

## Better Water Demand Management for overcoming water crisis in the Mediterranean



### From scenarios elaboration to strategic choices

Climate conditions have led the people of the Mediterranean Sea to learn to plan and manage their water since the earliest times. Everywhere you look you see signs of that elicited justified admiration. Yet the demographic growth and social and economic changes in the 20th century created a new situation. In the degraded environment water, a rare commodity, is under threat and has become a factor limiting development in a major way. To face up to a rise in the problems that seem inescapable, the people of the Mediterranean must learn how to better manage demands for water in the long-term for all economic sectors.

Within the Mediterranean Commission for Sustainable Development (MCSDD) as well as the Fiuggi Forum in October, 2002, the water sector's countries and players are thinking about and assessing the best ways to avoid local water supply crises.

Increased use of unconventional resources (e.g. desalination and waste water reuse) and long-distance water transfers, which are unavoidable in certain places but are costly, will respond only very partially to the increased demand for water.

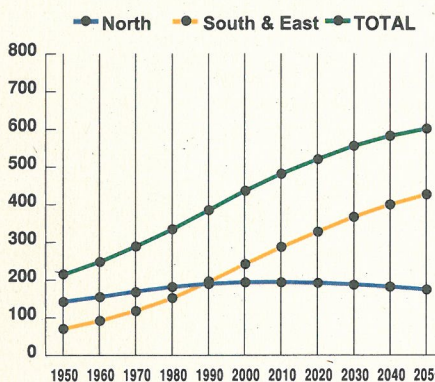
Giving priority to a better water demand management will be the expression of a genuine vision of society for sustainable development in the Mediterranean. Facing the necessity to improve deeply supply service quality for water stressed poor people, optimising water use is imperative. Water demand management is a field that is getting better known and a strategic path taken more often. Several national and local experiments have shown this.

But it is advisable to design, adapt and evaluate the best possible combinations of tools for managing water demands depending on each situation. Room for progress and constraints should be well defined. The lesson-providing actions herein described are a promising future path for the Mediterranean.

Michel Batisse  
President of Blue Plan

### THE MEDITERRANEAN: NORTH-SOUTH DISPARITIES ARE REPRESENTATIVE OF THE WORLD'S IMBALANCES AND A CRITICAL SITUATION FOR WATER

Population : a determining factor for water demand



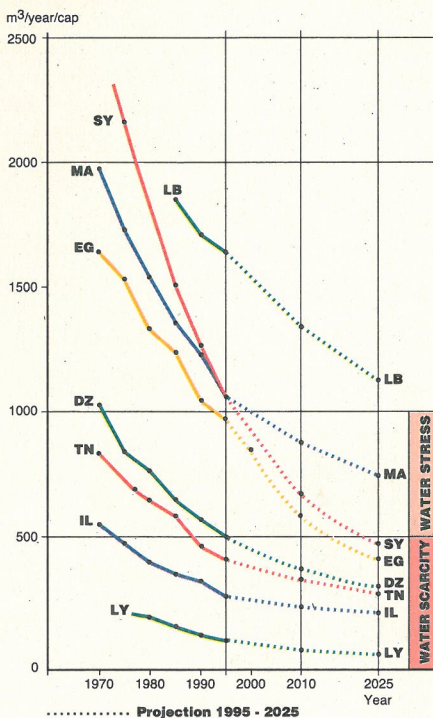
Despite the present drop in the fertility rate, the Mediterranean population will have almost tripled in a century because of the demographic growth in the South and East.

A young, strongly growing population in the South and East contrasts with a stagnating, aging population in the North while migratory movement continues between the Mediterranean's two shores.

### Town and country dwellers: a different water demand

Numerous southern and eastern countries are still very rural. 26 per cent of the Tunisia's working-age population, 35 per cent of the Egyptian and 48 per cent of the Turkish still live from rainfed farming; irrigation water is for them a vital economic resource. The movement from country to towns also generates an increased urban demand in outlying districts of the major cities.

### In the South, an impoverished and water stressed population



The GDP gap per head varies from 1 to 30 between the richest and the poorest countries of the Mediterranean. The share of the 5 European Union countries is about 90 per cent of the total GDP of the Mediterranean countries.

On its own the Mediterranean represents 60 per cent of the "water poor" (less than 1000m³/cap/year) world population, or 162 million head, mostly living in the South and East, while it is only 8 per cent (with 450 million head) of the world's population.

Despite that the Mediterranean Sea does more to bring its people together than it does to separate them. It has been and remains a place for meeting and trade. The Mediterranean countries of the European Union are the main trading partners of the southern and eastern Mediterranean nations.

## Water resources still just as constricting

Natural resources are very unequally spread between the countries (72% in the North, 23% in the East and only 5% in the South) and between population groups, in particular from the agricultural point of view. Certain countries or territories (e.g. Syria, Israel, the Palestinian Territories and Egypt) are heavily dependent on other countries located upstream (shared watersheds).

## WATER IN THE MEDITERRANEAN REGION: MAIN TRENDS OBSERVED IN A TYPICAL ECO-REGION

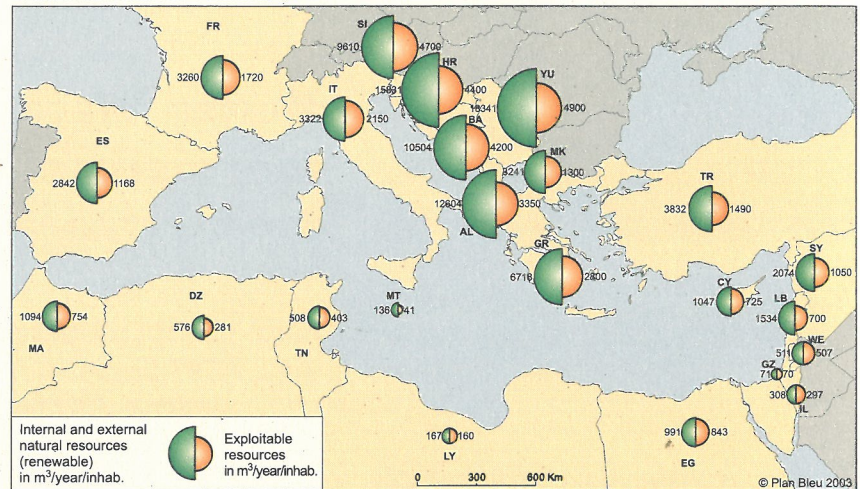
### A restricting climate but a developed area from time immemorial

The Mediterranean region is bioclimatically typified by strong summer drought. Over the past 20 years most of its countries have experienced memorable droughts lasting several years.

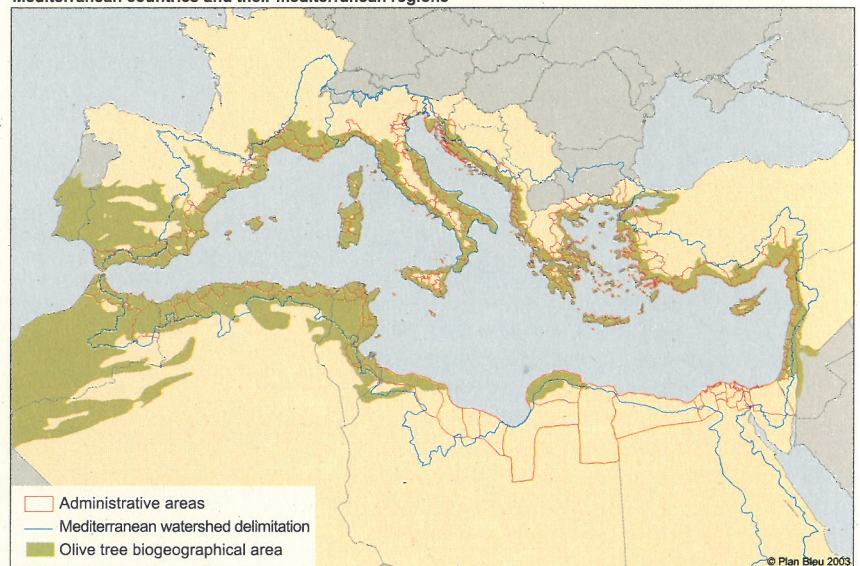
Precipitation is irregular and often violent. Mediterranean high water can cause disastrous flooding, and rain is a major cause of soil erosion.

Faced with these constraints, local societies and governments have always endeavoured to plan and manage water and soils as is witnessed by the ancestral know-how of the farming communities as with the major urban water works of antiquity. In the 19th and 20th centuries major drainage and irrigation works made it possible to transform numerous marshy plains into high-yield land.

Renewable natural water resources and exploitable water resources per capita in the Mediterranean countries



Mediterranean countries and their mediterranean regions

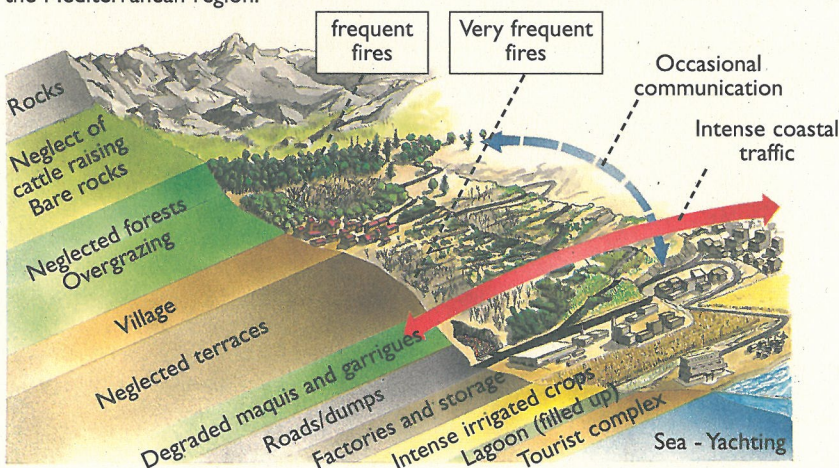


Source : Gaussen & De Philippis - FAO

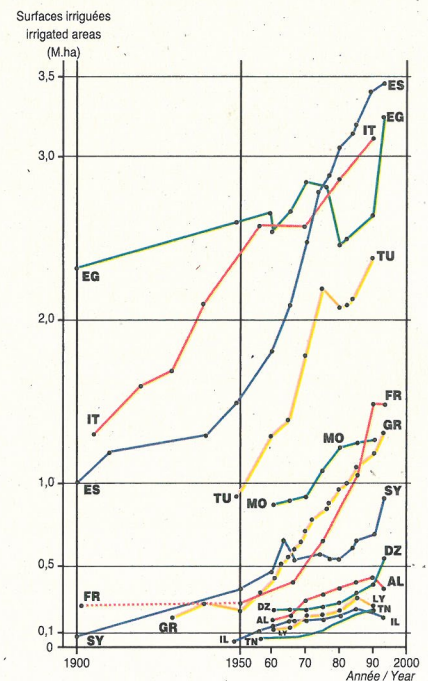
### The territorial imbalances of the 20th century

Populations and economic activity tend to concentrate on the coastline. Accelerated and uncontrolled urbanisation and accrued competition between activities for soil and water have led to the degradation of particularly precious and fragile landscapes and ecosystems. Coastal groundwater is over-exploited while the inland areas are often abandoned and degraded for lack of upkeep. Water demand is especially acute on coastlines and islands (tourism).

Better integration of development and the environment seems an absolute necessity in the Mediterranean region.



### Uneven but generally strong and growing sector-based water demands

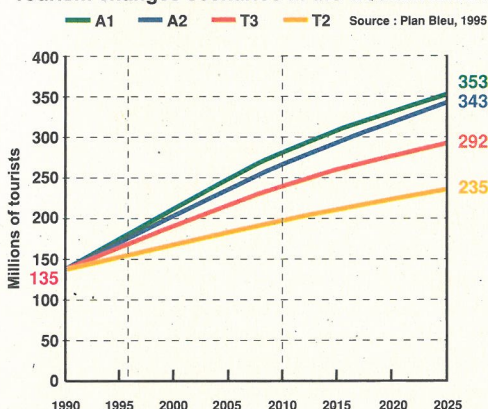


300 km<sup>3</sup> of water are being withdrawn today in the entire region. This water demand (consumption + losses from conveyance and distribution) has doubled in a century and increased by 60 per cent over the past 25 years. It remains unevenly distributed (from 100 to over 1,000 m<sup>3</sup>/capita/year) depending on the country.

The main cause of increased total demand is irrigation, which represents 82 per cent of the total demands in the South.

Demographic growth and urbanisation are the 2<sup>nd</sup> factor in this evolution: coastal towns of more than 10,000 inhabitants will represent 80 millions inhabitants at 2025 horizon (instead of 43 in 1995). Water supply and sanitation needs for this population will require more and more water and considerable supply investments in water supply and treatment. Several experiments show that service provision improvement (leakage control, customers monitoring, adapted water pricing,...) allow to mobilize water losses volumes to be oriented towards new water demands.

#### Tourism changes scenarios in the Mediterranean



Very rapidly developing tourism (the Mediterranean is the most visited destination in the world) greatly increases summer potable water demand in the coastal areas.

#### Already considerable impact

##### Already highly exploited water:

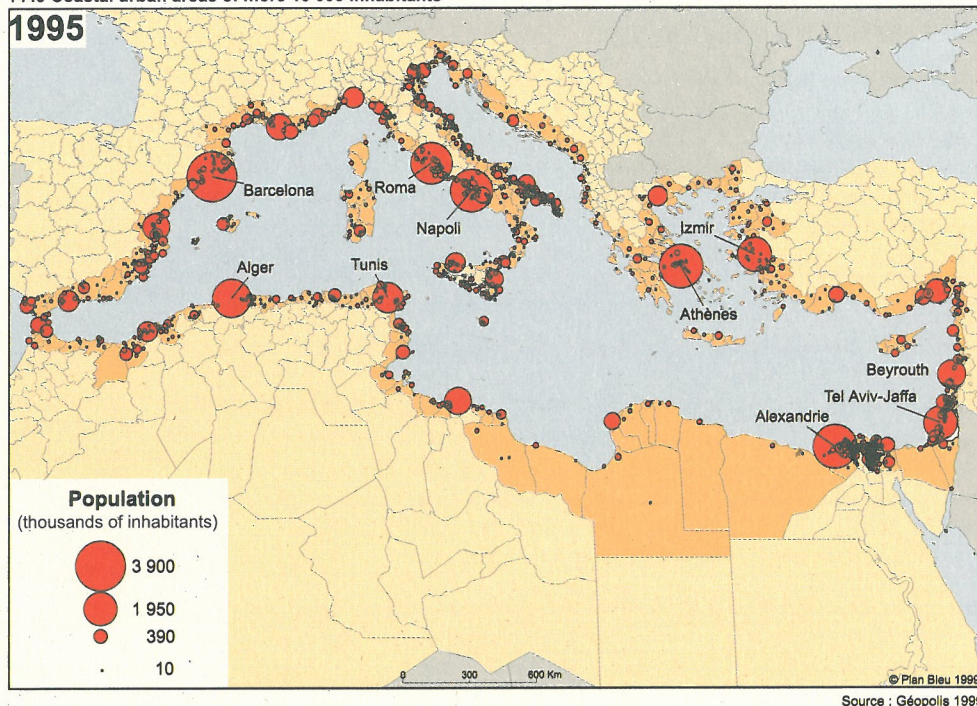
Withdrawal already surpasses 50 per cent of the renewable natural water resources (all of which are far from "exploitable") in countries such as Jordan, Malta, Tunisia and the Mediterranean watershed of Spain and 90 per cent of Egypt and Israel. The exploitation index goes beyond 400 per cent in Libya, a country that disposes only of non-renewable fossil resources. These averages in fact mask extremely tense local situations.

##### An unsustainable situation

The magnitude of the unsustainable water production index in the Mediterranean is explained by the over-exploitation of groundwater by multiple, unsupportive and short-term users and the increased use of fossil resources.

The erosion-generated blocking up of storage dams is another cause of unsustainability with annual loss of useful capacity being as much as 2 to 3 per cent in northern Africa. Half of this useful capacity will be lost by 2050 in Morocco.

1449 Coastal urban areas of more 10 000 inhabitants



#### Multiple impact on the environment, society and the economy

The over-exploitation of coastal aquifers has already caused a lot of nearly irreversible invasion of salt water. More than half (90% in some places) of the Mediterranean wetlands have disappeared with a huge impact on ecosystems.

Conflicts of use and interest between upstream and downstream, cities and farming, the short- and the long-term are tending to get worse. Water-resources management costs are growing (population hygiene and water protection, urban sanitation and pollution control). Water resources no longer make it possible to ensure food security in the region despite sustained growth in cereal demand. The southern and eastern regions depend 33 per cent on the international market, and the virtual annual transfer of water linked to these imports can be put at 40 km<sup>3</sup>.

## THE ANSWERS: TOWARDS A MAJOR STRATEGIC CHANGE ?

#### Still too-dominant supply-side policies

In most national planning documents the supply-side approach remains dominant:

- Generally cursory and over-estimated demands projections
- Under-developed demand management
- Incidental or lack of factoring in environmental objectives
- Upwards re-evaluation of the shares of natural resources considered exploitable
- Not without "hydraulic obstinacy", accenting the mobilisation of renewable and non-renewable natural resources
- Increasing inter-regional water transfers
- Increased use of unconventional resources

Despite high production costs, the use of unconventional resources is already considerable in certain countries, for example in Egypt (where recycling drainage water already surpasses 12 km<sup>3</sup>/yr), in Israel (where 65% of urban waste water is already treated and re-used) and in Malta (where more than half of the water supply is ensured by sea-water desalination).

#### In search of sustainable development strategies through WDM

##### The pessimistic version of the "Mediterranean Water Crisis" trend scenario should make us react

The "Mediterranean Conventional Water" trend scenario does not seem realistic. It calls for more vigorous action within the framework of water policies. The predominant supply-side approach (continuation of present trends) will lead to an increase in the demand by more than 55 per cent between now and 2025. In this scenario the relative share of irrigation is reduced despite extending irrigated surface area, and unconventional water production (desalination, recycling) will cover 5 to 10 per cent of demand in 2025. Efforts to manage demand are only priorities in critical situations.

In this trend scenario water demands in 2025 will surpass renewable natural resources (index >100% in 8 countries and 50 per cent of these resources in 3 others).

Through economic growth and considerable public investment (400 thousand million euros just for potable water and sanitation), this scenario makes it possible to defer the crisis (breakdown in resource/demand) but maintains and increases non-sustainable development processes at the price of growing environmental and social instability and increased costs for future generations. In its pessimistic version (growth in the North/South gap, weak economic growth and the lack of regional co-operation), this scenario leads to a crisis situation.

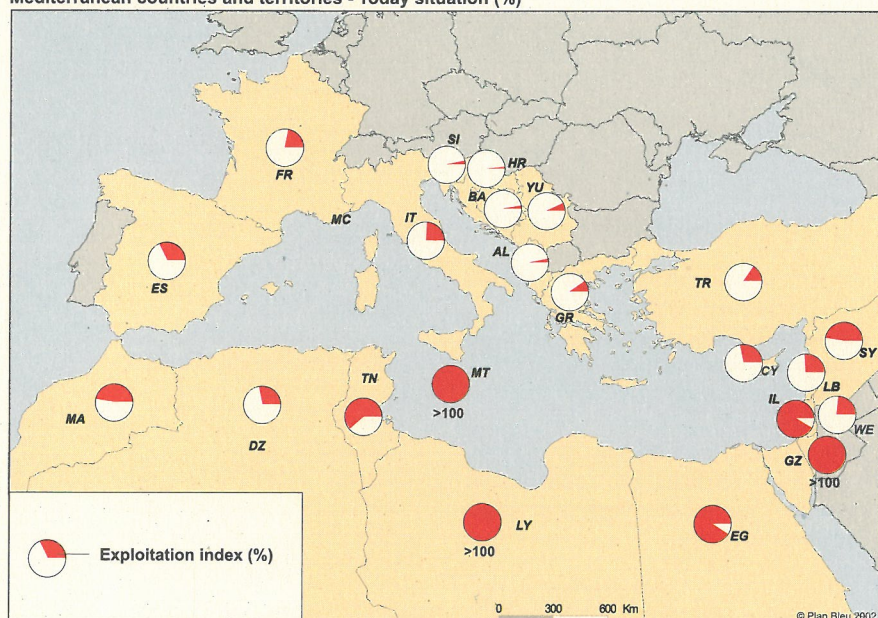
## Defining Water Demand Management (WDM)

At the Fiuggi Forum it became clear that the concept of WDM had to be better defined, which has led the Blue Plan to propose the following definition:

If water demand consists in the sum of water use (uses and losses), WDM consists in the body of interventions and organisation systems that societies and their governments can implement to increase technical, social, economic, institutional and environmental efficiency in water management. Complementary to supply-side policies (dams, pumping, long-distance transfers, transport and desalination), WDM therefore tries to reduce physical and economic loss and better satisfy social, economic and environmental demands (in quantity and quality) of present and future generations, and this at external least cost. Its implementation relies on a host of tools (economic, technical, institutional and the mobilisation of stakeholders) that it is advisable to adapt to each situation. The WDM policies therefore aim to intensify water use, optimise water usage, provide more products and services, greater value and ultimately more

sustainable development for each cubic meter of water received (rains), extracted (pumping, dams) or produced from salt or brackish water (desalination). The recycling of treated waste water is on the border between supply and demand. WDM implies accepting the specific costs in equipment or actions.

Internal and external renewable water resources exploitation index of Mediterranean countries and territories - Today situation (%)



## Mediterranean Commission for Sustainable Development (MCSD) guidelines

To avoid such developments the Blue Plan has attempted to quantify the amount of water that a more economical management of use would allow. Reduction by half of the quantities of water extracted and lost would represent about 70.4 km<sup>3</sup>, or 4/5 of the resources to mobilise to cover the projected additional water demands up to 2010.

### Theoretical expected gains with water saving measures

Sub-regions of the Mediterranean basin	Household	Industries	Agriculture / Irrigation		Total and % per sub-region	
	Networks water losses rate to be decreased to 15%, users losses to 10%	Generalised recycling extended to 50%	Conveyors losses decreased to 10%	efficiency rate increased everywhere to 80%	Total	%
North	4,4	9,5	13,3	2,4	29,7	42,15%
East	1,8	2,2	4,1	8,1	16,2	22,96%
South	2,5	4,1	6,5	11,4	24,6	34,89%
<b>Total</b>	<b>8,8</b>	<b>15,9</b>	<b>23,9</b>	<b>21,9</b>	<b>70,4</b>	<b>100,0%</b>

The MCSD's recommendations are to effectively integrate Water Demand Management into national water strategies, development policies and environmental policies, which would in particular require assigning quantified objectives of regulating the demand by setting deadlines. Four kinds of priority actions have thus been proposed:

- with all stakeholders developing awareness of the amount of water losses and making users more accountable
- improving understanding and evaluation
- undertaking concrete operations for regulating demand
- promoting co-operation between groups of countries

## The alternate "Sustainable Mediterranean water" scenario

The goal of such a scenario is to avoid all risk of a breakdown in the balance of water supply and demand while stabilising pressure on the natural milieu at an acceptable level and by taking social and economic issues into account.

This calls for closely combining resource management and water demand in order to stabilise the latter particularly through reducing loss and greater efficiency in use and through arbitration in resource allocation (e.g. reduction of the amount allocated to irrigation).

With this resolutely optimistic forecast scenario, the demand in 2025 will increase to 327 km<sup>3</sup> instead of the 463 km<sup>3</sup> for the worst-case trend scenario.

It is thus a break in trends scenario that implies a lot of determination and a new water "culture" as well as renewed water policies. In particular this means adopting performance and environmental and social conditionalities with the definition of quantified objectives, a new allocation of roles between the public and private sectors, a change in behaviour with a certain decentralisation of management and increased participation by stakeholders in management and use of technical (meters, leakage control, training and advising water users) and economic tools (the inclusion of certain externalities elements in the price of water, targeted subsidies, water pricing systems taking in account social constraints and giving signals to big water users).

Facing a limited volume of financial capacities, is it not an opportunity to reallocate investments from water resources mobilization towards water supply

services improvement (example of Morocco).

With this scenario only two countries (Libya and Jordan) and the Palestinian Territories will surpass an exploitation index of 100 per cent in 2025 instead of eight countries in the trend scenario.

With the principle being to limit pressure on natural surface and subterranean water at a maximum acceptable level for Nature, this scenario particularly implies a reduction of loss, the increase of efficiency and revisions in the allocation of water resources but also, when it is strictly necessary and justified, greater use of unconventional resources or water transfers. Above all it encourages structural adaptations of agricultural and rural development policies in the Mediterranean region, which should teach heightened consideration of environmental and social issues while seeking greater irrigation efficiency.

## PROMISING WDM EXPERIMENTS IN THE MEDITERRANEAN REGION

In the Mediterranean area progress in WDM can be seen in a combined process of very iterative but highly promising local and national experiments, presented at the forum of Fiuggi organised by Blue Plan in 2002.

- > Morocco: Drinking water supply for the Rabat-Casablanca coastal area. Planning Division and Water Management, General Direction of Hydraulics, Rabat.
- > Spain: Water demand management in the Upper Guadiana Basin. CEDEX Madrid.
- > Tunisia: The irrigation water savings national strategy: the case of Tunisia, Direction Nationale du Génie Rural, Tunis.
- > France: the management contract of Astien age groundwater table: a patrimonial aquifer in Water Management Master Plan. Rhône-Méditerranée-Corse Water Agency. Towards an integrated water resources management policy. Syndicat Mixte d'Etudes et de Travaux de l'Astien, Béziers.
- > Cyprus: Trade liberalisation and Irrigation Water Policies in Cyprus: consequences on WDM. Water Development Department, Nicosia.
- > Malta: Water demand management focusing upon strategic leakage control on a national scale. Water Services Corporation (WSC), Malta.
- > Turkey: Participatory Irrigation Management Activities in Turkey, National overview and case studies on local scale: the Antalya region. Istanbul University and DSI Ankara.
- > Egypt: Irrigation Improvement as an Integrated Measure for Water Demand Management in Egypt. Nile Water Sector, MWRI Cairo.
- > Jordan: Irrigation optimization in a pilot area in the Northern Jordan Valley. MREA-JVA, Jordan Valley Authority.

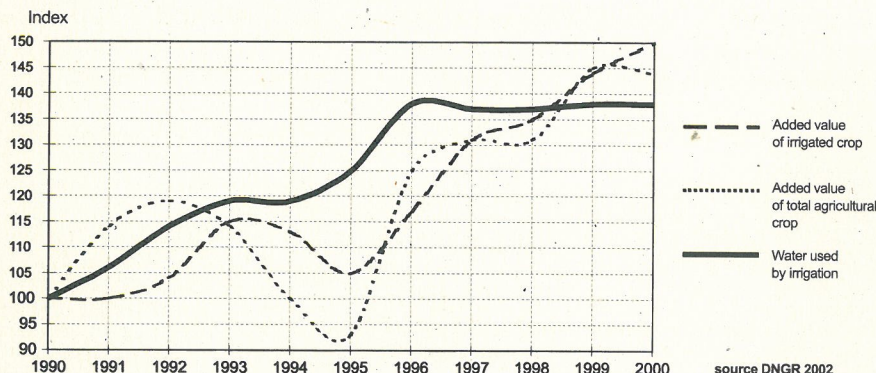
Some of these successful experiments have been described through GWP ToolBox on Integrated Water Resources Management ([www.gwpforum.org](http://www.gwpforum.org)).

## Increasing experiments and encouraging results

### The strategy for saving irrigation water in Tunisia

Early on Tunisia committed itself to a policy of saving water for both urban and farming needs in reply to the physical scarcity of its water resources. This has led to a nation-wide stabilisation of irrigation water demand for the past six years despite the size and the development of its irrigated farming sector, peak seasonal needs and unfavourable climatic conditions (droughts). This has made it possible to secure the tourist sector (a source of income) and provide for city demands (a source of social stability).

Water used change and added value of irrigated sector in Tunisia



The following are the basic principles of the Tunisian WDM strategy:

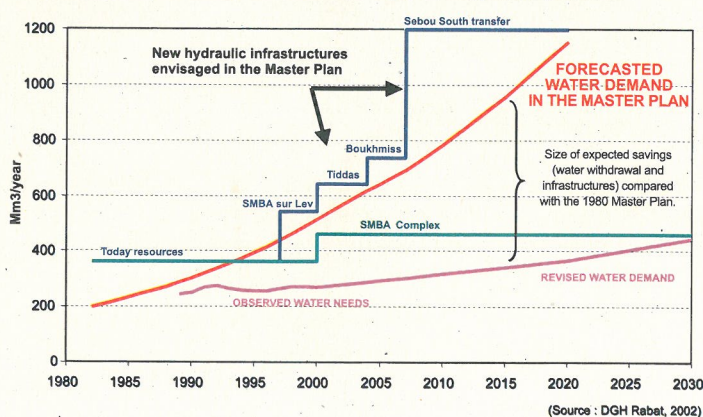
- to shift from isolated technical measures to an integrated approach.
- an approach that encourages users to participate and assume responsibility (960 CIG\* created on 60% of irrigated public area).
- the gradual introduction of reform, adapted to local contexts, involvement of users and encouraging them to organise themselves.
- the introduction of financial incentive schemes for promoting water-saving equipment and technology (60% grants when purchasing equipment)
- income support for farmers to allow forward planning and to secure farming investment and work.
- a pricing system combining transparency and flexibility, structured with the national aims for food security and which has enabled the gradual recovery of costs.

### Urban water demand management: a priority in semi-arid countries.

Despite high and growing urbanisation, the Rabat-Casablanca urban area in Morocco has experienced a substantial drop in the rate of growth in water use for the past 12 years by using measures to repair and find leaks in the system, the implementation of graduated pricing to make consumers (including public sector users) more responsible, and with welfare provision for the poor, but with the supply of water routinely metered, and an intense public awareness campaign for water savings. These actions have been made possible by an appropriate administrative framework that combines private business with government agencies and local authorities to give "delegated management of the water services" but supported by a binding inter-municipalities charter. This has allowed costly investments

(dams, canals) to be deferred as these are difficult to finance without additional debt and in the end may prove to be unnecessary if the effort is pursued.

Forecasts in the 1980 Master Plan for the urban area of Rabat-Casablanca (Morocco) (Water demand and infrastructures) and revised water demand following water management improvement.



\* CIG : Common Interest Groups

### Taking natural requirements into account: a beneficial operation for everyone concerned

The upper basin region of the Guadiana River in Spain has seen a rise in alluvial groundwater and a restoration of springs despite much increased irrigation since new regulations were introduced for pumping from boreholes including various measures for protection, warning, effective sanctions, permits etc. This was combined with compensation for loss of income for those using irrigation and financial incentives for using water-saving technologies or planting crops that need less water.

These agri-environmental measures contributed to the feasibility of a groundwater regeneration scheme, thus saving a natural park that is a tourist attraction in the region.

### Multiple combinations of possible tools for WDM

Although the implementation of the WDM strategy requires an appropriate institutional and legal framework to be fully operational, it can nonetheless rely on many tools. The three dimensions to favour are: stakeholders mobilisation, economic tools and institutional arrangements, WDM's main "black boxes", because of their central nature in the decision-making and consultation process and their arbitration role between use and users.

Information and aware-raising implemented through precise and well-targeted objectives make it possible to attract decision-makers and stakeholders to the WDM as shown by the experience of numerous Mediterranean cities.

Water pricing, even quotas, as main economic tools should be carefully structured with financial or fiscal incentive schemes, plus updated and adapted regulatory frameworks.

Areas for elaborating compromises between types of users should be created on appropriate scale levels; they will produce the rules, standards and benchmarks of tomorrow, so useful in evaluating WDM progress.

### Constraints and limits to surpass

The hardships in implementing the WDM should not be underestimated. There are many stakeholders involved, and on the whole they are not very aware, trained or accountable.

A policy of demand management must transit through a profound change in policies and practices (modes of management, consumption and production). What is at stake is to succeed in linking traditional approaches of the "hardware" type, placing the accent on technology and infrastructures (e.g. hydraulics, desalination) with approaches of the "software" type (the art of acting with all stakeholders to seek the best possible valuation of each cubic meter of water without ignoring the demands of nature).

Bolstering the abilities of actors and institutions, exchanging experiences, simplifying processes and procedures, inculcating a WDM culture and building local compromises where everyone wins are the concrete guidelines for overcoming these hardships.

Generalising adapted WDM strategies will be one of the major worksites for the early years of the 21st century in the Mediterranean region.

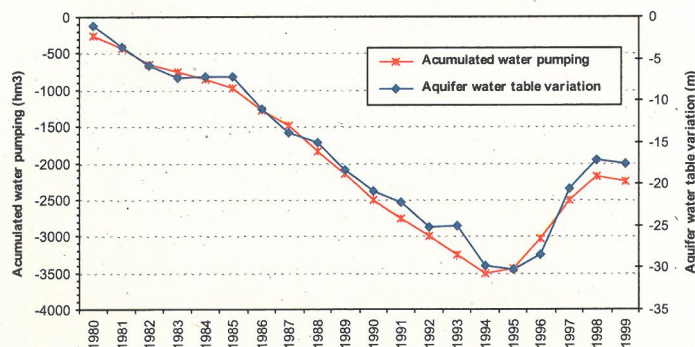
### Facilitation tools to strengthen synergies. A big push for regional co-operation

#### Accounting for water by the MAP / Blue Plan

The Blue Plan's regional activities centre was created within MAP in 1979. Its mission is to call decision-makers' attention to shared problems to be overcome and provide them with information allowing them to lead socio-economic development without degrading the environment. Right from the start the Blue Plan's prospective works gave a lot of space to the question of water.

Following Mediterranean work and the Rio Conference, the Mediterranean-rim countries and the European Community in 1996 decided

Comparative change of the cumulative volume of savings from pumping and the piezometric level of the alluvial sheet of the upper Guadiana river in Spain



to found the Mediterranean Commission for Sustainable Development, with the goal of proposing sustainable development strategies on the regional scale. "Water Demand Management" was taken as the first priority topic, which led in 1997 in Tunis to the adoption of recommendations by the States, the first results of which were evaluated in Fuggi in 2002 in order to strengthen the process.

#### The Euro-Mediterranean partnership and water

Water was also a priority topic for the Euro-Mediterranean partnership launched in 1995 in Barcelona. The Euro-Mediterranean conferences in Marseilles (1996) and Turin (1999) defined an action plan.

A Euro-Mediterranean system of exchanging expertise in the sector of water (SEMIDE) was set up in 1999. The Euro-Mediterranean MEDA-water programme was begun in 2003 based on "local water management", the WDM's main field of application.

#### Networks of experience

Water is the subject of much bilateral and regional co-operation in the Mediterranean. The Global Water Partnership for the Mediterranean is now composed of 12 networks and institutions, including the Blue Plan which has written "Mediterranean Vision on Water for the 21st Century".

The Blue Plan is a regional activity centre of the Mediterranean Action Plan (Barcelona Convention) created in 1975 under the aegis of United Nations Environment Programme. Blue Plan activities on water issues are focused on water policies, sustainable development indicators, environmental information, sharing of experience between countries, statistical data production and database management.

Blue Plan is the main support centre of the Mediterranean Commission on Sustainable Development to back the regional strategy for sustainable development in the Mediterranean.

Plan Bleu, 15 av. L. Van Beethoven, 06560 Valbonne, France.

Ph : +33 (0)4 92 38 71 30 - Fax : +33 (0)4 92 38 71 31 - E-mail : [planbleu@planbleu.org](mailto:planbleu@planbleu.org)

Main publications: some can be downloaded at the web site

[www.planbleu.org](http://www.planbleu.org)

- "Futures for the Mediterranean Basin, the Blue Plan", Michel Grenon and Michel Batisse, Paris 1989, Economica.
- "Water in the Mediterranean Basin", Blue Plan monograph (fascicule) no. 6, Jean Margat et al., Economica. Updated and reissued in 2003.
- "Water in the Mediterranean Region. Situations, Perspectives and Strategies for Sustainable Water Resources Management", Blue Plan, 1997 (document prepared for the Euro-Mediterranean Conference on Local Water Management, Marseilles, France, 25-26 November, 1996).
- "Mediterranean Vision on Water, Population and the Environment for the 21st Century", Blue Plan - Global Water Partnership Medtac, 1999 (document for the second World Water Forum in The Hague, 2000).
- "130 Indicators for Sustainable Development in the Mediterranean", Blue Plan, 2000.
- "Water Resources and Uses in the Mediterranean Countries: Figures and Facts", Jean Margat and Domitille Vallée, Blue Plan, 1999.

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