

Water management and water scarcity perspectives in the mediterranean

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Jel classification: Q 250, Q 280

1. Introduction

In most Mediterranean countries, particularly the Southern and Eastern ones, limited water resources pose severe constraints on people's economic and social progress, testing their resilience and threatening their livelihoods.

In those countries, water scarcity and water-related problems are daily growing. Available surface water is declining and the over-pumping of groundwater, beyond natural recharge rates, has resulted in lowering the water table and causing an increase in groundwater salinity and ecological degradation.

The bad water use, on the one hand, and the poorly fragmented water management, on the other hand, not only affected the available water resources lowering its quality, but also led to rapid land degradation due to widespread salinization and water logging problems.

The still unanswered question is how to meet these challenges that are expected to get worse in the future as population, over-exploitation of current water resources and pollution continue to increase and the corresponding demand for more freshwater is still on the rise. The widely acknowledged answer is that water management approach cannot be a sector-by-sector one and that a

Abstract

In the Mediterranean region, the increasing gap between potential water availability and foreseeable demand requires management policies for water use and management based on short, medium and long term development plans which should take into account social, economic and environmental criteria. The imbalance between the limited water supply and the steadily increasing demand leads to serious conflicts over water resources and to the degradation of water quality in all users' sectors in the major countries of the region. To overcome those conflicts, a new water management approach is needed: integrated water supply and water demand management in all sectors and particularly in agriculture that receives more than 80% of the available water resources, but with losses higher than 50%.

Much work remains to be done in order to elaborate the concept of supply and demand management into implemental policies, programmes and actions through the use of the appropriate tools that legal and economic policy, scientific and technological advancement gave us. This is the challenge the developing countries in the region are facing to meet the increasingly water demand and to safeguard and sustain the limited and fragile water resources.

Key words: water management, Mediterranean countries.

Résumé

Dans le pourtour méditerranéen, l'écart croissant entre la disponibilité potentielle des ressources en eau et la demande prévisible nécessite des politiques de gestion et d'utilisation des eaux se basant sur des plans de développement à court, moyen et long terme qui devraient tenir compte des aspects sociaux, économiques et environnementaux. Le déséquilibre entre les rares ressources en eau et la demande toujours croissante crée des conflits graves pour l'eau et une détérioration de sa qualité dans les différents secteurs d'utilisation dans les principaux pays de la région. Une nouvelle approche de gestion de la ressource en eau, à savoir une gestion intégrée offre-demande, s'impose dans tous les secteurs et, notamment, dans le secteur agricole qui reçoit plus de 80% de l'eau disponible, mais dont les pertes dépassent 50%.

Il reste encore beaucoup de travail à faire pour mettre en œuvre la gestion de l'offre et de la demande par des politiques, des programmes et des actions s'appuyant sur les outils appropriés offerts par les politiques économiques et réglementaires ainsi que par le progrès scientifique et technologique. C'est un défi majeur que les pays en voie de développement doivent relever pour satisfaire une demande en eau de plus en plus croissante et pour sauvegarder et soutenir les ressources en eau si rares et fragiles.

Mots-clés: gestion de l'eau, pays méditerranéens.

paradigm shift to a holistic vision is necessary, where water demand management, WDM, is part of that integrated approach. This will be the focus of this paper that will also provide some of the necessary knowledge required to further promote WDM in the region and to identify the work required for the much needed change to improve water governance.

2. Water features in the Mediterranean region

The key issues regarding the water situation in the Mediterranean region are summarized in Box 1 (Hamdy, 2003).

3. Water resources in the Mediterranean region: facts and perspectives

Deep analysis of the key issues characterizing the actual situation of water resources in the Mediterranean developing countries will draw the attention on some stylized

facts and perspectives about the water supply and demand in the Mediterranean region that are specified as follows:

Although there is still considerable uncertainty about exactly how and when the Earth's climate will be affected by greenhouse gases and even more uncertainty about the local impacts of global warming, it is reasonable to believe that the Mediterranean water management problems are unlikely to

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Box 1 – Key issues on water in the Mediterranean region.

- Limitation of natural water resources leading to water scarcity and decrease in water share per capita.
- Pollution of surface and groundwater resources accelerating water quality deterioration.
- Weak institutions and inadequate organizational, legal and financial management as well as inadequate O & M of water schemes leading to low efficiency of water use.
- Lack of clear comprehensive water policies covering social, economic and cultural aspects.
- Improper governance, high centralization and lack of stakeholders' participation.
- Lack of reliable data, information and knowledge on available resources and projections of future demands.
- Shortage of skills and capacity to develop and manage water resources.
- Poor multiplication of water authorities, lack of coordination and rising intersectoral competition for water demand.
- Dominance of public sector in the development and management of the water sector and low involvement of the private sector.
- The unresolved issues of Food Policy: relative or absolute food security.
- Lack of awareness on water issues and lack of economic incentives for water conservation and wise efficiency, particularly in the agriculture sector.
- Inadequate consideration for gender issues in water management.
- Lack of clear cooperation between riparian countries sharing water sources in the region.
- Insufficient access to national and international financing and funding.

be reduced and may be further complicated and exacerbated by climate change. Especially in arid and semi-arid areas, relatively small changes in temperature and precipitation, together with the non-linear effects on evapotranspiration and soil moisture, can result in relatively large changes in runoff;

Climate change may enhance the demand for freshwater, particularly for agriculture and direct human consumption. A decrease in summer precipitation, whilst having little impact on the annual total, may nevertheless have significant effects on plant growth through extension of the summer period of water stress. The efforts of agriculture to adjust to climate change may lead to increased demand for irrigation purposes, especially for soils with low water-retention capacity. However, any increased use of irrigation water would be in conflict with the growing per capita demand for domestic uses induced by warmer average and extreme temperatures;

Barriers to the sustainable use and management of water are not only technical, but also arise from the social, economic and institutional context. Water resources and water services are often under-priced when compared to the cost of provision; institutional arrangements are poorly adapted to sustainable use/management goals;

There is a high opportunity for water saving in agriculture by increasing efficiencies of irrigation systems and recycling effluents, as both approaches will free up large quantities of water for new uses and overcome sectorial water use conflicts. However, it is the basin efficiency that

counts most when determining a country's potential water surplus over present uses;

An integrated approach to wastewater is needed in the region, covering collection, treatment and reuse. The investment costs of wastewater treatment and reuse are high but the cost of inaction is even higher. In this field, efforts are needed to win over potential users of treated wastewater, through awareness and information campaigns and to encourage participatory approaches. In addition, wastewater reuse in agriculture requires appropriate legislation to regulate the use of this resource, using quality standards appropriate to local conditions.

The facts discussed above are all clearly indicating that the Mediterranean region and, in particular, the Southern and Eastern countries, with limited freshwater resource and intense population, are nowadays facing serious problems in satisfying their water demands. The future perspectives are not sound and the situation would be more aggravated and much more complicated unless immediate actions are taken and properly implemented.

4. What is Water Demand Management (WDM)?

Water Demand Management (WDM) is about governance and tools that motivate people and their activities to regulate the amount, manner and price through which they access, use and dispose of water to alleviate pressure on freshwater supplies and to protect water quality.

There are numerous attempts for more specific definitions of demand management (Grover, 2002; Tate, 1999), including any socially beneficial action that reduces or reschedules average or peak water withdrawals or consumption from either surface or groundwater, consistent with the protection or enhancement of water quality.

According to Deveril (2001), DWM is a practical strategy that improves the equitable, efficient and sustainable use of water.

Savenije and Van der Zaag (2002) termed DWM as the development and implementation of strategies aimed at influencing demand, so as to achieve efficient and sustainable use of a scarce resource.

The most recent WDM definition was given by Brooks (2003). (Box 2)

Box 2 – WDM Definition by Brooks (2003).

It states that WDM may be any method – whether technical, economic, administrative financial or social - to:

- Improve the efficiency of water used to accomplish a specific task;
- Adjust the nature of the task or the way it is accomplished so that it can be achieved with less water or with lower quality water;
- Minimize the loss in quantity or quality of water as it flows from source through use to disposal;
- Continue to provide water at times of drought when water is in short supply.

In addition, to the above reviewed definitions and meanings of WDM, more holistically, it also:

- improves water saving through maximizing efficiency of its use;
- protects the quality of water and matches quality of water supplied to use;
- uses non-conventional sources (brackish water, wastewater, grey-water); and
- considers the reallocation of water of different quality among sectors.

5. Supply and water demand management

Although this paper is focusing on the water demand management, in a region characterized by water shortage, like Southern Mediterranean countries, the question of the supply management versus the water demand should be fully considered being the two major sides of the integrated water resources management (IWRM) (Fig.1).

that will hopefully lead to water security in the region.

To this purpose, we would like to stress the point that water problems and their solutions will dramatically vary from country to country in the Mediterranean and that many of the proposed management solutions are going to be common to all of the actions needed for any solution.

6. The supply management: the hardware approach

Traditionally and for a long time, the supply management concept has dominated actions in the region through major water supply projects including large impoundments, long distance transfer and mining fossil water.

However, the learned lessons from this experience clearly demonstrated that this hardware approach, through developing more supplies, in reality did not effectively respond to water shortage in arid and semi-arid regions. Indeed, in most Southern and Eastern Mediterranean countries, increasing water supply is questionable. In those countries, the water uses have changed and expanded and most of the accessible water resources have been fully exploited and, thereby, the costs for further supply side option have dramatically increased.

Furthermore, in addition to direct investment costs of the infrastructural solutions for providing water to meet increasing demand, their adverse effect on the nature have become more difficult and more expensive to overcome. Such approach is now criticized for environmental, economic and social reasons. Basic human needs for water still remain unmet and it is becoming harder and harder to find new water resources, or even to maintain the existing ones to supply actual sectorial water needs.

Such concerns add weight for major changes in the approach to water resources management supplies, if the challenges of imbalance between usable water supplies and demands are to be overcome.

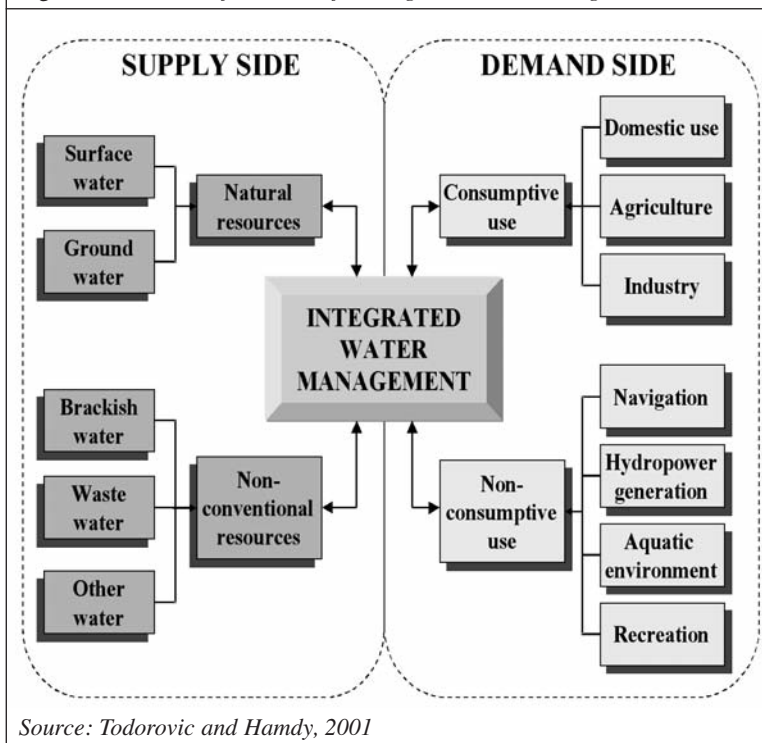
6. Water demand management: the soft path approach

Nowadays, many countries are changing the way of thinking and approaches in managing their water resources, re-directing them towards the soft path approach through developing new methods to meet the demands of a growing population without requiring major new constructions or new large scale water transfer from one region to the other.

In this approach, the management of water demand will increasingly depend upon non-structural solutions, to explore the possibility for efficiency improvements, reallocate water among users and reduce projected gaps and meet future needs.

However, to implement such desired options, a completely new approach for water planning and management is needed. Indeed, two approaches should be followed: the

Figure 1 – Technical framework for integrated water management.



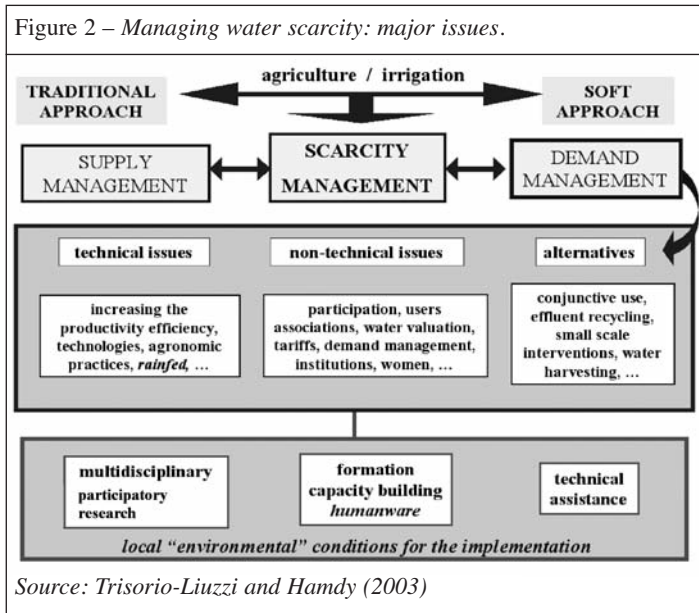
Source: Todorovic and Hamdy, 2001

An integrated approach to water resources management is a multi-disciplinary approach requiring a multitude of skills and professions ranging from civil engineers to accountants, hydrologists, economists lawyers and systems engineers.

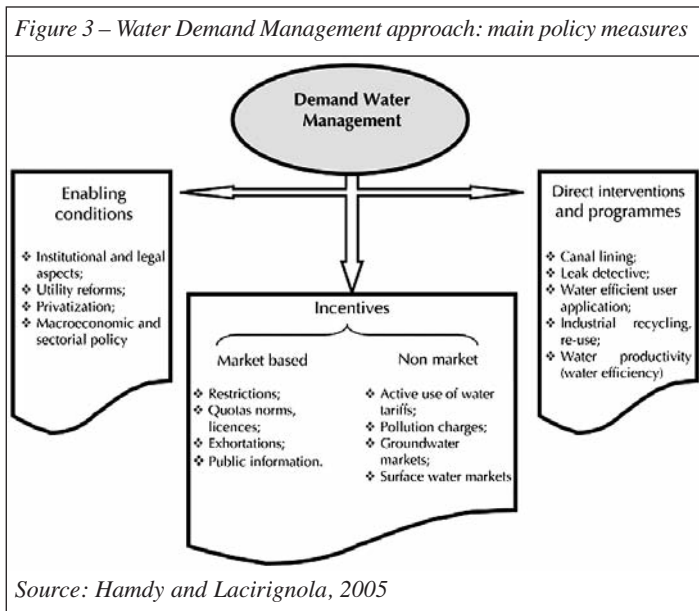
Indeed, the Mediterranean region is filled with tremendous uncertainty relating to the long term dynamics of water demand and supply and the interactions of economic, social, demographic and scientific forces which are not fully understood yet.

This means that we must understand these long-term dynamics before we can embark on a new course of action

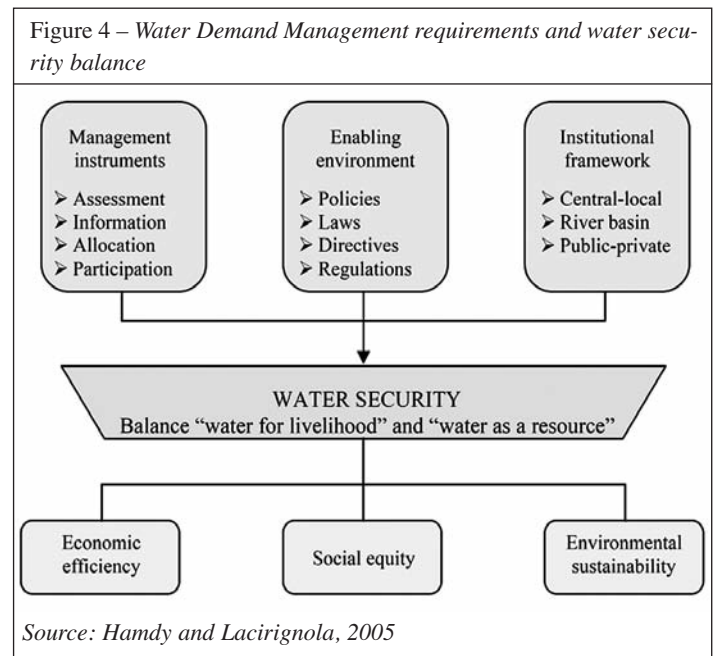
first, by increasing the efficiency through which current needs are met and, the second, by increasing the efficiency through which water is allocated among different uses. Both could be jointly practiced by integrating the supply-oriented management with the demand-oriented one for managing water scarcity (Fig.2).



Again, this clearly explains what we mean by changes in both water use and management. The changes do not imply to stop increasing water supply in the countries where physical and economic conditions are in favour of this approach, but, even in those countries, new approaches should be developed to permit water needs to be met with fewer resources, less ecological disruption and less cost; all are to be provided through the water demand management approach.



Today, for most arid countries in the region, it is well recognised that demand management is the main way of managing water resources and, through its appropriate implementation, the region will be able to move from water scarcity towards water security. However, integrated water demand management is not an easy process, as it involves mainly soft activities including regulation, education, pricing incentives, user participation and reallocation of water rights. Difficulties in managing the water demand are due to the fact that it does not call for a three level action (Fig.3) but also, to be successfully, it requires management instruments, establishing the enabling environment together with an appropriate updated institutional framework (Fig.4).

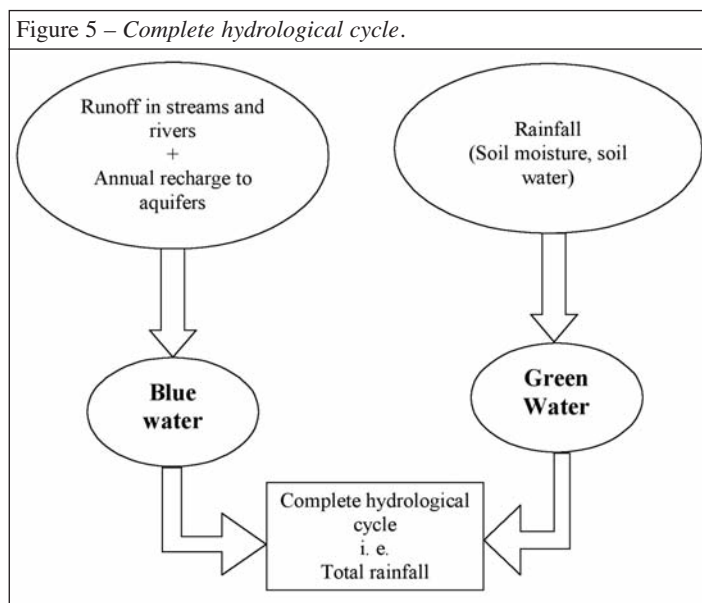


7. Water management and water scarcity perspectives

Water scarcity and its related problems in most countries of the region are increasing, the ways towards solving them are very well theoretically known but, practically, most of the solutions remain vastly unimplemented because water policies and water management strategies are not favouring the solutions both to the current and the future water problems.

In this context, water scarcity is related to renewable water resources, i.e. the runoff in streams and rivers plus the annual recharge to aquifers, “the blue water”. Following such a definition means that we are only considering nearly 40% of the annual rainfall and roughly 60% of it is left out. This is the additional water that infiltrates into the soil, the soil moisture which evapotranspires without having entered rivers or groundwater, “the green water”. This water is hugely important for agriculture as well as for environmentally-friendly rainfed agriculture and ecosystems (Fakenmark, 2000). Together, the “blue and green waters” encompass the complete hydrological cycle, i.e. the total rainfall (Fig.5).

Figure 5 – Complete hydrological cycle.



As previously mentioned, the dominant, traditional engineering response to water scarcity has been to construct infrastructure, particularly dams, in order to increase human control over water resources and make a larger share of the total renewable resources available for human use. Such an approach to increase the water supply has by and large been successful in producing its primary output providing water supply and sanitation to a high number of people. However, despite the enormous investments, the approach itself has not significantly slowed down the water scarcity intensity. The water scarcity problems were intensively increased, hence, many rural poor people do not have access to water for productive purposes, groundwater levels in key aquifers are falling rapidly, many rivers are no longer reaching the sea, etc. (Cosgrove and Rijsberman, 2000). Such unfavourable prevailing conditions have given rise to a backlash against water infrastructure investments calling for shifts from supply to the water demand management to cope with the increasing water scarcity in the region.

However, these shifts have not easily occurred: they are still facing strong internal opposition and are not universally agreed upon. Nevertheless, they represent a real change in the human thinking about the way to tackle the increasingly acute water scarcity problems (Gelick, 1998, 2002 and RMI, 2002).

Gelick (2002, 2003) introduced what he calls the “soft path for water” that, in essence, focuses on the improvement of the overall productivity of water rather than seeking endless new supplies as appropriate response to water scarcity.

The intensive good work carried out in several Mediterranean countries gives evidence that the supply augmentation policies, which were dominant throughout the 1970s and 1980s, are no longer the primary policy choice but demand management now shares the focal attention. The challenge is not only to seek new supplies of water but, also, to increase the productivity of existing water resources and to be developed in the near future.

In the region coping with water scarcity, water resources challenges need to be approached without preconceptions.

Neither all problems can be solved with infrastructures, nor they can be addressed through better management in countries with minimal infrastructures. A balance is needed between meeting the requirements of the management, on the one hand, and developing water resources, on the other hand, with major focusing on increasing overall water productivity.

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