective work illustrates management problems of future water demand. Control and water utilisation conditions depend on a number of factors which could transform or even reduce exploitable resources in the medium and long term. A number of indicators show that current practices are not sustainable; on the one hand reservoir capacity will in time be reduced because of silting and on the other, the number of sites that can still be exploited is becoming more and more limited; furthermore, the productivity of certain overused sites is going down while the cost of exploiting them is going up. Some coastal aquifers are abandoned because of salt intrusion, these are all phenomena observed in the countries of the area.

As opportunities become scarce, conflicts between short term development objectives and long term management goals, among regions and countries are on the rise. Moreover, in certain countries, deliberate policies of nature conservation, especially concerning wetlands take out of the volume of exploitable resources a greater part of natural resources. And among countries and regions conflicts appear between those that are rich and those are poor in water. Resources which are external to a country or to a catchment area may be of lower quality or become more limited as consumers use them upstream. The future depends on either conflict of interests or on the will to cooperate and negotiate. Discussions and debates are carried out. Thus in Spain, the National Hydrology Plan which proposes new inter-regional transfers and management of irrigation policies, has remained blocked since 1993.

To prevent and soften such conflicts, to make choices on the allocation of resources without insurmountable costs while at the same time promoting environmental conservation, it is necessary to adopt a global and integrated policy. In their majority, the countries endorse such management. Thus some reaffirm their will in the texts of framework acts: Water Act of 1995 in Morocco, Law of the Water of 1985 in Spain. Coordination structures exist in several countries: the High Council on Water and Climate under the presidency of the King of Morocco, the National Water Council in Spain. These countries and others have drawn up national plans (Spain, Cyprus) and regional ones (Morocco). However, the plans mostly focus on short term needs and aim at increasing the supply through technological means (dams, transfers, re-use of wastewater).

In this analysis, it is necessary to evaluate two aspects of sectoral policies: correction efforts to solve utilisation problems and strategies bearing a direct or indirect impact on water demand. Here are some elements for reflection:

- In the agricultural sector, there does not seem to be any serious questioning of the strategies of irrigation development and investments in infrastructures; forecasts show a reduction of the part of total demand allocated to agriculture (Syria, Morocco, Spain). However, in several recent documents on agriculture planning (Spain, Morocco, Cyprus)one finds modernisation plans for the relevant irrigation networks in order to reduce losses. The tariffs applied to water used for agriculture are very low in all countries and will remain so, since they are calculated on the basis of an amount paid per irrigated hectare (Spain, Cyprus) which at times barely covers operation and maintenance costs (Syria). In Cyprus, in public land, the Irrigation Division makes its members pay the real price of operation costs in addition to a basic fee to pay off loans. This practice discourages low value added crops (cereals, olives, almonds) and encourages crops such as oranges.

- In the urban sector considerable investments have been carried out in some cities to reduce losses in the distribution system. The cities of Fez and Rabat in Morocco have launched programmes to renovate their networks and combat leakages which are financed by the World Bank; the programme for Fez aims at improving the yield of the system from 65 to 80% in 5 years through an investment of Dh 72 million (USD 8.5 million); that for Rabat to improve the yield from 80 to 85% through

similar investment. In both cases, the benefits derived from the reduction of losses by far exceed the cost of investment. Tariffs vary widely among countries: they are established in a different manner in each town in Spain; or they may be established at national level with various classes of consumers one of them being the class paying the social tariff (Morocco). Tariffs can be very low, and indeed those paid by consumers in Spain are the lowest among OECD countries.

- Most of these countries lag behind in investments in the wastewater collection system, with the exception of Spain (where 72.5% of the population is linked to a sewerage system and 595 has access to a STEP). In certain cases this is due to a pollution combating fee which would help defray the costs of wastewater collection and treatment. In Cyprus, just 12.5% of the population is linked to the sewerage system and to a tertiary STEP. In Syria and Morocco, the large cities are equipped with sewerage systems. However updated information is not available in order to describe the situation accurately.

3. LOW DEMAND BUT UPPER LIMIT OF RESOURCES REACHED BY THE YEAR 2000

Natural and renewable water resources for this group of countries amount, for an average year, to billions of m^3/year (20,65 km^3/year for the group or Perthan 2% of the total resources in the Mediterranean region). Malta, Tunisia, Israel, Algeria and the territory of Gaza are thus the poorest countries in water with an average below the "absolute poverty threshold" of 500m^3/year/per capita. The situation varies between the extreme of 59m^3/per capita in Algeria. When the differences in the level of socio-economic development are also taken into consideration, for instance GNP/per capita, this unequal distribution becomes all the more obvious: it is often in the poorest countries that it costs more to mobilize the available resources because they are so scarce. These countries depend for their supplies largely on underground resources (particularly Malta, Israel, Gaza and the West Bank of the Jordan). Surface resources are unequally distributed in space: in Tunisia, the North (30% of the territory) produces 80% of the resources, in Algeria, 75% of renewable resources are concentrated in 6% of the country in the Mediterranean zone. The irregular character of the flow of surface waters and the unequal distribution of water makes imperative large projects for the control and management of water resources. Thus, Tunisia, Algeria, Israel have developed considerable infrastructure of reservoirs and transferring systems to carry the water from the North to the South.

Demand is covered to a rate of 96% by renewable resources (underground and surface waters). The resources that are easily exploited are being used up and infrastructure projects become more and more costly. Distances over which water has to travel become longer and longer: a channel 160 km in length brings water to Tunis and Sfax from Medjerdah in Tunisia, dams are being constructed more than 100 km from Algiers to supply water to that city, a channel for the Lake of Galilee provides drinking water for the whole country of Israel. The yield of dams and reservoirs is diminished because of the high rate of evaporation affecting the water surfaces (from 0.8 to more than 2m/year in Algeria).

In some of these countries, almost all of the renewable resources are being or have already been used up (Gaza, Malta). In many countries the policies of mobilizing conventional resources are no longer effective. Some have already launched a reorientation effort toward new resources: Malta covers almost 50% of its demands

through desalination and Israel 13% of its demands (especially in agriculture) through re-use of wastewater. But in other countries such refocussing has not taken place yet.

Uses: current situation and trends

Average per capita demand is 211 m^3/year (lowest 110m^3/year/per capita for Malta, highest 344m^3/year/per capita for Israel). Agriculture is predominant except in Malta and accounts for 67% of water demand (8% for Malta and 85% for Tunisia). Second is drinking water with 30% of demand (11.37% for Tunisia and 91% for Malta) which peaks in the summer tourist season. Industry and energy account for just 4% of the total demand for the former (80% of industrial demand comes from Israel and Algeria) and 2.27% for the latter (all of which comes from Algerian power plants). Correlation between total volumes used with annual average renewable resources gives an average exploitation indication of 42% (ranging from 31% in Algeria and the West Bank to more than 200% in Gaza with 85% in Tunisia and 89% in Israel). High pressure in Tunisia, Israel and Gaza is related to agricultural use which represents 48%, 76% and 167% respectively of renewable resources. The various uses, especially the large consumers among them militate against the replenishment rate of the natural water resources, especially in the wetlands. In Tunisia, Lake Ichkeal is threatened with drying up and salinisation by projects affecting the oueds that replenish it.

It would be useful to access the effectiveness of utilization in the two major consuming sectors:

- the development of irrigation by sprinklers and dripping is used very widely in Israel and Malta, but surface irrigation is still predominant in Tunisia (83% of irrigated land) and Algeria. Most of the irrigated crops have high added value. There has been no assessment of unit needs per hectare or of losses in the transport and distribution systems.

- drinking water needs are covered at a 100% rate in most urban areas (with the exception of Algeria with 85% and Gaza). The situation is a lot less homogeneous in rural areas: 97% in Israel, about 65% in Tunisia. Great variation also exists in the urban distribution networks 69% in Bizerta, Tunisia, 57% in Algiers, Algeria and 75% in Ramallah.

Water demand per capita while increasing in the 70s stabilised in Tunisia and even increased in Israel thanks to water saving efforts. They continue on the increase moderately in countries where they started from rather low leads because of lack of infrastructure such as Algeria and the Palestinian territories. The same goes for drinking water production and irrigated areas. Reaching the limit of resources has therefore a definite impact on water demand in these countries.

How is demand going to develop? By 2025, demand, according to the low demand scenario, would increase in respect of the 1990 situation by +21% and by +71% according to the high demand scenario in the Southern countries; in Algeria it would treble. In Tunisia, the low demand scenario would forecast lower rate of increase from the year 2010 onwards. On the other hand, in Israel and Algeria, a faster rate of increase would occur after 1020. By the year 2010 or 2025 a drastic decrease of available resources would come about in all these countries, in some even reaching zero levels.

Sectoral actions in respect of water demands

Prospective work highlights the seriousness of future scarcity, which will exacerbate conflicts centering on water: among sectors, regions, countries and generations. Some indicators show that current practices are not sustainable: the productivity of some overexploited sites is going down and the costs of exploitation are going up. Moreover, in addition to the lessening of quantities, quality is going down which means a decrease in the resources that can be exploited at reasonable cost even though they are difficult to quantify, physical and chemical types of pollution have been observed in many aquifers in Israel, Malta, Tunisia, Gaza. Some coastal aquifers are abandoned because of salt intrusion.

How is it possible to ensure in a sustainable way and under satisfactory conditions, in respect of both quantity and quality, that the needs in water of the people for their life and health as well as for their economic and agricultural development are covered? Obviously the answer depends on the situation in each country. However, because the problems are similar throughout, it is urgent to carry out an analysis of the current conditions, the ways in which problems have been tackled, the difficulties and problems encountered, but also the successful attempts and experiments. Indeed, this group of countries is witnessing an extreme situation which can promote new strategies:

- these countries reaffirm a political will for integrated policies defined in framework acts: Water Code of 1975 in Tunisia, Water Code of 1985 in Algeria, the Water Service Corporation Act in Malta, the latter being the reference framework of all aspects of water policies on the island. Coordination structures exist in several countries, e.g. the National Water council in Algeria. All countries have planning documents at national level, but they mostly focus on increasing the supply through technology (transfers, re-use of wastewater, desalination) rather than on demand management. Thus in Israel, the rate of re-use of wastewater for non-food crops should reach 80% by the year 2000. In Tunisia, the strategy is to mobilize 90% of surface waters and 100% of underground waters by the year 2010 by building new infrastructures (dams, hill reservoirs and channels).

- with respect to drinking water, programmes for the improvement of networks have been launched. In Algiers an action plan for the improvement and modernization of the network will be implemented. Bizerta has launched a campaign against water losses through measurements of night flows and streamlining of the network; Sonede is very active in combating water wastage stage by consumers, especially industry and local authorities. At Ramallah, the Jerusalem Water Undertaking (JWU) in its plan accords priorities to water savings, network planning, seeking out leaks, presentive maintenance and installing metres. Tunisia has developed a sliding tariff policy which penalizes large consumers, in particular tourism and industry that get their supplies from the system; but the same policy allows access to the resource through a social tariff.

- with respect to irrigation, considerable efforts to save water have been made through the adoption of appropriate methods. Israel is a leader in this area. The government of Malta subsidizes the installation of dripping irrigation systems and the re-use of wastewater. Tunisia also. In all countries the price of water for agriculture uses remains very low. Some have sought to make consumers active partners in water demand management; thus in Tunisia, AIC (the association of those that irrigate their land) with more than 1200 associations as members, is involved in demand management.

- more than 90% of the people in Malta and Israel are linked to sewerage systems. In Israel, 80% have also access to a treatment station; 61% of urban population has access to sewerage systems. On the other hand, the other three countries lag behind in this respect.

4. HIGH DEMAND BUT UPPER LIMIT OF RESOURCES REACHED BY THE YEAR 2000

This group contains two countries which have a common point: that per capita demand exceeds 1000m^3/year which is the highest in the Mediterranean. Both face water scarcity but at a different degree: Egypt with 986m3/year/per capita, Libya with very scarce resources 111m^3/year/per capita (1995). However, Egypt depends for 98% of its exploitable resources on the upstream countries; thus the situation is sensitive and the resource will become scarcer in the future. Supply sources differ: 93% of water demand in Egypt is covered by renewable resources, but 84% of water demand in Libya by non-renewable ones. This type of supply is not sustainable. The development of non-conventional resources (re-use, desalination) is still in its infancy, especially in Libya.

Uses: current situation and trends

In both countries, agriculture gets the lion' s share with 90% of water demand and 93% of renewable water resources. Drinking water comes in second place with 6% of demand, then industry in the 4%. Correlation of use with total renewable resources gives an average exploitation indicator of over 100%.

- A more detailed analysis of the agricultural sector shows little in the way of irrigation methods that save water in Egypt (just 10% of irrigated land); surface irrigation is used for 88% of land. Libyan agriculture saves more water with sprinkling systems used in 100% of irrigated land. Dripping techniques have not been developed. Moreover, some of the irrigated crops use vast amounts of water, especially cotton, maize, rice in Egypt, bananas in Libya.

- Drinking water needs in urban areas are covered to a very high degree (100% of urban population and 90% of rural in Libya, 90% in Egypt), but only 45% of rural population in Egypt has access to safe water. Little information is available for distribution systems in the cities of the two countries (58,8*% in Alexandria, Egypt).

Water demand per capita (for all uses) stabilized in both countries between 1975 and 1985 at very different levels: Egypt was near 1300m^3/year/per capita and Libya 500m^3/year/per capita. Since 1985 the situation is reversed; per capita demand decreased in Egypt, whereas it increased at a dramatic rate in Libya to reach the same per capita volume in 1995. The same goes for drinking water production in Egypt. There is moderate increase of irrigated areas in the two countries. Reaching the upper limit of resources impacts upon water demand in Egypt, but recourse to fossil resources allows Libya to continue its policy of agricultural development. Moreover, Libya has an ambition industrial development programme which will depend more on water in the future.

How is demand going to progress? According to the low demand scenario, by 2025, demand would increase in respect of the 1990 situation by +21%, but by +71% according to the high demand scenario in the Southern countries; it would quadruple in Libya. In Egypt, the low demand scenario would indicate a slower increase from the year 2010 onwards. By 2010 and 2025, a large decrease of resources per capita is forecast for all these countries, reaching zero level in Libya. National forecasts in planning documents indicate for these two countries

a decrease of the water allocated to agriculture *vis-à-vis* total demand.

Sectoral actions in respect of water demand

The worsening scarcity apparent in the forecasts can be worsened further still by the respective of the drying up of the sources of supply for these countries. The forecast of available quantities of water resources per capita have been based on the assumption that natural resources will be constant both in quantity and quality in the future. However this is an optimistic assumption.

Water scarcity has to be considered from the point of view of quality. Excessive exploitation of coastal aquifers in Libya causes loss of the resource because of saline intrusion which progresses by 100 to 250m/year. If no measures are taken, all coastal aquifers will have become saline by the year 2000. Water scarcity considered from the point of view of quantity means that the use of non-renewable resources in Libya will stop because of either the exhaustion of extractable water resources on the degradation of water quality (increasing salinity). Resources can be exploited for another 50 years according to estimates. The Asswan reservoir alone consumes by evaporation 50 times more water than all the power and nuclear stations of the Mediterranean. However, conditions in the upstream countries will impact upon whether the reservoir regularly fills up.

This group of countries depends heavily on one source of supply and would need better demand management. These countries have a powerful administrative structure that deals with almost all aspects of water management (mobilization, distribution, research, construction): Ministry of Public Works and Water Resources in Egypt (which is also responsible for construction, operation and maintenance of irrigation networks), and General Water Authority in Libya. Other administrative structures are also involved, in particular the Great Manmade River Water Utilization Authority which is responsible for the water extracted from the Southern fossil aquifers and used for agriculture purposes. Management focuses on increased transfers of the water: water transfers from the Nile to all Egyptian regions, water transfer through the Great Manmade River from the aquifers of Southern Libya to the consumers mostly in coastal areas. Sewerage systems, wastewater treatment, waste management and prevention of diffuse sources of pollution have not been promoted as much as securing water supplies.

- There are several laws pertaining to water, especially as concerns pollution prevention (thus in Egypt, a law on the prevention of the Nile and other watercourses from pollution, a law on urban wastewater and their collection through sewerage systems) and on drainage and irrigation (one law in Egypt); however there is no framework act on integrated water management. These two countries have ambition agricultural policies based on irrigation. Irrigation development in Libya depends on transferring water from the South which for the next 50 years will allow use of 2 km^3/year. Part of the water will be used by the coastal cities (Tripoli, Benghazi, Sirt and Misratah). The cost of water produced is not known. It is estimated that Egypt will develop an additional 920 000 ha by the year 2000 by further mobilizing all conventional water resources, the development of draining water and wastewater and more efficient use of its resources. In these two countries, the costs of investments, maintenance and distribution of water for agricultural uses is covered by the state, without the farmer paying anything. This is an old tradition in Egypt.

- There is little information on water saving schemes concerning drinking water. In Egypt, distribution falls within the jurisdiction of the Ministry of Housing and Public Utilities; in the large cities it managed by public bodies under the

auspices of the Ministry Alexandria is planning to spend USD 27 million for the improvement of the network and the installment of water metres; there is also a public awareness raising programme.

- More than 80% of the urban population in Egypt and 100% in Libya is linked to a sewerage system, but only 25% of the rural population has such access in Egypt (while rural population accounts for 55% of the total). In Egypt, it is estimated that 550 million m^3/year of wastewater is discharged into the Nile without treatment. No information is available on treatment schemes on tariff policies in the field of drinking water.

- Diversification of supply sources is a low priority in the development plans of the two countries. Egypt plans to develop re-use of wastewater (1.5 to 2.5 km^3/year) and draining waters (4.7 to 8 km^3/year) by the year 2025, i.e. 8.7 to 14.7% of water demands. Libya plans on developing the re-use of urban wastewater for agricultural purposes (10 km^3/year by 2020) and desalination (10 km3/year by 2020). This would represent less than 3% of demand according to the low scenarios.

CONCLUSION

The implementation of sustainable development in the Mediterranean rests for the most part on the capacity of the various countries to develop strategies of sustainable management of water demand which will play an important role in the economy and the welfare of Mediterranean society.

Several conclusions can be drawn from the analysis of the 4 groups, i.e:

- a sustainable part of water taken is apparently misused or very little used. Even where scarcity is a fact, utilization effectiveness is far from satisfactory in both the drinking water sector and irrigation. However, in order to assess better these problems, more accurate information is needed on utilization systems (cities for drinking water, irrigated areas for agriculture). There is no information on water saving schemes for industry (e.g. recycling)

- Correcting the current problems of water use must be an essential objective of demand management. Assessing the grains which would result from practical water saving measures - at competitive cost in respect of the additional efforts to bring the water or to produce it - *vis-à-vis* deterred investment costs to meet future demands, is the prerequisite for all future programmes.

Such assessment is not possible with the information available now.

Thus several areas can be studied by the Working Group "Water demand management"

- In the short term, it is necessary to carry further the assessment of strategies on water demand management in the Mediterranean countries, through national studies on water utilization systems.

- Utilization yields, water saving schemes and prevention of pollution in the various sectors are fundamental elements for assessing demand management. Data on these aspects is lacking, especially at the level of management units. The analysis of the sector of drinking water can proceed with the evaluation of

the situation in the large cities (with over 1 million people) and the assessment of water for agriculture to the level of large irrigated areas.

- Water saving schemes yield less and cost more. What part of the water that is not used can really be saved and at what cost? There is a need for a better quantification of the gains expected by reducing losses in the production/distribution systems, reducing wastage by consumers, by modifying exploitation systems especially in agriculture, by changing mentalities etc.

To this end, a short questionnaire shall be sent to all countries. It will be used as reference framework by the countries to prepare their presentation to the workshop; the results will be processed by the Blue Plan and discussed during the workshop in June.

- In the medium term, it could be interesting to launch some pilot studies on countries representative of each group. Indeed, this will make possible to highlight the specific options that have been selected by each country to manage water demands.

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Annexes

Annexe 1: Données sur les ressources en eau naturelles et renouvelables dans les pays méditerranéens.

Data on Natural and renewable water resources in the Mediterranean countries.

EAU : RESSOURCES NATURELLES ET RENOUVELABLES (flux moyen annuel en km³/an)								SITUATION ACTUELLE (1995)					
Pays & Territoires	Ressources Intérieures *	Ressources Extérieures * (a)	Ressources Totales (b)	dont eau de surface	dont eau souterraine (c)	partie commune (d)	Ressources régulières	Population (1995) (e)	Ressources per capita	Indice de compétition	Indice de régularité naturelle *	Indice de liberté d'action*	Indice d'indépendance *
	(1)	(2)	(3) = (1) + (2)				(4)	(5) Mhab	(3)/(5) m³/an	(5) / (3) hab/hm³/an	(4)/(3)	%	(1)/(3)
FR	170	11	181	179	100	98	86,1	57,77	3133	319	48%	88,7	94%
IT	179,4	7,6	187	175	43	31	30,5	57,91	3229	310	16%	100	96%
ex-YU	139,2	115	254,2	249	20	15		24,11	10543	95		21	55%
AL	44,5	5,5	50	49	7	6	6,5	3,39	14749	68	13%	98	89%
GR	45,15	8,5	53,65	51,15	12	9,5	7,7	10,25	5234	191	14%	94,9	84%
TR	196	7	203	199,8	20	16,8	...	62,03	3273	306	...	66	97%
Groupe 1	774,3	154,6	928,9	903,0	202,0	176,3	130,8	215,5	4311	232	14%		83%
ES (l)	113	1	114	109	20	15	13,89	39,28	2902	345	12%	72,3	99%
CY	0,9	0	0,9	0,83	0,3	0,23	0,27	0,73	1233	811	30%	100	100%
SY	7	28,9	35,9	32,5	5,4	2	11	14,78	2429	412	31%	14	19%
LB	4,95	0	4,95	4,25	3,3	2,6	3,2	3,03	1634	612	65%	86	100%
MO	30	0	30	23	1	3	10	28,26	1062	942	33%	99	100%
Groupe 2	155,85	29,9	185,75	169,58	30	...	...	86,08	2158	463	...		84%
MT	0,025	0	0,025	0,0005	0,025	0	0,025	0,37	68	14600	100%	0	100%
IL	0,75	0,92	1,67	0,595	1,075	...	1,2	5,88	284	3521	72%	64	45%
GZ	0,02	0,035	0,055	0,015	0,04	0	0,04	0,93	59	16945	73%	100	36%
WE	0,63	0	0,63	0,05	0,58	0	0,58	1,48	427	2341	...	53	100%
TN	3,42	0,42	3,84	2,63	1,61	0,4	2,1	8,93	430	2326	55%	100	89%
DZ	14	0,43	14,43	13,1	2,33	1	2,7	28,58	505	1981	19%	97	97%
groupe 3	18,845	1,805	20,65	16,3905	5,66	8,9	6,645	46,16	447	2235	32%		91%
EG (g)	1	56,7	57,7	56	9,2	7,5	25	58,52	986	1014	43%	100	2%
LY	0,6	0	0,6	0,1	0,5	...	0,4	5,41	111	9017	67%	100	100%
groupe 4	1,6	56,7	58,3	56,1	9,7	7,5	25,4	63,93	912	1097	44%	100	3%
Total	948,95	186,31	1135,25	1088,92	237,66	...	...	347,70	3265	306	...		84%
	(1)	(2)	(3) = (1)+(2)				(4)	M.inha.	m³/yr	cap/hm³/yr.	(4)/(3)	%	(1)/(3)
Countries and Entities	Internal Resources*	External Resources * (a)	Total Resources (b)	Incl. Surface Water	Incl. Groundwater (c)	Overlap (d)	Regular Resources	Population (1995) (e)	Resources per capita	Competition Index	Steadiness Index*	Freedom of Action Index*	Indepen-dance Index *
WATER: NATURAL AND RENEWABLE RESOURCES (average flow in km³/yr)								CURRENT SITUATION (1995)					

Source : Plan Bleu à partir de références nationales et internationales / Blue Plan from national and international references

Annexe 2/Annex2: Demandes en totales et sectorielles contemporaines dans la région méditerranéenne / Present total and sectoral water demand at the national level.

		DEMANDES EN EAU * (Flux moyen)								Consommation finale	SOURCES D'APPROVISIONNEMENT						
		Total	Collectivités		Agriculture		Industries non desservies		Energie (refroidissement)		Prélèvements de ressources conventionnelles		Productions non conventionnelles		Aménagement des ressources en eau		
Pays & Territoires	Date de valeur	(2)	Total (3)	(3)/(2)	Total (4)	(4)/(2)	Total (5)	5)/(2)	Total (6)	(6)/(2)	Total (7)	Dont exploitation non durable (a)	Réutilisation des eaux usées (8)	Dessalement (9)	Date de valeur	Total des capacités (b)	Flux régularisé
		km³/an	km³/an	%	km³/an	%	km³/an	%	km³/an	%	km³/an	km³/an	km³/an	km³/an		km³	km³/an
FR	1990	37,73	6,09	16,14	4,93	13,06	4,45	11,78	22,27	59,02	8,62	37,73	...	-	-	1996	11,064	
MN	1995	0,06	0,06	100,00	0,00	0,00		0,00				0,06		-	-			
IT	1990	45,00	5,90	13,11	32,30	71,78	6,80	15,11	0	0	31,16	45,00	-	-	-	1996	9,865	
ex-YU (c)	1990	17,34	1,94	11,19	0,90	5,19	5,80	33,45	7,20	41,52	1,89	17,34	0	-	-	1980	11,6	
AL	1989	2,97	0,61	20,47	2,20	74,07	0,16	5,45	0	0,00	1,93	2,97		-	-	1980	3,8	
GR	1990	7,03	1,15	16,30	5,66	80,51	0,14	1,99	0,08	1,14	6,03	7,03		-	-	1996	10,402	
TR	1990	30,60	5,14	16,80	21,79	71,21	3,67	11,99	-	-	19,45	30,600		-	0,0005	1991	206	
Groupe1	(90')	140,73	20,88	14,84	67,78	48,16	21,02	14,93	29,55	21,00	69,08	140,73		0,00	0,0185			
ES	1992	34,49	4,31	12,48	24,25	70,29	1,94	5,64	3,99	11,56	23,10	34,379	1,055	0,10	0,019	1996	51,75	
CY	1989	0,38	0,04	11,45	0,34	88,42	0,00	0,13	0	0	0,33	0,372	0,04	0,008	-	1989	0,297	
SY	1990	9,62	0,83	8,61	8,50	88,40	0,25	2,58	0,04	0,42	7,04	9,617		0,002	-	1995	15,8	
LB	1991	1,24	0,26	20,65	0,93	75,00	0,05	4,03	0	0	1	1,24	0	-	-	1994	0,348	
MO	1990	11,60	1,68	14,48	10,13	87,33	0,39	3,38	0	0	10	11,65	...	0,05	-	1994	10	6,5
Groupe2	(90')	57,33	7,11	12,41	44,14	76,99	2,63	4,60	4,03	7,02	41,14	57,258		0,156	0,019			
MT	1990	0,04	0,04	91,56	0,00	7,67	0,00	0,77	0	0	0	0,0211	-0,005		0,018			
IL *	1994	1,76	0,40	22,69	1,28	72,44	0,09	4,83	0	0	1	1,5	0,32	0 24	0,02	1995	0,67	
GZ	1994	0,12	0,03	24,03	0,09	74,19	0	1,61	0	0	0	0,12	0,03					
WE	1994	0,20	0,07	32,50	0,13	65,00	0,01	2,50	0	0	0	0,2						
TN	1995	2,18	0,25	11,37	1,87	85,74	0,06	2,89	0	0	2	2,141	0,23	0,17	0,009	1995	1,331	1,378
DZ	1990	4,50	1,80	40,00	2,50	55,56	0,20	4,44	0,20	4,44	2,64	4,5	0,4	0	0,03	1994	4,3	
groupe 3	(90')	8,80	2,58	29,28	5,87	66,67	0,36	4,04	0,20	2,27	5,98	8,4821		0,17	0,077			
EG	1992	57,40	3,10	5,40	49,70	86,59	4,60	8,01	0	0	42	53,9		0,2 + 4,7 (d)	0,01	1994	169	74
LY	1990	4,76	0,41	8,57	4,28	89,81	0,07	1,55	0	0	5	4,656	4	0,070	0,03	1991	0,387	0,06
Groupe 4	(90')	62,16	3,51	5,64	53,98	86,83	4,67	7,52	0	0	47	58,556		4,970	0,04			
Total	(90')	269,03	34,08	12,67	171,77	63,85	28,68	10,66	33,77	12,55	162,81	265,03						
		km³/year	km³/year	%	km³/year	%	km³/year	%	km³/year	%	km³/year	km³/year	km³/year	km³/year	km³/year		km³	km³/year
Country & Entity	Date of value	(2)	Total (3)	% (3)/(2)	Total (4)	(4)/(2)	Total (5)	5)/(2)	Total (6)	(6)/(2)	final consumption	Total (7)	Unsustainable exploitation (a)	Waste Water Reuse (8)	Desalination (9)	Date of value	Total capacity (b)	Regulated flow
		Total	Public Supply		Agriculture		Self-supplied Industries		Electric Power Cooling			Conventional Withdrawals		Non-conventional Productions		Water Resources Development		
		WATER DEMANDS* (Mean flow)										SUPPLY: MAIN SOURCES						

Source : Plan Bleu à partir de sources nationales et internationales / Blue Plan from national and international sources

* voir glossaire / see glossary

Annexe 3 /Annex3: Indicateurs de demandes et de pressions sur les ressources en eau
Water demand and pressure indicators

Pays & Territoires		POPULATION						DEMANDES PAR HABITANT en m³/an/cap.					PRESSIONS DES USAGES SUR L'EAU				
		Total (e)	Population desservie en eau potable		Population raccordée à l'assainissement		dont accès à STEP	Total (e)	Collectivités	Agriculture	Industrie	Energie	Taux d'irrigation des terres cultivées	Indice d'exploitation	Indice d'exploitation agricole	Indice de consommation finale	Indice d'usure
	Date de valeur	(Mhab.) (1)	urbain %	rural %	pop. %	urbain %	%	(2) / (1)	(3) / (1)	(4) / (1)	(5) / (1)	(6) / (1)	%	%	%	%	%
FR	1990	56,45	100	100	77,6	65	68,3	668,38	107,88	87,30	78,74	394,46	6,20	20,85	2,72	4,76	16,89
MN	1995	0,03	100		100	100	100	2142,86	2142,86	0,00	0,00	0,00	-				
IT	1990	57,54	100	100	59,8	100	54	782,06	102,54	561,35	118,18	0,00	26,30	24,06	17,27	16,66	8,88
ex-YU (c)	1990	23,80			...	...	22	728,57	81,51	37,82	243,70	302,52	...	6,82	0,35	0,74	6,12
AL	1989	3,20			...	...	-	928,13	190,00	687,50	50,63	0,00	...	5,94	4,40	3,86	2,16
GR	1990	10,05	100	95	50,6	85	11,4	699,50	114,00	563,18	13,93	7,96	25,00	13,10	10,55	11,24	2,1
TR	1990	56,28	100	70	22	...	6,3	543,71	91,33	387,17	65,21	-	13,40	15,07	10,73	9,58	6,07
Groupe 1	(90')	207,35						678,71	100,72	326,88	101,36	142,50		15,15	7,30	7,44	
ES	1992	39,08	100	100	72,5	...	59,1	882,65	110,18	620,39	49,74	102,00	17,00	30,16	21,27	20,26	12,54
CY	1989	0,67	100		12	17	...	567,16	64,93	501,49	0,75	0,00	...	41,33	37,33	36,67	9,33
SY	1990	12,53	91	68		72	-	767,52	66,08	678,45	19,79	3,19	15,30	26,79	23,68	19,61	8,94
LB	1991	3,20			...	94	...	387,50	80,00	290,63	15,63	0,00	28,10	25,05	18,79	23,43	1,99
MO	1990	25,09	100	25	...	70	...	462,34	66,96	403,75	15,62	0,00	17,40	38,83	33,77	31,70	14,07
Groupe 2	(90')	80,57						711,57	88,29	547,87	32,70	49,97		30,83	23,76	22,15	
MT	1990	0,35	100		97		...	110,76	101,42	8,50	0,85	0,00	7,70	84,40	12,00	80,00	
IL	1994	5,12	100	97	93,6		79,5	343,75	78,01	249,02	16,60	0,00	41,80	89,82	76,35	83,23	131,84
GZ	1994	0,93			40		-	133,05	31,97	98,71	2,15	0,00	...	218,18	167,27	218,18	
WE	1994	1,48			25-60		-	135,59	44,07	88,14	3,39	0,00	...	31,75	20,63	17,46	16,67
TN	1995	8,79	100	31		61	....	248,26	28,23	212,86	7,17	0,00	9,70	55,76	48,70	44,27	22,59
DZ	1990	25,06	85	75	....		....	179,57	71,83	99,76	7,98	7,98	7,40	31,19	17,33	18,30	15,78
groupe 3	(90')	41,73	...	...	...	...	...	211,00	61,79	140,68	8,52	4,79		41,08	28,43	28,96	
EG	1992	54,80	96	82	....	80	....	1047,45	56,57	906,93	83,94	0,00	100,00	93,41	86,14	72,70	99,4
LY	1990	4,55	100	80	....	100	....	1046,15	89,67	939,56	16,26	0,00	24,30	776,00	712,50	776,67	
groupe 4	(90')	59,35						1047,35	59,11	909,44	78,75	0,00		100,44	92,58	79,95	
Total General	(90')	329,64	...	...	...	...	...	816,11	103,39	521,06	87,01	102,45		23,35	15,13	14,34	
	Date of value	(million of inhab) (1)	urban %	rural %	pop. %	urban %	%	(2) / (1)	(3) / (1)	(4) / (1)	(5) / (1)	(6) / (1)	%	%		%	%
Country & Entity		Total	Pop. with access to drinking water		Pop. connected to public sewerage		of which : served by STP	Total	Public Supply	Agriculture	Industry	Energy	Part of cultivated land irrigated*	Index of exploitation	agricultural exploitation index	Index of final consumption	Deterioration index
		POPULATION and WATER						DEMAND PER CAPITA IN m³/yr/cap.					PRESSURES OF USES ON WATER				

Source : Plan Bleu à partir de sources nationales et internationales / Blue Plan from national and international sources

Annexe 4 : Prospectives des ressources et des demandes en eau dans la région méditerranéenne (estimations du Plan Bleu)

Annex 4 : Prospectives of resources and demands in the Mediterranean region (estimated by Blue Plan)

	POPULATIONS en 2025 (a)		RESSOURCES PAR HABITANT en 2025 (b)			DEMANDES EN EAU en 2010 (c)										DEMANDES EN EAU en 2025 (c)									
	Projections de population (1)		Ressources naturelles	Ressources par habitant (2)/(1)		Demandes sectorielles en km³/an								Demandes totales		Demandes sectorielles en km³/an								Demandes totales	
Pays &	en million d'habitants		km³	m³/an /cap		Collectivités		Agriculture		Industrie		Énergie		km³/an		Collectivités		Agriculture		Industrie		Energie		km³/an	
Territoires	Mini.	Maxi.	(2)	Mini	Maxi	haute	basse	haute	basse	haute	basse	haute	basse	haute	basse	haute	basse	haute	basse	haute	basse	haute	basse	haute	basse
FR	57,33	64,53	181	3157	2805	7,90	5,9	6,0	4,7	5,0	4,8	27,0	22	45,9	37,4	9,6	5,4	5,8	4,0	5,9	5,1	28,7	17,8	50,0	32,3
IT	50,63	55,44	187	3693	3373	7,60	6,5	30,7	21,6	13,3	7,0	0,5	0,5	52,1	35,6	5,2	4,5	31,7	17,2	7,0	5,0	0,5	0,3	44,37	26,98
ex-YU	24,21	27,16	254	10492	9352	2,80	1,9	1,1	0,8	6,0	5,0	10,0	8	19,900	15,7	3,7	1,8	1,4	0,8	8,0	5,0	12,0	8,0	25,1	15,6
AL	4,25	5,07	50	11765	9862	0,83	0,5	3,5	2,0	0,2	0,15	0,0	0	4,526	2,65	0,8	0,6	4,6	2,0	0,3	0,2	0,0	0,0	5,65	2,8
GR	9,60	10,41	53,65	5589	5154	1,50	1,0	7,7	5,1	0,18	0,13	0,12	0,1	9,500	6,33	1,8	1,0	9,0	4,0	0,2	0,14	0,2	0,1	11,2	5,24
TU	82,58	99,23	203	2458	2046	7,9	5,6	30,9	20,7	5,0	4,0	5,0	3,0	48,8	33,3	10,20	5,60	41,0	21,0	7,00	4,00	10,00	5,00	68,2	35,6
groupe1	228,6	261,8	928,7	4062	3547	28,53	21,40	79,90	54,90	29,68	21,08	42,62	33,60	180,73	130,98	31,27	18,88	93,50	49,00	28,35	19,44	51,40	31,20	204,52	118,52
SP	36,51	39,69	114	3122	2872	6,28	5,0	27,6	19,5	2,43	2,0	4,0	3,5	40,35	30	7,0	4,5	25,7	17,2	3,0	2,3	5,0	3,0	40,7	26,95
CY	0,85	1,01	0,9	1061	891	0,1	0,1	0,5	0,4	0,0	0,0	0,0	0,0	0,593	0,440	0,10	0,06	0,8	0,3	0	0	0	0	0,9	0,36
SY (e)	30,87	36,18	15,77	511	436	2,1	1,5	17,6	10,0	0,3	0,3	0,1	0,0	20,120	11,8	3,94	2	21,07	12,0	0,55	0,4	0	0	25,56	14,4
LB	3,99	4,88	4,95	1241	1014	0,45	0,40	1,40	1,20	0,24	0,15	0	0	2,090	1,750	0,72	0,60	1,70	1,50	0,490	0,250	0	0	2,91	2,35
MO	36,34	44,93	30	826	668	1,59	1,40	15,26	12	1,36	1	0	0	18,21	14,40	1,98	1,6	17,0	13,0	2,22	1,5	0	0	21,2	16,1
groupe 2	135,63	161,07	227,86	1680	1415	10,51	8,36	62,44	43,08	4,36	3,45	4,05	3,50	81,36	58,39	13,74	8,76	66,27	44,00	6,26	4,40	5,00	3,00	91,27	60,16
MT(d)	0,38	0,45	0,03	66	55	0,04	0,04	0,005	0,004	0	0	0	0	0,044	0,042	0,04	0,038	0,006	0,004	0	0	0	0	0,046	0,042
IL	7,09	8,72	1,67	236	192	0,77	0,60	1,25	1,10	0,22	0,15	0	0	2,240	1,850	1,40	1,30	1,24	1,05	0,200	0,150	0	0	2,84	2,50
GZ	1,25	1,55	0,055	44	35	0,090	0,060	0,128	0,070	0,005	0	0	0	0,223	0,130	0,12	0,09	0,15	0,10	0,010	0	0	0	0,28	0,19
WE			0,63			0,133	0,100	0,190	0,150	0,007	0,005	0	0	0,330	0,255	0,16	0,12	0,25	0,20	0,010	0,005	0	0	0,420	0,325
TN	11,80	14,82	3,84	325	259	0,63	0,37	2,54	2,54	0,12	0,12	0	0	3,29	3,03	0,76	0,6	2,7	2,0	0,15	0,1	0	0	3,608	2,7
DZ	40,35	50,36	14,43	358	287	3,26	2,00	5,11	3,74	1,45	0,93	0	0	9,82	6,67	4,90	3,1	8,8	5,7	1,90	1,1	0	0	15,6	9,9
groupe 3	187,98	231,36	106,57	567	461	4,92	3,17	9,22	7,60	1,80	1,21	0,00	0,00	15,95	11,98	7,38	5,25	13,15	9,05	2,27	1,36	0,00	0,00	22,79	15,66
EG	87,08	107,88	57,7	663	535	3,5	3,1	49,7	46,6	8	7	6	4	67,20	60,70	7,00	5,00	49,70	43,50	14,60	9,6	8	3	79,30	61,10
LY	12,41	13,37	0,6	48	45	1,01	0,70	11,98	5,85	0,24	0,20	0	0	13,23	6,75	1,76	1,50	17,21	6,64	0,57	0,3	0	0	19,54	8,44
groupe 4	339,62	417,79	579,0	1961	1586	4,51	3,80	61,68	52,45	8,24	7,20	6	4	80,43	67,45	8,76	6,50	66,91	50,14	15,17	9,9	8	3	98,84	69,54
Total	515,88	605,42	1239,70	2403	2048	43,96	32,93	151,56	105,58	35,84	25,74	46,67	37,10	278,04	201,35	52,39	32,89	172,92	102,05	36,88	25,20	56,40	34,20	318,58	194,34
Countries	Mini.	Maxi.	(2)	Mini.	Maxi.	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low
& Entities	million inhabitants		km³	m³/year/inhab.		Public Supply		Agriculture		Industry		Energy		km³/year		Public Supply		Agriculture		Industry		Energy		km³/year	
	Population projected (1)		Natural Resources	Ressources per capita (2)/(1)		Sectorial demand in km³/year								Total Demand		Sectorial demand in km³/year								Total Demand	
	POPULATIONS in 2025		RESOURCES PER INHABITANT in 2025 (b)			DEMANDS in 2010										DEMANDS in 2025									

Source : estimations Plan Bleu / Blue Plan estimations
M = million