Impact on water supplies and management strategies

Faced with these increasing demands, **the supply approach would remain dominant** in order to satisfy public and industrial demands: new infrastructures, intensified utilisation of natural resources (renewable or not) and extended water transport networks would be implemented in all the countries in which there would be an important quantity of exploitable water available, the latter being assessed according to technical and economic criteria (internal costs). On the other hand, for agriculture, there is a trend to re-allocate the outstanding amount of resources available and to adapt demand.

The use of unconventional water production (desalination, wastewater recycling) may cover 5 to 10% of water demand in 2025. This would have a noticeable effect only as conventional water resources become rare and also according to their micro-economic competitiveness. In Israel, the rate of re-use, mainly by non-food farming, is to be raised to 80% by 2000. In Cyprus, recycled volumes could treble or quadruple by 2010. In Egypt, drainage water recycling is likely to double between 1990 and 2025, just as urban wastewater recycling could be multiplied by ten in 2025.

By considering only urban wastewater, the increase in community water demand gives a measure of the considerable flow rates expected from this new resource. But the delays in equipping communities for urban sanitation and wastewater treatment in the South and East (except in Israel), will postpone wastewater recycling in towns. As of today, a large proportion of investment must be steered towards the development of sewage networks and facilities aimed at treating water discharged by unequipped urban areas.

Infrastructure and water mobilisation costs would generally increase according to the decreasing yields of many facilities as well as to the need for more effective treatment, notably of drinking water. Not only financial costs, but also energy costs imposed by pumping (water transfer, utilisation of deeper underground water) and by treatment (desalination).

Demand management efforts would become significant or even paramount only in crisis situations of structural shortage, in order to prevent shortages in cases of limited supply. These efforts would especially encourage greater efficiency in water use with rising production costs, by improving efficiency, or would postpone major investment. In the agricultural sector, real investment in water savings will prove difficult to mobilise and irreconcilable with the will to develop water use as a production factor.

Growing Pressure on water resources and the environment

Consequently, **quantitative pressure** on natural water resources would tends to stabilise in the North, but would increase greatly in the South and East.

Starting in 2010, eleven countries would use more than 50% of their renewable resources.

In 2025 this index will exceed 100% in 8 countries, and more than 50% of these resources in 3 other (Fig. 9). This would mean excessive utilisation, but also either intensive re-use, or calling on non-renewable or unconventional resources (more expensive).

Thus, the countries and territories of the South and the South-East, where the annual resources are often less than 500 m3 per capita, are the most threatened by shortage: e.g. Israel, Gaza, Jordan, Libya, Malta, followed by Syria, Cyprus, Tunisia and Algeria.

Naturally, this quantitative pressure on resources **would affect their quality** in the North as well as in the South and East: increasing amounts of wastewater disposed of in the environment, unevenly purified, or of drainage water having leached through salty soil; continued impact of various human activities on surface and groundwater quality.

Localised, better controlled pollution would stabilise or cease, but extensive pollution, in particular agricultural pollution, is likely to spread and deteriorate.

In the North, the fight against water pollution would be a priority that could be solved more or less efficiently, but this would be only a secondary goal in the South and East where sanitation and water treatment will progress slowly and will not follow the rise in demand.

Efforts to protect water quality would generally remain selective with the main objective being to preserve already used resources, notably for drinking purposes, and to protect the environment.

The protection of aquatic ecosystems and wetlands would progress slowly and would depend more on local and private initiatives than on an overall policy. This would rarely take priority in the event of conflict.

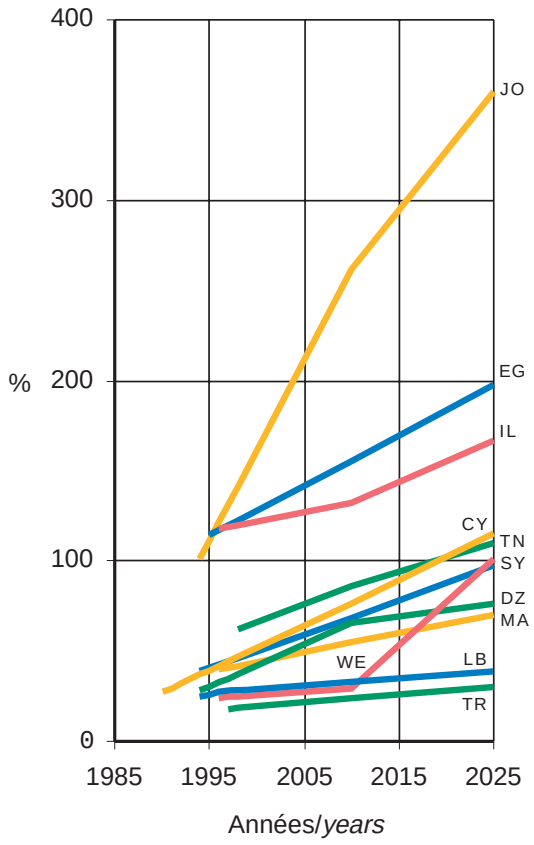

Figure 9:
Projected growth of the ratio demand/ water resources[17] in Southern and Eastern Mediterranean countries (moderate trend scenario).

(Gaza and Libya are not mentioned since their indexes, way over 100, are off the scale).

17 - Ratios: total water demand / natural water resources.

Impact on society

As on the world level, there would be an increased polarisation of wealth and growing inequality of access to national resources in the Mediterranean region.

Basin institutions, with the participation of users' organisations, would be maintained and may expand as basin-specific water management develops. However, the level of management participation for certain social categories would remain insufficient, often being restricted to a technical level and rarely reaching a decision-making level.

The number of users' associations would increase in the agricultural sector, with progressive State withdrawal. However, the poorest farmers could suffer if there is no control over the appropriation of production means and territory by a small number of private operators. The migration of rural populations to urban areas would also increase despite major irrigation projects in some countries.

Financial and economic consequences

To provide drinking water and sanitation to an extra 120 million inhabitants (mainly urban), which is the projected increase in the Mediterranean population by 2025, and to make up for currently insufficient facilities, the amount of overall investment required could be as much as 400 billion Euros, i.e. approximately 15 billion per year, mainly needed in Southern and Eastern countries.

Figures for the investment required in other sectors (agriculture, energy…) are much more unpredictable. The related **economic costs** might rise in all water related sectors, less quickly than economic growth in the North, but faster in the South and in the East (for example in proportion to GDP). In fact, in these countries demand is growing faster and the policies and objectives to make up for lost time weigh down the agendas.

There will be a common trend to cover an increasing part of these costs directly by users with a more important cost recovery plan even though it will not be easily feasible in different sectors (easier for the drinking water supply sector than for irrigation).

The principle of "the polluter pays" becomes more widespread but in some cases deviates towards the "grouping together" of shared costs. This trend has already been observed where the level of licence charges is not high enough to be a real incentive.

Local authorities will increasingly delegate drinking water distribution to private companies in those sectors that are the most profitable (urban water supply, notably when huge infrastructures already exist). For sanitation, which is most often left to the public sector, the trend will be more moderate. The role of private operators may expand to cover delegated management of resources (water planning and transport).

Private participation is guided by profitability, creating the risk of exacerbating unequal access to resources and leading to less social equity in a conventional format (in particular, more serious lagging behind in rural areas).

This scenario avoids or at least delays a crisis by developing vital equipment and infrastructures for the population, but it maintains unsustainable development processes, increasing social and environmental instability versus the choice of medium term economic security.

THE "MEDITERRANEAN IN CRISIS" (UNDESIRABLE SCENARIO, EXACERBATED TRENDS)

Here, the forecasts apply pessimistic estimates – even if they are not logically related - notably by maximising those factors that exacerbate tension between water supply and demand (Table 5).

Main features of the exacerbated trend scenario:

This is an exacerbation of the previous trend scenario. These estimates concern:

- Demographic changes: maximum growth according to the United Nations high estimates of demographic change; chaotic urban expansion.
- Economic context: minimum growth, even negative; impoverishment and growing gap in development between the North and the South; free market without taking into account environmental and social objectives.
- Possible events that for the most part are not dependent on decisions and that might have a negative impact:

- climate changes depleting natural water resources (more frequent droughts, or even structural climatic changes);
- natural disasters that damage water supply and water system infrastructures;
- political crises and armed conflicts disrupting or destroying infrastructures, that could lead to upsurge of water related diseases (cholera, etc).

Similar to the initial "exacerbated trend scenario" of the Blue Plan (1989), this scenario presents a globally undesirable and unacceptable future that should be avoided. It is the antithesis of the sustainable development scenario. Some recent events in the Mediterranean region (the Balkans, Algeria) have given a preview of some of the hypotheses in this scenario.

Consequences for water demand and supply

Under the effects of poverty and an economic slowdown, water demands would stagnate or decrease in the North, and would increase less in the South and East, despite the growing demand resulting from demographic growth.

This demand would not be completely satisfied because of the slow growth of water production, but despite this, water loss and waste would not diminish. Water saving efforts would develop little, except in the event of supply restrictions and increases in water prices. The supply approach would be dominant and mainly based on the utilisation of conventional resources, which is nevertheless slowed down by lack of investment capacity. New equipment would be limited to the most profitable short-term operations without taking into account their external impact (environmental and social). In particular, in the most Southern countries, the decline in the regulatory capacity of dams due to their silting up, would not be balanced by new dam-reservoirs.

Because of lack of funds, infrastructure maintenance would be neglected. The rate of drinking water services for urban and rural populations in Southern countries would

progress little or could even decline, and the same would apply to the collection and treatment of wastewater. Breakdowns in drinking water distribution whether in terms of regularity or quality would occur more often, even in the North.

Periodic shortages – including local shortages for Northern countries - would become more frequent, and structural shortages would extend to the South as well as in the Southern regions of Northern countries (Spain, Italy…), mainly due to breakdown or disruption of distribution.

Social consequences

Conflicts over water use rights would increase and aggravate: between sectors, especially between community water supply and irrigation; between regions or basins (reluctance and resistance of the actors of the "supplying" territories, claims and pressure from "demanding" territories) and between countries with shared water resources (cross-border waterways or aquifers). International conflicts over water are frequent in the Mediterranean region, in the East (the Jordan basin, the Nile basin, the Euphrates…), in the North (the Balkans) or even in the West (Iberian basins shared between Spain and Portugal). These conflicts could not be resolved in the absence of an international legal framework. Some bilateral agreements may not be respected.

Environmental consequences

Pressures on the resources would increase more slowly, but would remain high in the South and East where the intensification of water outtake would generally take precedence over the use of non-conventional resources, too costly, or over demand management efforts.

- The overuse of underground water would continue until depletion or deterioration in the quality of resources (marine invasion of coastal groundwater has already started).

- Deterioration in water quality will progress because of stagnation or a decline in sanitation and wastewater treatment and the extension of diffused pollution, as well as greater risks of industrial accidents.

Environmental protection would not be a priority. Aquatic environments would be depleted and wetlands would regress and even disappear.

Financial and economic consequences

Water rights markets, which would develop locally, would not be regulated and would benefit the urban sector or high profit, short-term agricultural ventures. The privatisation of water services would expand without specific social or environmental constraints and without State regulation or control.

Lastly, **economic costs** related to water would undoubtedly be lower with a slower overall growth rate than in the moderate trend-based scenario, but seemingly **a heavier burden on public budgets** and revenues. No efforts would be made to update facilities or address future requirements (especially sanitation systems and the extension of drinking water distribution networks).

In the whole, with this "push back" scenario, a lesser development rate would be more harmful to the environment and the social equilibrium.

THE "SUSTAINABLE MEDITERRANEAN" (SUSTAINABLE DEVELOPMENT SCENARIO)[18]

The Mediterranean vision for sustainable development for water, population and the environment could be expressed thus: "**A peaceful future where socially, economically and environmentally sensitive water allocation and management supports people's well-being with safe, permanent and fair access to safe water for everyone.**" (Bari, May 1999, Seminar: Water for Food in the MENA region).

Taking this direction would imply an intentional, voluntary approach and the definition of quantified objectives in the different hypotheses (Table 5).

Features of the scenario.

Conditions required

This scenario assumes various favourable conditions:

- minimum population growth (see the United Nations low estimates of demographic change) and controlled urban development. In comparison with the moderate trend scenario, this scenario introduces strong social, cultural and behavioural dimensions in water management.
- moderate economic growth, more sustainable, since there is less consumption of resources (especially non renewable one) and less pollution.

Systematic introduction of environmental and social criteria. These are defined and quantified case by case, to be integrated in development, natural resource management and commercial strategies. Contractual specifications and regulations would force private firms to respect environmental and social constraints. On this basis, a regular assessment of water sector performance and general economy performance would be carried out by the State.

Definition of quantified objectives. The core water policy objectives would be to avoid disrupting the balance between water supply and demand, which would have a negative impact on development, while stabilising pressure on the environment at an acceptable level. This would imply:

- identifying on a case by case basis the acceptable level of pressure on natural water, with quantity and quality objectives aimed at preserving renewability of resources as well as preserving aquatic environments: making social choices involving a broad participation of all the different actors through discussions and arbitration.
- adapting the different forms of development, in particular in countries with scarce or soon to be exhausted water resources; the economic sectors would strive to improve water use performance *("more jobs per drop, a better $ per drop ratio, more crop per drop, more users for the same resource and less drops per unitary production"[19] …).*

Means for a sustainable development scenario

To reach this goal, **water resource and demand management would be considered as a whole.**

Management aimed at preserving the ecosystem and natural water resources would consist, according to the countries or territories and the conditions prevailing, in:

- limiting the pressure increase on natural surface and groundwater – when and if possible based on socio-economical and technical criteria- at a maximum acceptable level, notably by not submitting the natural environment to an abusive impact and by limiting non-sustainable approaches regarding irregular surface water.

18 - This sustainable development forecast was already adopted by the initial Blue Plan "alternative" scenarios and was taken up again in many of the low estimates of the 1996 update.
19 - Tony Allan, Consultation Water for Food, Bari, May 1999.

- stabilising pressure at its present level (in countries where there is very little leeway)

- lowering pressure by reducing outtake and stopping the continuous over use of renewable groundwater reserves and by intensifying wastewater treatment (in those countries featuring non-sustainable production Fig.6).

Consequently, beyond the stage where the expected stabilisation level in pressure on conventional resources is reached (already reached in the two last instances) **any demand for additional water** would be **satisfied with non-conventional resources** (wastewater recycling, desalination), or even water imports.

Demand management would first aim to delay the need to turn to new supply sources – generally more costly - but also to modify the relationship between the different user sectors. This consists in:

- Limiting the increase and even lowering the demand through water saving incentives, by improving efficiency and reducing waste (very high in Mediterranean countries and a very competitive "source" compared to conventional resources still available and non conventional resources) (Box 5).

Box 5: possible gains through water savings

Reducing by half the volume of water withdrawn and lost, unused or misused in all sectors would represent some 75 km³/year as of 2025. This corresponds to what will be needed in terms of new water production to cover 4/5 of the projected demand in 2010, for the moderate trend scenario. This comparison is somewhat harsh but it applies to most Mediterranean countries taken individually, notably those with the scarcest resources.
This would delay the arrival of disruption and overcome the hurdle of demographic transition in some countries.
Conclusion of the Fréjus workshop of the MCSD (Mediterranean Commission for a Sustainable Development), September 1997.

- Water saving efforts would concern all sectors: the urban sector (reduction of losses in distribution, leakage and poor user efficiency, development of recycling techniques in concentrated housing areas), the industrial sector (through recycling) agriculture (reduction in transport losses, gains in irrigation efficiency, re-use of drainage water). They would also include a better adjustment of the volumes of water used including for domestic use (Box 6).
- Reviewing resource allocations to the benefit of more value-added uses, those capable of withstanding the growing direct and external costs of water production (drinking water supply for communities and tourism). This would entail implementing structural changes for the different economic sectors using water so that the scarceness of resources in southern Mediterranean countries does not hamper their development.

Irrigation of course would be the most affected, both in terms of volume of water consumption and expected water savings, but socially this is also the most sensitive.

Efficiency gains and the reduction of resource allocation would be inseparable from incentive policies (measures effecting farmers' incomes and agricultural prices), which would facilitate the payment of water costs and water saving measures, and offer compensation (tax, converting activities…).

Here, water policy would be particularly inseparable from agricultural and rural development policies, and from general socio-economic policies.

Thus, for water policies compatible with sustainable development, demand management would be as important as resource management or more generally supply management. Such an objective would however require arbitration between the different objectives that might be incompatible at times, e.g.:

- Maximising the productivity of the quantity of water allocated to irrigation, with no reduction (subject to pressure on behalf of the market) and preserve a minimum standard of living for the active rural populations.

- Invest in agricultural water savings and allocate water resources preferably to the most advantageous economic sectors.

These policies would be based on broad participation by all users in the decision-making process and management. This implies decentralised management at the level of hydraulic units (drainage basins, aquifer systems, etc.) or any other relevant management units, with ad hoc participatory institutions.

Box 6: drinking water and domestic use

In communities, there will be a noticeable increase in the total water demand per inhabitant, principally in Southern countries. At the same time, drinking water standards will become stricter (cf. the new European Union directives), thereby increasing drinking water treatment costs.
In such conditions, for how much longer will it be feasible to distribute more and more costly drinking water for domestic uses, which for the most part, do not require such a high quality of water?
Is this economic wastage? The question can be raised, particularly in low income communities, as to whether production and distribution of high quality drinking water, reserved for noble uses (food and drink), should be separated from water of sufficient quality for other domestic uses.
Should we consider distributing drinking water using containers, at the same time moderating the treatment of water distributed for domestic use, or even encourage recycling, particularly in large buildings?

Lastly, sustainable development policies would imply imposing more restrictive environmental protection conditions on all trade agreements and the delegation of public services to the private sector. This implies strengthening the role of the public sector as a regulatory body.

Implications for water production and pressure

How would water demand and production evolve?

Contrary to the trend scenarios:

- on the one hand, the gap between water demand and production would be reduced thanks to gains achieved in the efficiency of transport and use for all sectors;
- on the other hand, outtake would coincide less and less with total production due to the development of non conventional resources, especially in several Southern and Eastern countries; zero growth or even local decreases in withdrawals would not be incompatible with a moderate growth in demand.

The figures given in Table 8 for 2010 and 2025 per sector of use cover:

- figures from certain national planning documents which correspond to a sustainable development outlook (Israel, Tunisia); or
- for the Northern countries, the Blue Plan's efforts to bring water demand forecasts up to date (1996), which roughly corresponded to the sustainable development scenario's objectives. However, the hypothesis used, which also minimised all the demand factors, no doubt represented the absolute minimum of future water demand; or
- for most of the Southern countries, figures from scenario 3 of the Vision on Water for Arab countries (1999), based on the hypotheses of both growing supply and a moderate fall in demand (corrected to fit United Nations low population forecasts).

The figures in Table 8, illustrated in figure 10, can be summarised as follows (in km^3 /year).

	Previous reference	Projections	
Sectors	1990	2010	2025
Communities	38	48,4	59,4
Agriculture	181	184,4	193,3
Industry not supplied	33	35	38,1
Energy	47	40	36,2
Sub-regions			
North	155,5	134,5	116
East	55	70,5	91,5
South	88,5	103	119
TOTAL	299	308	327

Figure 10:
Total Water demand in each sub-region, sectoral water demand in the whole Mediterranean region, by the years 2010 and 2025, in sustainable development scenario.

In this perspective:

- global demand would be somewhat stable until 2010 , and then increase up to 2025;
- a stable growth rate of community demand (+27% in 2010, +56% in 2025, and industry +6% in 2010, +15% in 2025) would be balanced by a slow yet steady growth in the demand for agriculture (+2% in 2010, +7% in 2025);
- a sizeable decrease in the Northern countries' demand (-25% in 2025) would come as a contrast to the strong increase in countries of the East and South (+66% in 2010, +34% in 2025).

These are obviously very optimistic forecasts. Indeed, current estimates of water demand (cf. table in Appendix I) are already higher than those calculated here for 2010 and even for 2025 in all the Northern countries. This implies a turnaround in current trends and a drastic fall in water demand, which cannot be achieved by population decrease alone, thereby supposing a firm intention to change.

On the other hand, even if minimised, future water demand will be higher than at present in all the Southern and Eastern countries.

Moderately increasing and stable demand would help limit or halt the progression of water development projects, even more so since the feasibility criteria of such equipment, taking better account of the external impact on the environment, would be more restrictive. More specifically, to better master irregular water, conventional techniques which have become less effective (scarcity of potential dam sites, silting up of reservoirs) would be replaced by the development of artificial underground water

recharge coupled with a more active use of some aquifers while putting and end to harmful overuse. Moreover, the capture of relatively fresh water could develop around the numerous coastal or underground sources found in the Mediterranean.

Non-conventional water production would increase:

- development of the **regeneration and reuse** –mainly for agriculture- of urban waste-water and drainage water, to better limit the pressure of irrigation on conventional resources and limit competition between urban and agricultural demand while ensuring a better distribution of the financial participation in treatment costs;
- progress made in **desalination** techniques, encouraged by substantial reductions in treatment costs in most of the Southern countries and islands.

Table 8.
Water demand in Mediterranean countries and territories in 2010 and 2025 according to the sustainable development scenario

Countries and territories	Sectoral demand (km³/year)								Total demand km³/year	
	Communities		Agriculture		Industry		Energy			
	2010	2025	2010	2025	2010	2025	2010	2025	2010	2025
PO	0,52	0,6	4,5	4	0,3	0,5	3	2	8, 32	7,1
ES	5,0	4,5	19,5	17,2	2,0	2,3	3,5	3,0	30,0	26,95
FR	5,9	5,4	4,7	4,0	4,8	5,1	22,0	17,8	37,4	32,3
IT	6,5	4,5	21,6	17,2	7,0	5,0	0,5	0,3	35,6	26,98
MT	0,04	0,038	0,004	0,004	0	0	0	0	0,042	0,042
SI,HR,BA,YU,MC	1,2	1,8	0,8	0,8	5,0	5,0	8,0	8,0	15,0	15,3
AL	0,5	0,6	1,0	1,3	0,15	0,2	0	0	1,65	2,1
GR	1,0	1,0	5,1	4,0	0,13	0,14	0,1	0,1	6,33	5,24
TR	15,2	23,6	23,8	28,5	4,0	4,0	3,0	5,0	46,0	61,1
CY	0,1	0,06	0,4	0,3	0	0	0	0	0,44	0,36
SY	1,0	1,26	17,2	20,7	0,3	0,47	0	0	18,5	22,4
LB	0,4	0,48	0,78	0,82	0,1	0,14	0	0	1,28	1,44
IL	0,6	1,3	1,10	1,05	0,15	0,15	0	0	1,85	2,50
GZ, WE	0,16	0,26	0,28	0,40	0,01	0,05	0	0	0,45	0,71
JO	0,34	0,5	1,3	2,0	0,12	0,2	0	0	1,76	2,7
EG	4,0	5,0	60,0	65	8,6	11,4	O?	O?	72,6	81,4
LY	0,9	1,5	5,85	8,7	0,20	0,5	0	0	6,95	10,7
TN	0,4	0,5	2,5	2,05	0,12	0,17	0	0	3,02	2,72
DZ	3,5	4,9	2,8	3,1	1,1	1,5	0	0	7,4	9,5
MA	1,0	1,5	11,0	12,0	0,8	1,3	0	0	12,8	14,8
Total	48,36	59,4	184,4	193,3	34,9	38,13	40,1	36,2	299,3	326,7

Sources for the calculations used in Table 8 are given in Appendix III

Even with optimist estimates, the **pressure on natural water would remain high** in the **Southern** and **Eastern** countries with current cases of extreme pressure being relieved where a balance is reached, either in terms of quantity or quality.

The exploitation indexes for renewable resources would have a sizeably lower growth rate, remaining in the upper range in those countries where the indexes are already high: they would still be over 50% in 8 countries by 2010 and in 10 countries by 2025, but never exceed 100% (except for the specific cases of Jordan and Libya due to the importance of fossil water exploitation, and in the Gaza strip).

Nevertheless, this quantitative pressure would tend to stabilise after having reached the limits of utilisation potential and the neutralisation of land use impacts. For its part, water pollution (even diffused) would regress thanks to more active and preventative measures even though this still differs according to country or sector: generally speaking, sanitation and the treatment of urban and industrial wastewater would improve; the impact of farming practices would be reduced (even though this would not by widespread).

The preservation of natural aquatic zones and wetlands (which have become rare in many Mediterranean countries) as well as sources of supply, would become a priority objective thanks to a better understanding of the useful role played by such zones, and thanks to the efforts made to enhance them.

Impact on society

Most water and agricultural development policies would be influenced by European directives and international conventions. Water would be managed at the level of hydrological units (drainage basins, aquifers) when and where physical conditions make this possible, with the active participation of the direct and indirect actors.

User participation in water management, particularly through basin institutions, would become widespread, and would partly compensate for the increasing costs users will have to carry. Partnerships between public and private sectors and users associations would develop in the irrigation sector and in the water distribution and urban sanitation sectors.

This participation would occur on all levels (from decision making through to technical management) and implies greater responsibility being taken by the direct and indirect actors, and in particular users.

Public authorities are more present and apply more restrictive conditions and controls to private sector intervention.

Financial and economic consequences

The related economic costs would generally increase more than in the trend scenario due to the more rapid rise in supply costs (despite the low demand growth rate) and greater and more efficient efforts to ensure the protection and conservation of natural water resources. This increase would be in line with that of the economic growth rate and undoubtedly higher in the Southern and Eastern countries. They would be a heavier burden on public and private budgets.

In fact, one price to pay for sustainable development is the recovery of cumulated investment delays and environmental damage caused by “conventional” policies in the past. Public budgets will probably have to finance this “debt” in order to avoid placing an additional burden on users, already involved in financing future investments.

Part of the investment could come from private sources, if the sector is profitable enough and the government should set the terms and conditions of this in the delegation specifications.

Cost sharing in all sectors of use between users and communities would remain open as a function of socio-economical policies. The tendency would be to recover all costs for drinking water and sanitation with partial recovery for rural and agricultural sector, at least for operation and maintenance costs, and the reduction of subsidies, which would only be maintained to guarantee the social functions of water.

The principle of the polluter pays would become more widespread and apply to all water users. The incentive factor would be reinforced by a rise in licence charges and grants.

To avoid wastage, a "waster pays" principle could be introduced to apply to communities, industrial and domestic users and the agricultural sector. This "wastage" charge would be linked to grants to assist water saving efforts.

Ultimately, the sustainable development scenario does not eradicate water scarcity (essentially in the South and East and in many islands) any more than the other scenarios do, and scarcity could even be increased by conservation objectives.

This approach differs from the conventional scenario:

- firstly in the way that it confronts the risk of shortage, with reinforced integration of educational, cultural and environmental investment in water management:
  - by better adapting demand, optimising use and reducing some uses,
  - by excluding non-sustainable supply.
- secondly, the State will have to invest more (more taxes and use of public spending to correct past mistakes and ensure equal public access to water).
- lastly, the State's role as regulator and controller is strengthened, with the essential participation of the private sector in some aspects of water management (distribution, sanitation, dam and sinking management, etc...) In fact, private sector intervention is subject to increasing constraints (environmental and social objectives). This may make some markets less attractive for the private sector.

The outcome of this would be to minimise the impact of development on nature – which otherwise would be directly passed on to future generations as a "debt" - and thus making today's users pay as they benefit from economic development.

Conclusion: a major issue for the Mediterranean

The Mediterranean Vision on Water, Population and the Environment in the 21st Century seeks to imagine several different possible future scenarios and to underline the importance and feasibility of a sustainable development scenario.

What are the differences between the scenarios?

According to the different hypotheses used, the three scenarios lead naturally to differences in their results, which are more or less marked according to the subjects, countries and time scales, and indicate the degree of freedom and scope for choice that the actors, i.e. today's decision makers, have.

Leaving aside the water crisis scenario, the main differences between the conventional scenario and the sustainable development scenario involve:

- the extent to which the environmental and social functions of water are taken into account: limited in the conventional scenario, great in the sustainable scenario;
- the unequal growth in water demand, more moderate in the conventional scenario;
- the risks of water use conflicts: more preventive measures in the sustainable development scenario;
- the future of irrigation in the South and East: a more moderate growth in the sustainable development scenario, with provision of adequate social compensations;
- pressure on the environment, which is higher in the conventional scenario;
- overall costs: higher but better distributed in the sustainable development scenario;
- effects on the social stability of political and economic choices relating to water: risk of social crisis in the conventional scenario;
- the respective roles of public and private actors, better balanced in the sustainable development scenario (Table 9);
- the possibility of a water crisis: avoided in the sustainable development scenario and, at best, delayed in the conventional scenario.

In general, the future situations explored by the scenarios would be more contrasted in the Northern countries than in the Southern and Eastern countries, which are under greater pressure.

Advantages of the sustainable development scenario

The main advantages of the sustainable development scenario, over the conventional scenario (and a fortiori over the crisis scenario) are:

- Greater social and geographical equity in the share of resources and costs:
- Transition from irrigated agriculture, better accompanied with adequate compensations;
- Greater inter-generational equity;

Table 9.
Water policies in the different scenarios.

The most important differences in the hypotheses used in the different scenarios concern the implementation of water policy and the distribution of roles between public and private sectors and users.		
	Conventional scenario	Sustainable development scenario
State, communities, public firms	• Disengagement from water supply, water treatment and management of big aquatic areas. • Little control,	• Considerable effort made by the State to reduce delays in investments (strong pressure on public budget and taxes). • Firm environmental objectives that limit access to and outtake from certain resources.
	• Expenditure: increasing • Increasing management of drinking water supply by private firms in urban areas; • Little investment in sanitation and the distribution of health water in rural areas.	• Expenditure: increasing rapidly • Less private sector management • Operating costs and provision for future equipment recovered from users • Public-private investment in water treatment and water supply in rural areas.
Private sector	• Increased participation in water supply and sometimes in water treatment and agricultural water management. • Growing interest in resource management (dams, pumping etc.)	• Growing public-private partnership in water supply sector in urban and rural areas, and even in large irrigated areas. • Conditional delegation of responsibility to private firms or users associations (conditions of performance, social and environmental objectives).
	• Expenditure: increasing • High recovery rate through tariffs applied to water supply in urban areas	• expenditure: increasing rapidly • more social differences in cost recovery; obligatory investment in sanitation and rural areas • Huge environmental constraints.
Users	• Participation in basin committees (if they exist). • Users associations in agricultural sector. • Urban consumers association for protection of their water access rights.	• Participation in basin, aquifer committees, or other management units. • Public-private partnership – users association for managing certain irrigated areas. • Conditional delegation of responsibility to users associations (conditions of performance, social and environmental objective)
	• Expenditure: increasing, but without any guarantee nor extension of service.	• Expenditure: increasing, through tariffs, but with guarantee of service and provision for future needs.

- Fewer conflicts, both between sectors of use – notably between community supply and irrigation – and between regions and countries. Solidarity and cooperation take precedence over conflict.
- Development and environmental protection objectives are better balanced, with better conciliation between economic, social and environmental imperatives in defining the water use efficiency.

How to move towards the sustainable development scenario?

The management of tomorrow's water resources must prevent disruption of the balance between supply and demand, leading to local or regional water scarcity. This will be possible in those Mediterranean countries under threat, particularly all the countries in the South stretching from Spain to Syria through:

- supply management, combining (to various levels according to the countries) a more active conservation of resources (especially their quality) with transfers (including international ones) and also an increase in non conventional water production;
- demand management promoting better appreciation of water, developing water savings, avoiding net wastage, and modifying the relationship between the different water use sectors.

A major aspect in demand management in the Southern and Eastern countries involves reducing the share of resources allocated to irrigation for the benefit of urban demand. These reductions can be partly compensated for through efficiency gains in irrigation and rainfed agriculture and through the re-use by agriculture of urban and drainage wastewater, with a view to impede the growth rate of low value-added agricultural food production. Assisting farmers to maintain agricultural prices or facilitating redeployment could help prevent the risks of social crisis in the rural areas.

Resource allocation arbitration must reconcile environmental and social criteria, which should take priority over economic profit criteria. The success of such compromises is linked to the participation of the different actors and will ensure that the major investments required in the future will be properly applied. The higher added value for water using production activities, is no more important than the preservation of the other functions of this resource - notably that of maintaining the services rendered by the natural ecosystems and thus the quality of life in the Mediterranean region, for the present and future population as well as for tourists.

The strengthening of the Euro-Mediterranean partnership, which should ensure that it limits environmental impacts and tensions related to the management of natural resources, will have to pay special attention to all issues concerning water. In this respect, given the weight of irrigation in the region and the social and environmental concerns linked to agriculture, the evolution of the regime of agricultural exchanges will have to be carefully monitored, particularly in the frame of the future Euro-Mediterranean free trade area to be set up by 2010.

The foodstuffs security objective will be depending more and more from trade, notably Euro-Mediterranean. In order to reach this objective, the countries will have to balance the foodstuffs imports and high value-added product exports (agricultural sector and, more and more industry and tourism); this will considerably effect the choice of water resource allocation.

In the Mediterranean, the future of water management will be neither entirely State run

nor entirely private, but it will have to stem from a partnership between the public and private sectors and users, calling for innovative co-operation mechanisms.

Mediterranean people must be prepared to face the growing burden of water on public as well as private budgets. Integrating social and environmental concerns into water policies will have a high cost in the short term (higher in the conventional scenario), but will avoid much higher costs in the longer term.

Development will be sustainable only if it changes.

In the Mediterranean region, in order to achieve sustainable development, a veritable social and cultural transformation has to take place in order to change managerial methods and consumer behaviour, which have been introduced only rather recently in a region long time known for its traditional mastership of water issues.

Thus, actions and investments should focus more on:

- changing individual and collective behaviour in current water use both by individuals (including tourists) and institutions: public awareness, education, increasing the capacity of all actors;
- community participation and management: decentralisation, structural reinforcement of institutions, transfer of management skills to the appropriate level and community management...
- promote non-conventional resources (recycling and desalination);
- environmental and social performance of resource management, particularly in agriculture, stressing reduction of water losses in the networks, and especially improved demand management;
- co-operation, especially for joint water resource management within shared basins, water transfers, research and development, intervention plans, organisation of exchanges of food and energy supplies, etc…

Water constitutes a vital issue for the Mediterranean people, in the South and East in the firs place, but also in some countries of the North. This precious resource is threatened today by negative trends. It has become the physical factor that limits and will limit even more development in the entire basin.

Water policy, but also economic and social policy must integrate environmental objectives.

In the water field, the time has come therefore in the Mediterranean to “change the scenario”.

Appendix I: Current water demand in the Mediterranean countries and territories (according to national sources)

Countries and Territories	Date of value	Gross water demand* in km³/year — Sectors of use								Total per capita demand (on the date of value) m³/year	
		Communities, Drinking water supply		Agriculture irrigation		Industries non supplied		Thermoelectric Energy (cooling)	Total		
Portugal	1995	1,02		8,57		0,78		0,48	10,85	1105	
Spain	1997	4,667		24,09	1	1,647	1	4,915	35,323	908	2
France	1994	5,93		4,97		3,95		25,81	40,67	720	
Italy	1993	7,9		20,3		7,5		8,79	44,6	775	
Malta	97-98	0,0408		0,0066		0,0005		0	0,048	155	
Slovenia	1994	0,247	7	0,0034	7	0,07	7	0,95	0,495 8	245	9
Croatia	1996	0,38		0,001		0,097		0,24	0,764	153	
Bosnia-Herzegov.											
R.F. Yougoslavia (Monténégro+Serbia)											
Macédoina											
Ex-Yougoslavia	1990	1,94		0,9		5,8		7,2	17,34	729	
Albania	1995	0,4		1,0		-		-	1,4	413	
Greece	~1990	1,15		5,66		0,14		0,08	7,03	700	
Turkey	1997	5,5		~26,0		4,0		-	35,5 11	661	
Cyprus	1998	0,06 à 0,065		0,16 à 0,17		ε		0	0,230 à 0,235	323	
Syria	1993	0,53		13,6		0,28		0	14,41	1150	6
Lebanon	1994	0,37		0,88		0,005		0	1,25	390	
Israel	1996	0,597		1,275	16	0,137	17	0	2,009 18	353,4	
Palest. Auth. — The West Bank	1996	~ 0,065		~ 0,1		~ 0,005		0	0,17 22	115	
Palest. Auth. — Gaza	1994	0,048		0,081		0,002		0	0,131	140,5	
Jordan	1994	0,19		0,66		0,04		0	0,89	203	
Egypt	1995-96	4,54		54	23	7,5		0	66	1064	6
Libya	1995	0,364		3,376		0,145		0	3,885 14	809	14
Tunisia	1996	0,365		2,429		0,055		0	2,829	248	14
Algéria	1990	1,12		2,7		0,48		0,2	4,5	180	26
Morocco	1998	1,1		10,18		0,2		0	11,48 28 29	462	

(*) Including losses.

Water production / sources of supply in km³/year																				
Countries and territories		Outtake								Imports		Non conventional production						Sources
		Surface water			Underground water			Total				Desalination			Wastewater regeneration for reuse			
Portugal		7,35			3,5			10,85			0		0			0			EC, 1997
Spain		29,69			5,522			35,21			0		0,019	3		0,096	3		Libro Blanco
France		39,64			6			40,67			0		0			0			Min. Env. 96
Italy		34,2	4		10,4			44,6			0		ε			0			Benedini 96
Malta		ε			0,025			0,025			0		0,0225	5		0,0016	6		WSC 98, Rio 96
Slovenia					0,176	7	13	0,495	8	8	0		0			0,0025	10		Workshop Fréjus 97 Stat. Year Book 94
Croatia								0,764			0		ε			0			Ostovic/Fréjus 96
Bosnia-Herzegovina											0		0			0			
F.R. Yougoslavia (Montenegro+Serbia) Macedonia											0		0			0			
Ex-Yugoslavia		16,85	4		2,25			17,34			0		ε			0			Nuri
Albania		~ 0,77			~ 0,63			1,4			0		0			0			Workshop Fréjus 97
Greece		5,03			~ 2,0			7,03			0		ε			0			Conf. Rome 92
Turkey		29,55	11	12	6,0			35,5			0		ε			0			
Cyprus		0,085	4		0,125	13		0,215			0		0,013			0,012	5	14	Tsiourtis 99
Syria		12,24	4		1,8	14	15	14,04			0		0			0,37			FAO 97
Lebanon		0,85			~ 0,4			1,25			0		0			0			
Israël		0,57	14	19	1,17	14		1,57		14	0,07	20	0,02	10		0,27	21		Min. Env. 99
Palest. Authority	Cisjordanie	ε			0,17			0,17			0		0			0			F. Daibes-Murad 98
	Gaza	ε			0,13			0,13			0		0			0			Al Jamal 96
Jordan		~ ,36			~ 0,48			0,84			0		0,009			0,045			Source ? (Doc. Marseille)
Egypt		47,7			5,3	4	4	53			0		0,03			0,7	24		Amer, 99
Libya		0,17			3,65		4	3,82		14 25	0		0,069	2		0,069	2		Salem 99/FAO98
Tunisia		1,154			1,675	4		2,829			0		0,0083			0,011			DGRE 99
Algeria		2,2	4		2,3	27		4,5			0		0,064	26		-			Conf. Rome 92-Hadji. FAO 97
Morocco		10,95	9		2,68	9		13,63		9	0		0,0034			0,05			DGH, DRPE, 99

Notes
1 +,034 livestock
2 year 1998
3 year 1992
4 With sources
5 FAO 97
6 year 1993
7 ECE/IEDS Database
8 source ?
9 year 1991
10 year 1994
11 Min. Env. 98
12 At. Fréjus 97 – year 97 – with sources
13 No sources
14 year 95
15 2,5 with source ?
16 reuse (of which 0,3 brackish water
17 0,025, brackish water
18 2,031 ?
19 of which <- NWC and Yarn.
20 year 1990 – Yarnouk
21 Σ
22 with ~ 0,04 colons isr.
23 With reuse drainage water
24 '+12,6 drainage water
25 3,675 (supply < demand)
26 year 1990
27 of which 0,4 non renewed
28 Σ
29 . year 1991 = 11,8

Appendix II. Variables, water demand factors

The following table gives estimations of the main variables (demand factors) used for forecasting water demand in 2025, for the 1996 Blue Plan exercise. The demand factors vary according to the high and low growth estimates which approximately correspond to the Vision's "conventional" (moderated trend) and "sustainable development" scenarios.

These estimates mainly concern the Northern countries which did not have any available national forecasts. For the Southern and Eastern countries, the available national forecasts were applied or adapted.

The results of this exercise were presented in the reference document "Water in the Mediterranean region", produced for the Euro-Mediterranean conference on water management, Marseilles, Nov. 1996.

Countries and territories	Scenarios	Community drinking water supply			Irrigation		
		Demand per inhabitant (production m³/year)	Service levels (%) (1)	Distribution yield (%)	Irrigated areas 1000 ha	Water demand for crops m³/an.ha	Average efficiency (%)
PO	T	75	90	80	800	4000	80
	D	60	85	85	630	3600	90
ES	T	130	95	80	4000	4000	90
	D	110	90	85	3500	3500	90
FR	T	108	100	72	1650	2300	90
	D	68	100	80	1400	2000	90
IT	T	urb 120 rur 65	100	85	4000	3800	70
	D	urb 120 rur 70	100	85	3000	3500	80
SI,HR, BA, YU MC	T	120	90	70	200	3200	70
	D	90	80	80	180	2800	80
AL	T	urb 90 rur 50	100	70	700	3100	70
	D	urb 60 rur 30	80	80	500	2900	80
GR	T	120	90	62	1700	2300	70
	D	110	80	82	1300	2000	80
CY	T	80	90	70	100	4400	80
	D	70	80	80	50	4000	90

T: Trend, high estimate ;

D: Sustainable development, low estimate.

1. The low estimation of service levels would be better suited to the crisis scenario. It was too pessimistic for the sustainable development scenario.

Appendix III. Sources for the figures in Tables 7 and 8

Countries or Territories	Table 7 : moderate trend-based		Table 8 : sustainable development	
	2010	2025	2010	2025
PO	A	B	B	B
ES	A	B	B	B
FR	A, B/agriculture	A, B/agriculture	B	B
IT	A, B/agriculture	A, B/agriculture	B	B
MT	A	A	B	B
SI, HR, BA, YU, MC	B	B	B	B
AL	A, B/agriculture	B	B	B
GR	B	B	B	B
TR	A(1), B	A(1), B	A(1) ; B (4)	A(1) ; B (4)
CY	A, B/agriculture	B	B	B
SY	A	C, A/local authorities	D	C, B (5)
LB	A, D/agriculture	C	D	C
IL	A (2)	A (2)	B	A
GZ, WE	A	A	D	C
JO	A	C	D	C
EG	A/local auth, C	C	D	C
LY	A (3)	A (3)	D, A/agricult.(6)	C, A/Agricul (6)
TN	D	C	A (7)	A (8)
DZ	D	C	D	C
MA	A	C	D	C

Sources

A. National source (planning document or consultants' surveys, details given in the bibliography)

B. Blue Plan calculation (1996), high estimates for Table 7 and low estimates for Table 8.

C. Forecasts from the Vision on Water in Arab Countries (1999), prepared by the UNESCO's Cairo office, currently being published: Scenario 2 for Table 7 and Scenario 3 for Table 8.

D. Calculation for 2010 of the average between the 1995 situation and the forecast for 2025, taken from the Vision in Arab Countries (1999): Scenario 2 for Table 7 and Scenario 3 for Table 8.

Notes :

(1). Calculated using variables put forward by Anac (1999)

(2). High estimate

(3). With average forecasts for agriculture

(4). Blue Plan Calculation for Industry and Energy

(5). Blue Plan Calculation for communities

(6). Low estimate of the Salem forecasts (1992)

(7). Forecast " Economie -eau 2000 "

(8). Forecast Alouini, Bari (1999)

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