WATER RESOURCES MANAGEMENT IN THE MEDITERRANEAN COUNTRIES: PRIORITY ACTIONS

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ABSTRACT

Consumption of fresh water for domestic, agricultural, energy and industrial purposes is expected to increase greatly by the beginning of the 21st century for a number of reasons among: population growth, the extension of irrigation for the purpose of increasing agricultural output, the foreseeable development of water distribution systems and the expansion of water-consuming industrial activities. Although in global terms, water resources are well in excess of foreseeable demand, they are unevenly distributed. Some regions are already experiencing severe water shortages that risk becoming worse in the future. This can have some serious repercussions on the economy and the environment. In many cases, the situation is further aggravated by the poor quality of water that makes it unsuitable for various purposes. The solution to the problem of water resources lies in rational management which should be concerned both with supply and demand grounded on solid scientific and technical foundations and necessitating an interdisciplinary approach to the ecological, economic and social problems. Such management should aim at promoting the use of water resources in such a way as to ensure the satisfaction of society's needs while preserving them for the future.

RÉSUMÉ

Au début du 21e siècle, l'on prévoit une forte augmentation de la consommation d'eau douce pour l'utilisation ménagère, agricole, industrielle et pour la production d'énergie, suite à: l'accroissement démographique, l'extension de l'irrigation afin d'accroître la production agricole, le développement prévisible des systèmes de distribution de l'eau et l'expansion des activités industrielles consommatrices d'eau. Même si globalement les ressources en eau sont en excès par rapport à la demande prévisible, elles sont irrégulièrement réparties. Certaines régions vivent déjà une situation de pénurie d'eau qui risque de devenir encore plus grave à l'avenir. Ceci peut avoir des répercussions graves sur l'économie et l'environnement. En plusieurs cas, la situation est aggravée encore plus par la mauvaise qualité de l'eau qui la rend inadéquate pour plusieurs emplois. La solution au problème des ressources en eau doit être recherchée dans une gestion rationnelle qui devrait comprendre l'offre et la demande basées sur des fondations scientifiques et techniques solides et nécessitant une approche interdisciplinaire aux problèmes écologiques, économiques et sociaux. Cette gestion devrait viser à la promotion de l'utilisation des ressources en eau de sorte à assurer la satisfaction des besoins de la société tout en les préservant pour l'avenir.

Water shortage is not a new phenomenon in the Mediterranean countries. What is new, however, is that it is occurring in an increasingly changed environment and this makes it more serious and long-lasting. The recent droughts in the last decade marked a turning point.

They highlighted the vulnerability of water supplies even in the industrialized northern Mediterranean Countries which had always relied on adequate per capita of rainfall.

The water crisis is endemic or permanent in some southern Mediterranean areas, but it has now even reached towns and villages in France, Spain, Italy and Greece, obliging them to impose temporary restrictions. The shortfall in quantity has been compounded by a decrease in quality due to contamination of surface or underground water.

Therefore, in the near future, availability of water rather than land will be the main constraint to agricultural development of arid and semi-arid countries of the Mediterranean. There is no doubt that, without an efficient control and proper water management, self-sufficiency in food and energy will continue to be a mirage for most countries of the region.

The lessons learned by the past decade are that technical solution alone cannot provide the increasing population with safe water supply and proper environmental sanitation. An integrated management of water resources is needed including technical, institutional, managerial, social and economic aspects. The future requires new mechanisms to protect the water resource and allocate diminishing water supplies to increasing and competing uses. Anticipatory and preventive approaches should be developed for managing the quality and quantity of arid regions water resources in a way that acknowledges their use in social, economic and environmental terms.

In the Mediterranean, we need a new ethic, one that promotes efficiency and protection of water system in all we do. Efficiency must be the option of first choice. Part of that ethic is an acceptance of the obligations that accompany the rights we assume to have to water, obligations to protect water's many ecological functions, to get as much as possible out of each liter we take from its natural course, and to help others to receive its benefits.

CONSTRAINTS TO ENVIRONMENTALLY-SOUND WATER MANAGEMENT

A comprehensive and critical analysis of existing literature on environmental aspects of water development in the Mediterranean region indicates that there are many constraints which limit the potential application of available knowledge by water professional and deci-

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sion-makers in developing countries. On the basis of this analysis, the following four major constraints can be identified:
1. incomplete framework for analysis;
2. lack of appropriate methodology;
3. inadequacy of knowledge;
4. institutional constraints.
It should be noted that the four major constraints identified are not independent. On the contrary, they are often closely interrelated.

1) Incomplete framework for analysis

The framework currently used for analysing and considering various environmental impacts associated with water development projects is overwhelmingly biased towards assessing only the negative impacts.
What is thus needed is a balanced framework for analysis which will identify both positive and negative impacts. The next step should then be how to maximize the positive impacts and minimize the negative ones. A framework that considers only the negative impacts and ignores the positive ones is both incomplete and counterproductive.

2) Lack of methodology

A review of the process currently used by developing countries to incorporate environmental issues in water management indicates that the methodologies available at present do not appear to satisfy the special requirements of those countries. While the environmental impact assessment (EIA) process was made mandatory in several industrialized countries, its actual use so far in developing countries has been somewhat slow. The reason for this slow acceptance is the lack of an operational methodology that can be successfully applied in the developing countries with limited expertise, resources, data and time. The EIA methodologies that are being used in industrialized countries are not directly transferable to developing countries for various socio-economic and institutional reasons (Biswas and Kindler, 1989).

3) Lack of adequate knowledge

Present knowledge about Mediterranean water resources is fragmented and insufficient. There is a lack of adequate data on the hydrological cycle, including insufficient areal coverage of the data and their representativeness, the gaps in data, the quality of data, and in some cases problems of access to data even if they are available.
In addition, there are questions raised about the adequacy of the scientific basis, methods and techniques used in making the assessments. There are many areas where adequate technical knowledge may not exist for getting reliable answers.
Equally, there are areas where "conventional" knowledge can at best be dubious and at worst totally erroneous.

4) Institutional constraints

A sectorial approach to water development is a major institutional constraint in all developed and developing countries, and this has an important bearing on the sustainability of projects. There are many reasons for this situation, but one of the most important is the division of responsibilities between the various water-related issues. Because of long-standing rivalries, the coordination and cooperation between the various ministers leave much to be desired and yet in any large-scale water development project all these issues must be integrated within the project area. While it is easy to point out this necessity, how this integration can be really effected in the field is a very complex and daunting task.

Priority actions

Preventing water scarcity from undermining food security, ecological life-support systems, and social and political stability will not be easy. In much of the world, particularly arid and semi-arid regions, expanding the water supply to one user now means taking it away from another. New dams and river diversions will rarely offer sustainable solutions, since in most cases they would involve taking more water from freshwater systems that are already overtaxed. The key challenges now are to establish priorities and policies for allocating water among competing uses and users, to encourage more efficient and productive use of water, and to reshape institutions to better suit the new era of water constraints. These are not challenges that water managers can meet alone. They now belong in the portfolios of diplomats, on the agendas of cabinet meetings, and high on the priority lists of development banks and international support agencies.
In front of the water scarcity situation in the Mediterranean region and the water related environmental threats, it is necessary to review at national and regional levels and set a priority ranking of problems of physical and technical nature that affect the development and management of the water resources. A top priority is to ensure that both people and ecosystems get at least the minimum amount of good-quality water they need to remain healthy and to function productively. Especially with competition for scarce water increasing and strong pressures to treat water more as a commodity, governments have an important responsibility to ensure that water's most fundamental-supporting life- is fulfilled.
Satisfying these basic human needs is thus not constrained by water availability per se, but rather by inadequate investment by governments, external support agencies, water providers, and community groups in the technologies, infrastructure, and institutions need-

ed. In this regard, a number of issues concerning needed actions are outlined and discussed in the following.

Water Resources Assessment

Many efforts have been made in the different countries of the region with regard to the assessment of water resources. However, due to the complex nature of the arid and semi-arid climates and the sharp variabilities in magnitudes and distribution, still more efforts are needed in this respect. Many of the data have not been adequately analyzed and more important, the heroic assumptions are involved in the estimates of groundwater. The assessment of water resources is required for a number of purposes apart from assessing the quantity and quality and distribution in space and time, it should also include monitoring variations caused by climate variabilities or by climate changes, assessing environmental impact of water resources management and socio-economic systems and water related hazards.

Management of Water Resources: a new approach

In the Mediterranean region, current trends demonstrate that we cannot continue on the present path where water resources management is characterized by policies that are unsustainable from any perspective: economic, social or environmental. There are multitudes of problems, they all stem from four principal failures:

- refusal of treated water as an economic good;
- excessive reliance on the government for water and wastewater services;
- fragmented management of water between sectors and institutions;
- inadequate recognition of the health and environmental concerns with current practices.

We must adopt a new approach to water resources management in the region that overcome the failures, reduce poverty and conserve the environment all with a sustainable development framework, having the following characteristics:

- addresses quantity and quality concerns through an integrated approach;
- integrally links land use management with sustainable water management;
- recognizes water as an economic good and promotes cost effective interventions;
- support participatory and innovation approaches.

Realizing the new approach the essential elements for action have to be taken are synthesized in Box.

NEW APPROACH FOR WATER RESOURCES MANAGEMENT

a) Strategies: from Segmented to Comprehensive. Water issues need to be treated in a systematic manner. We must stop managing water sectorially by its separate uses, and instead develop a comprehensive framework for water resources management. Coordination between different sectorial users is critical for successful long-term water resources management. In addition, physical and institutional infrastructures must be complementary.

b) Interventions: from curative to preventive. To prevent expensive problems from occurring and to achieve an effective application of water resources, interventions in the water sector should move from curative to preventive ones. Through preventive interventions, the fragile water sources characterizing the region could be sustainably used, beside, minimizing the requirements and costs for remediation, mitigation and restoration.

c) Investments: from incremental to strategic. Addressing water resources management issues under the new approach requires that a broad range of investments, both large and small, be made on a continuous basis. Investments that maximize benefits can be of a variety of scales and types. Complementarity and cost-effectiveness are important determinants in making investment decisions. Equally important is the ability to operate and maintain investments effectively. However, it must be recognized that investments are not the only solution for the sustainable management of water resources. While infrastructure improvements remain critical, they must be complemented with measures to strengthen institutions, develop human resources, and promote public awareness.

Given the need to mobilize resources, improve efficiency and increase the quality of services for users, the participation of the private sector in water management should be encouraged. Equally, to ensure the internalization of measures to promote the use of economic incentives, increasing user participation in programme and project design should be supported.

Supply and Demand Water Management

The questions of demand side versus supply side water management are important issues that require special attention in a water scarce zone like Southern countries of the Mediterranean. For long time the supply management concept has dominated actions in the region. During the last century the region witnessed major water supply projects including large impoundments, long distance transfer and mining fossil water. These driving

forces are met with many economic and environmental limitations that require a combination of the supply management with demand management through minimization of wastes, efficiency improvement and conservation works.

Irrigation Water Charges

The introduction of irrigation charges is a very important prerequisite to good management of irrigation demand because it is noticed that despite the observed water shortages, misuse of water in agriculture is widespread in current irrigation management practices. This is mainly due to the failure in the past to recognize water's economic value and the real cost of water services provision. It is therefore now widely believed that managing water as an economic good is an important tool of achieving efficient and equitable water use as well as encouraging the conservation and protection of scarce water resources. Yet, for many States in the region, it is difficult to reconcile the concept of water as an economic good with the traditional idea of water as a basic necessity and human right.

Food Security: short-term and long-term strategies

Agriculture will continue in many parts of the region to be the main consumer of water resources and consequently region wide over 85% of the resources are consumed by agriculture. To realize food security of the developing countries of the region, the water gap will be about 50% resulting from increasing population and deterioration of productivity due to the poor water management. Two approaches need to be debated among scientists, policy makers and the end users of water for agriculture. First on the formulation of short-term strategy for water and sustainable agricultural development, large amounts – nearly 50% of the whole water volume already used in agriculture – could be made available to meet new agricultural demands by improving the efficiency in this sector, only 40% through better systems of farm water management, reducing irrigation water distribution losses, changing cropping pattern, improving irrigation scheduling and adopting irrigation efficient technologies. In this regard, a part of the increasing agricultural water demands could also be supplied through the use of unconventional water resources, the saline and treated sewage water. This brings us to the second approach of long-term strategy to satisfy future food demands taking into consideration the water burden and the availability of food self-sufficiency in terms of the prevailing local economic, trade and environmental conditions.

The achievement of food security in the region actions should be taken for:

- promoting water efficient irrigation ("precision irrigation")
- promoting water efficient agriculture ("precision agriculture")
- promoting water re-use in agriculture, particularly drainage water recycling and urban-wastewater re-use.

Sectorial Water Use and Allocation Efficiency

In the region, there is argument now on the adoption of the principles of allocative efficiency which leads to the utilization of water first in the economic sectors which bring the best return to water – that is industry and service rather than agriculture – and secondly, within each sector, in the productive activities which generate sound economic returns, for example the production of crops which get a high price on world markets rather than those – such as sugar, wheat and rice – for which other producers have access to free or nearly free water. Such an approach does not create new water but it does provide a sound basis for both policy and practice in the utilization of the region's scarce water.

The possibility of gaining water from the existing systems to provide supplies for additional users in other sectors where higher economic and social returns exist, will be an increasingly important strategy but it has not yet entered the policies of national governments or water institutions of the developing countries in the region. Following the analysis of the traditional place of water in the economies and cultures of the region, such policies are difficult to adopt and deploy. For those who consider that new water is the only solution and that the political problems of re-allocation are insurmountable, the approach of re-allocation is not yet a relevant option. On the other hand, for those who consider that serving the interests of as many effective water users as possible is the major issue, the re-allocation of water will be a major feature of their future water policies. What is obviously needed is initiative and managing in terms of the solutions being put forward. In this regard, a much more controversial issue is how a society regards its water resource base and the use it makes of it. This depends, to some extent, on the overall level of economic development of an individual country. The more economically advanced a society becomes the more it needs to question its water resource policy.

Sharing the Waters

The transboundary water resources shared between the countries of the region or with countries outside the region constitute the majority of the water resources, both surface and groundwater bodies. The competing demands for water in the absence of conflict resolution mechanism may lead to severe consequences in the water scarce zone. Urgent actions are needed in this respect to promote basin-wide cooperation between the riparian states. This can only be achieved through recognition of the interests and the concerns of all the

riparian through comprehensive, integrated and environmentally sound water management of the entire water basin.

Water Programmes Implementation

Implementation means of the water programmes in the region at national and regional levels including funding, capacity building and human resources development are important issues that require particular attention. Existing water institutions need to be restructured to undertake multi-disciplinary functions.

National laws and regulations pertaining to the protection and development of water resources need to be elaborated and enforced. Supporting measures need to be undertaken to promote public awareness and participation, education, training and information systems. The mobilization of applied research centers, the scientific communities at national and regional levels and enhancement of the regions, science and technological capacity are important requisites to implement the water programmes for water resources development and management, particularly for addressing the future environmental threats to the integrity of these resources.

Concerning the interdisciplinary and inter-sectorial character of water resources problems, it is essential for the achievement of a sustainable development of water resources that adequate institutional framework for water resources management, be established in each region and each country. Water management can be rational only if the institutions responsible for such management are efficient.

Water resources challenges and the role of Ciheam/Iam - Bari

It is becoming clearer and clearer that continues and rapid growth in population together with socio-economic changes are exerting increasing pressure on policy-makers and on the public to find viable and realistic water management strategies that can deal with the following four issues:

1. How to safeguard water to meet basic needs for future uses;
2. How to minimize water losses;
3. How to re-use and allocate scarce water for desired socio-economic development;
4. How to protect the environment from degradation and loss of productive capacity.

The common requirements in all practical responses to the solutions of all these major issues must include greater investments, better institutions, more technology and expertise, and intensified cooperation. Aware of the above-mentioned challenges and based on past-experiences and accumulated knowledge in water resources sector, the CIHEAM Mediterranean Agronomic Institute of Bari has started in 1998, within the frame of the EU (DG I) Programme, the four-years Regional Action Programme on "Water resources management". This programme is mainly oriented to the sustainable use of water resources in irrigation sector emphasizing the following major issues (**Fig. 1**):

- Non conventional water resources practices and management for sustainable use;
- Water use efficiency;
- Management, optimization and performance analysis of collective irrigation systems;
- Participatory Irrigation Management (PIM);
- Economic aspects of water mobilization and use.

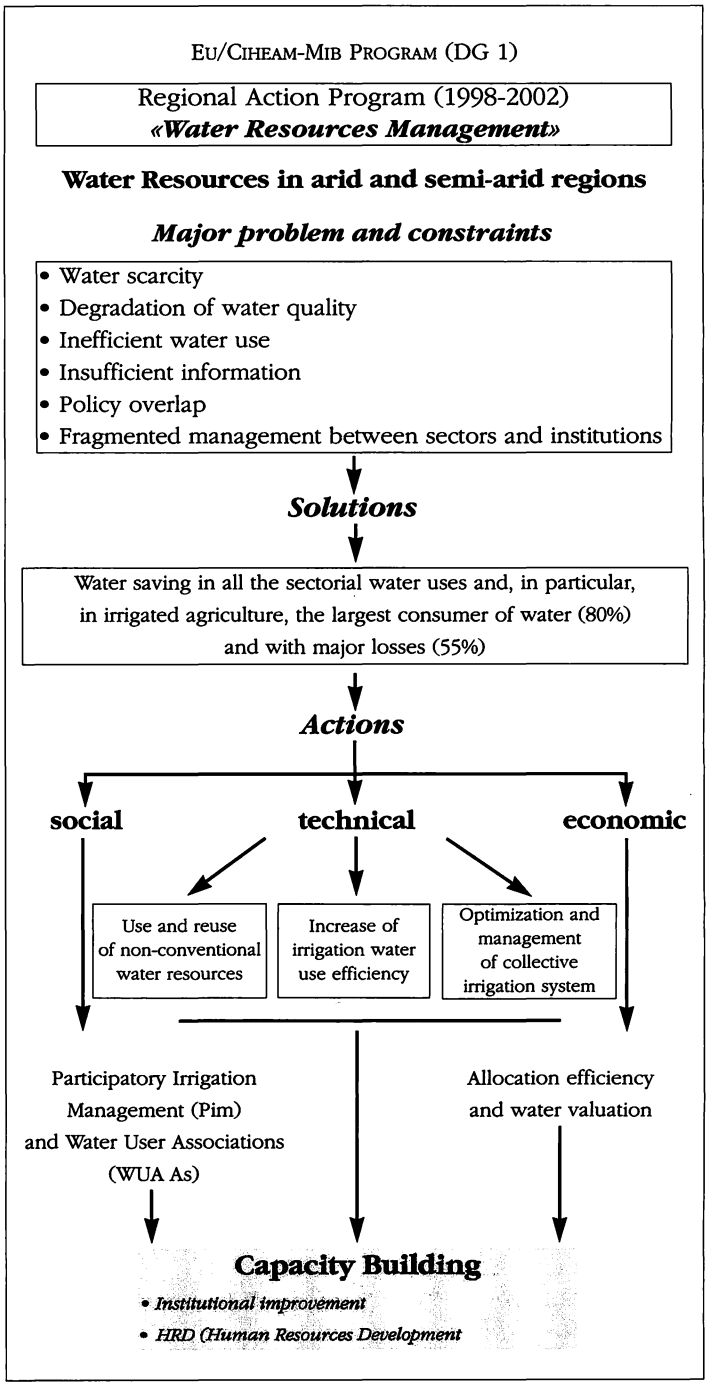

Figure 1 - EU/CIHEAM-MAI Bari Regional Action Programme (RAP).

The objectives of the programme are to improve the institutional capacities, the development of human resources strengthening regional co-operation, technology transfer and exchange of experiences between the Southern and Northern part of the Mediterranean through training, promotion of research, networks and communication of scientific and technical information in the field of water resources and irrigation based on the concept of "Centers without Walls".
The Regional Action Programme is realized in cooperation with many important universities and scientific institutions from both Southern and Northern Mediterranean countries, which emphasize the need for continues development of human potentials, education and public understanding as an essential element in a major international effort.
Particular weight is given to capacity building within national research institutions in order to increase the capability within individual countries to address issues of sustainable development with adequate attention to environmental constraints.
More emphasis is given to the socio-economic aspects of water resources management and this is carried out in tide cooperation with other CIHEAM Institutes and, in particular, with the Institute in Montpellier (France).
The role of Bari Institute in development and promotion of new strategies and actions for sustainable management of water resources in the Mediterranean region confirms the importance of international cooperation.
Combining international experience of countries with different levels of development may also be mutually beneficial as the developing countries can learn from the experience of the more developed ones, taking the lessons of their successes and failures, and the more developed countries have the opportunity to use their skills to help sustainable water resources development in developing countries.
For the foreseeable future, reining in demand and distributing water more equitably – between people and between nations, as well as between people and nature – offer the best hope for preventing scarcity from leading to more hunger and poverty, greater political and social instability, and more widespread ecological decline.
Efficiency gains can go a long way toward squeezing more out of the existing supply.
But water strategies alone will not be sufficient.
Living within the limits of nature's water supply will require reduced consumption among the more wealthy social groups and reduced family size among all groups and stepped up efforts to create the conditions needed for population stabilization.
It must be at the care of any successful strategy to achieve a sustainable and secure water future for all.

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