Problems and needs of sustainable water management in the Mediterranean area

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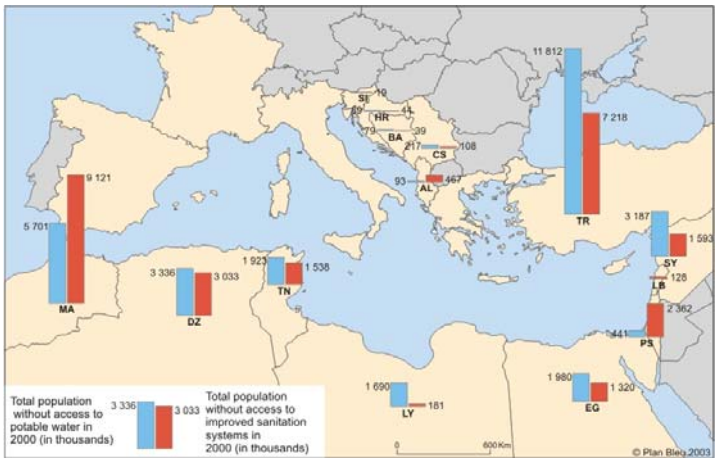
Introduction – Mediterranean Area

- The Mediterranean Sea is the largest semi-enclosed European sea, characterized by a narrow shelf, a narrow littoral zone and a small drainage basin especially in the northern part.
- **82 million people** live in coastal cities (by 2025 there will be an estimated 150-170 million)
- 32 % of the region's population lives in the southern countries (by 2025 that is expected to have reached 60 %).
- Expected **increase in environmental pressure** in the immediate future (the rise in population will be mainly concentrated in the countries in the southern and eastern Mediterranean)
- Human activity in coastal areas is leading to **serious pollution problems**, caused by the large quantities of industrial and urban waste that are produced, in a sea with a low capacity for self-decontamination and a slow water renewal cycle
- **Seasonal population pressures** are also very high (tourism)

Access to safe drinking water and sanitation

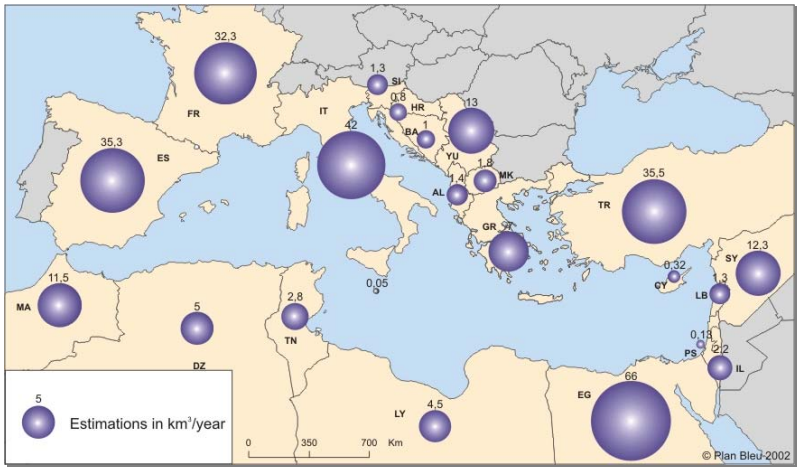
(source: UN-SDMI,OMS-Unicef, 2003)



It is estimated that 30 million Mediterranean people live without access to clean drinking water

Growing demand in the South and East

Total Demand: Irrigation, the main consumer, is growing rapidly



Irrigation represents 63 % of total demand (42% in North and 81% in the South and East)

Water scarcity

- The regions included in the Mediterranean basin are amongst the world areas most suffering of water scarcity
- Irregular water supply and rising water demands.
- Water scarcity has a direct impact on citizens and economic sectors that use and depend on water, such as agriculture, tourism, industry, energy and transport.

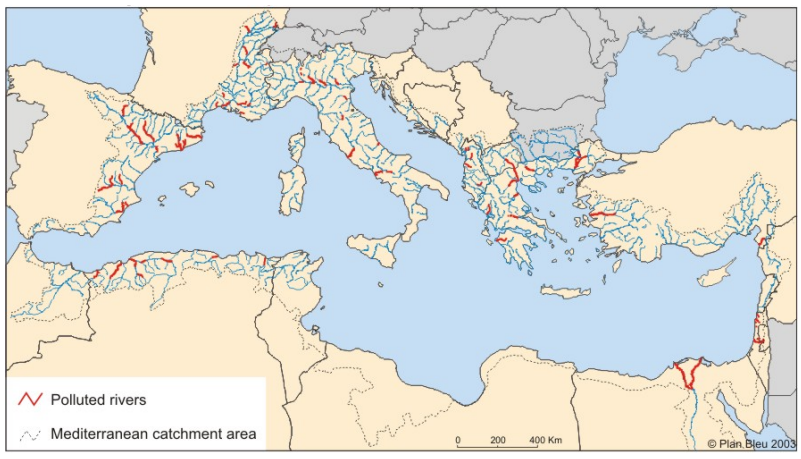
Water scarcity

- Example: 2007-2008 drought in NE Spain, with an extremely high societal, economical and environmental cost.

Impact of climate change

- **Increased frequency of water shortages and decline in water quality** (Reductions in water availability would hit southern Mediterranean countries the hardest)
- Increase in extent and severity of desertification
- Increase in erosion, salinisation and fire hazard and reductions in soil quality
- Loss of valuable ecosystems
- Falls in production and world price rises resulting in threatened food security

Resource and ecosystem degradation



Main rivers subjected to chronic pollution

Potential alternatives and needs with respect to existing water resources

- Culture of water-saving and valuing ecosystem services
- Improvement of wastewater treatment quantitatively and qualitatively
- Reuse of treated effluents
- Treatment of drinking water
- Protection of aquifers

Culture of water-saving

- Working for a culture of water-saving and efficiency is essential.
- This requires an active public awareness from citizens and economic sectors. Potential savings can be stabilized into the future and these savings extended to domestic and agricultural needs.
- Developing water savings in irrigation, within general planning for the economical needs of the whole territory, is essential.

Valuing ecosystem services

- Added value of the Ecosystem services: Improved urban amenity, through irrigation and fertilization of green spaces for recreation (parks, sports facilities) and visual appeal (flowers, shrubs and trees adjacent to urban roads and highways).
- Valuing ecosystem services can provide a framework for understanding that societal needs and natural capital are not separated.
- Public education is critical to achieve the goal of compatible use of water resources and the conservation of our natural heritage.

Improvement of wastewater treatment

- The choice of treatment technology performed should rely on those not entailing excessive costs and providing the best environmental practice and option.
- New and innovative control strategies could be adopted in order to improve the biological process performance and reach a proper water quality and energy consumption.
- Strategies to improve water treatment along with maintaining power consumption under control, for example considering the combination of different technologies (biological and physico-chemical) in a single wastewater treatment plant according to the different effluent characteristics.
- Pilot plant tests and benchmarking of existing works will provide a useful knowledge to help in the choice of the wastewater treatment plant (WWTP) technology and layout. These activities will improve the long term performance of the new WWT infrastructures.

Reuse of treated effluents

- Reuse of treated sewage waters can be considered as an adequate water source for urban, tourism and agricultural uses.
- With proper treatment, sewage water can even be used for drinking water.
- Major environmental pollution such as dissolved oxygen depletion, eutrophication, foaming, and fish kills can be avoided by, for instance, planning the reuse of treated wastewater.
- Public perception and cultural issues also needs to be evaluated and improved when this source of water is considered. Thus public consultation would help to early detect future misunderstandings.

Treated wastewater for direct and indirect potable reuse

Perhaps you have seen: " This property is irrigated with reclaimed water. Do not drink"

Requires Advanced Environmental Technologies (like the one in Advanced Water Purification Facility, California)

Micro-filtration
Reverse Osmosis Membranes
Hydrogen peroxide and UV light,
Aquifer recharge by Injection to wells (travels up to six month to drinking water well)

" As waters supplies tighten, perhaps more communities will be asked *to put their faith in chemistry and accept recycled water into drinking water supply*"

Treatment of drinking water

- Desalination for drinking water treatment is a current option to obtain water resources that could be considered as independent of potential changes in climate.
- Energy needs and costs are high.
- Desalination should not be considered the only option.

Treatment of drinking water - Desalination

Potential issue: environmental impacts of large scale processing.

- Seawater desalination is raising significantly the overall energy intensity and cost of water.
- Despite improved technology and reduced costs, desalinated water remains highly expensive and sensitive in particular to increases in energy costs.
- Our knowledge of impacts is largely based on limited research from relatively small plants operating in relative isolation from each other.
- The future being indicated by public water authorities and the desalination industry is of ever larger plants that will frequently be clustered together in the relatively sensitive coastal environments that most attract extensive settlement

Protection of aquifers

- Use of ground waters requires adequate protection of aquifers.
- Overexploited aquifers affect available water for surficial aquatic ecosystems and may create problems of subsidence and salt water intrusion.
- Recharging aquifers requires good chemical and microbiological quality of the waters. Some techniques to improve the water quality of underground waters exist, even at the large scale.
- Recovered ground water wells can provide additional resources (up to 25 Mm3 in Catalonia which could be raised to 90 Mm3 during extreme droughts).

Barcelona Process: Union for the Mediterranean

Declaration of the Euro-Mediterranen ministerial conference on water

Stress:

- the **degradation of resources** both from a quality and quantity point of view;
- the necessity to design and implement strategies and plans to achieve **sustainable water resources management** through integrated approaches comprising all kinds of water and all its uses ;
- the **growing gaps between water consumption and availability** of resources (likely to be worsened by the effects of climate change, economic development and demographic growth)
- that water supply measures (traditional or alternatives) might be considered once the projected impact of water savings prove insufficient;
- the **imbalances in access to water supply and sanitation**,
- the need to prepare a **comprehensive and detailed assessment of water resources** in the Mediterranean and of management policies
- the necessity to promote the development of **science-based technologies** that will provide inter alia for efficiency in water use and supply measures;

Recommendations of the Water Directors

- Efforts should be pursued so as to downscale crucial climate related data/information at the lowest possible level throughout the region.
- With respect to the climate water energy nexus, the rising cost of conventional energy sources (in particular oil) should be considered whendevelopin g new water resources (eg. desalination and transfers). - Due consideration should be given to impacts on the environment.
- The level/degree of water quality needed for the various usages (agriculture, drinking water, ecosystems) has to be assessed in the light of the different water treatment technologies available and their respective cost.
- encourage the necessary diversification of economic activities towards activitiesless impacted by climate change, keeping in mind the need for equity considerations in tackling climate change.