



International Center For Environmental Technologies
of Tunis (CITET)



INECO

Institutional and Economic instruments for sustainable
management of water resources in the Mediterranean Region

The deterioration of available Groundwater resources in Tunisia (CAP-BON region)

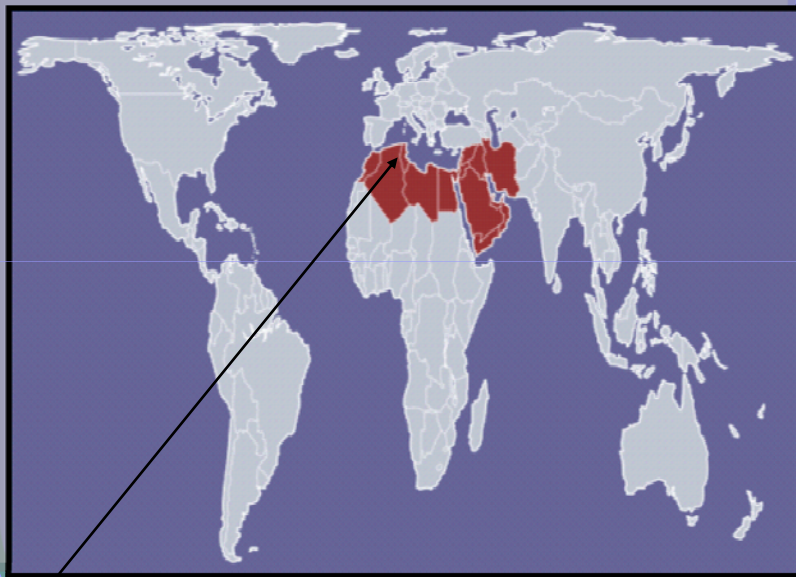
Tunisia case Study

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10/06/2009 Cyprus

WATER RESOURCES

Tunisia is located in the north Africa between Algéria and Lybia and situated in the southern rim of the mediterranean sea.

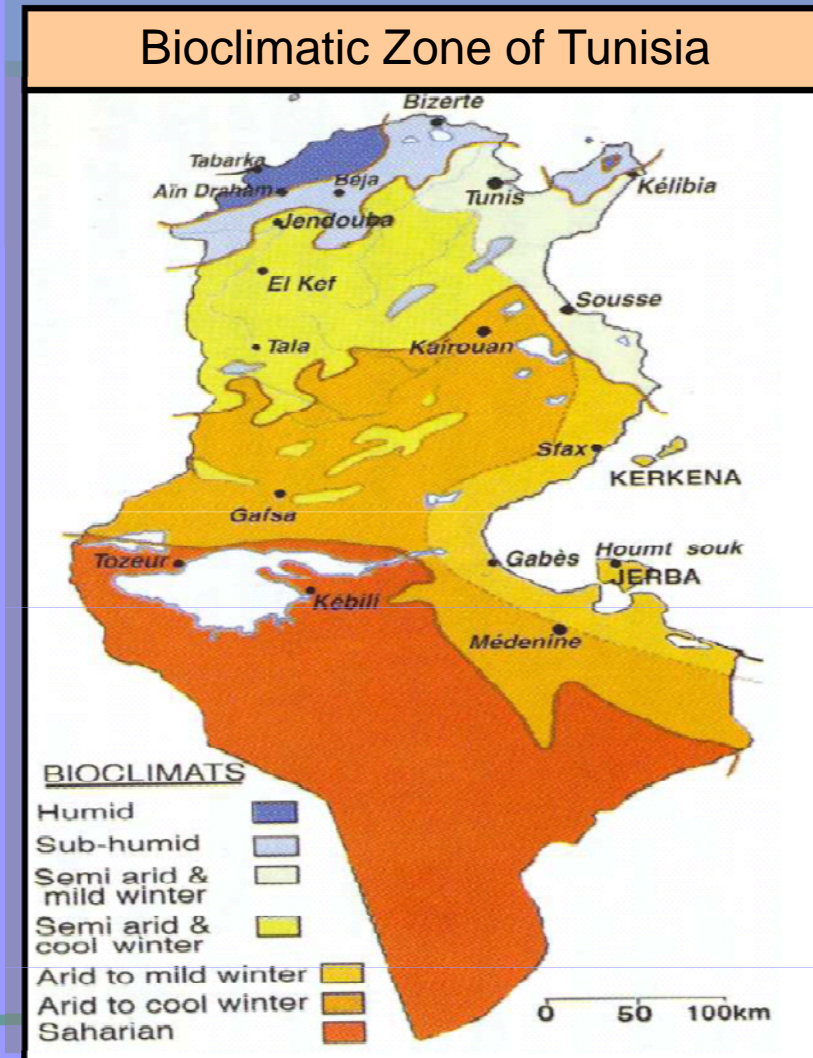


Tunisia

Year	2007
Population (millions)	9.91
Growth rate (%)	1,08%
life expectancy (years)	72,4
Water - mobilization rate (%)	87,93%
Forestry rate (%)	12,11%

WATER RESOURCES & Bioclimatic Zone

- Tunisia occupies 165.000 Km² with the atlas mountain range in the north accounting for 25 % of the area.
- It has a semi arid climate and few renewable natural resources.
- It has seven (7) bioclimatic areas
- Tunisia is one of the most drought-stressed countries in the middle East and North Africa region



WATER RESOURCES

The annual total volume of exploitable water resources in Tunisia is about 4670 Million m³ of which about 57 % is surface water and the remaining groundwater.

Rainfall:

– Tunisia received an annual average of 245 mm which is the equivalent of 36 milliards m³ of water. The annual rainfall varies from 1000 mm in the North to 300 mm in the South.

The last decade has known an implementation of a great and ambitious project for the mobilisation of water resources, their control and management that contributed to an increase of the mobilised water resources to 90 %

WATER RESOURCES

Surface water:

Surface water is estimated to 2700 Million m³ and represent 75,5% of the total amount of water.

This increase is due to the considerable effort made by the state in order to mobilized surface water as the construction of 27 large dams, 182 hills dams and 698 artificial lakes. 3176 boreholes, 130 000 wells and 93 natural water springs.



Groundwater :

- Groundwater is estimated to 2140 Million m³ and are classified as follow:
- Deep aquifer: 1400 Million m³
- Shallow aquifer: 740 Million m³
 - The number of boreholes reached 3780 deep boreholes and 130000 shallow boreholes and 93 natural spring.
- The excessive groundwater extraction in the coastal region has resulted in saline intrusion in many areas leading to unsuitable groundwater for further irrigation.

Tunisia, being arid to semi-arid country, is facing water shortage of increasing severity, Water scarcity problems are expected to intensify, as a result of population growth, rising living standards and accelerated urbanisation. Those drivers put significant pressure on available resources and on the agricultural sector, leading to a significant increase in water use and pollution.

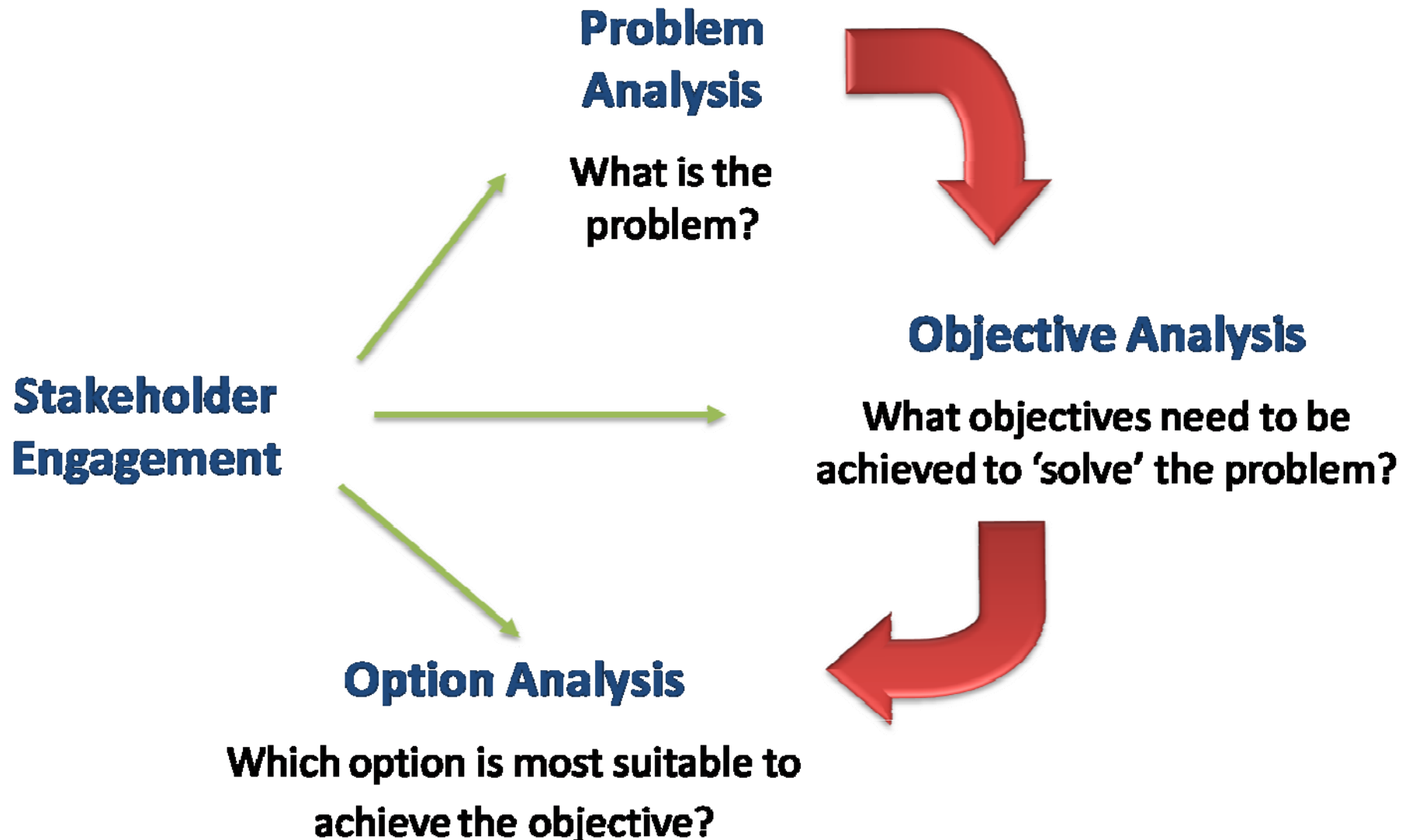
However, in spite of the considerable effort for water mobilization, which has played a dominant role in controlling water resources and attenuating the socio-economic impacts of droughts experienced during the last 15 years, farmers continue to overexploit phreatic water tables.

The average rate of exploitation is 106 %, Resulted in:

- **The gradual depletion of productive aquifers**
- **and increased salinity levels in coastal ones.**

**The deterioration of available
Groundwater resources in Tunisia
(CAP-BON region)**

in the above context, the INECO project team has decided to foster constructive dialogue on alternative institutional and economic instruments for better managing the focal problem selected in this project for Tunisia case Study which is based on:





The first workshop, open to all parties, was held on **May 8th 2007**, in Nabeul, 60 km from Tunis.

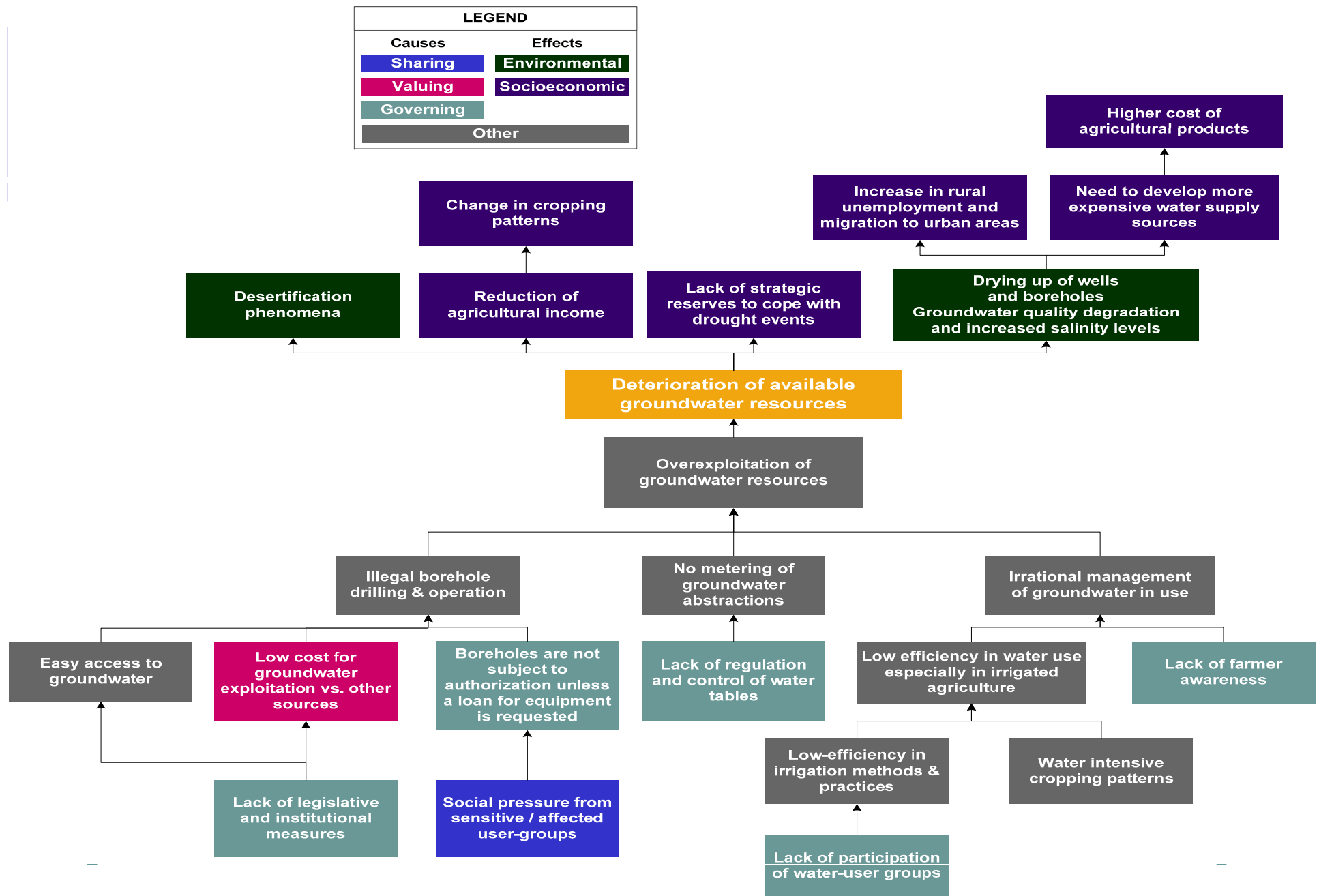
The workshop brought together 46 participants, including 15 decision-makers, 13 technicians, 5 farmers, 12 representatives of Agricultural Development Groups (GDAs), and 1 Media representative. Its main objective was to foster discussion and exchange of opinions and views on the focal water management problem of aquifer depletion.

Problem Identification

Causes and Effects:

A second workshop for “Building a common vision for managing groundwater resources in Tunisia” was held in Nabeul on December 6th 2007. Its primary aim was to further discuss the problem with the local stakeholders, through the development of a “Problem Tree”, qualitatively describing the causes and effects of the problem





Problem tree: Analysis of the causes and effects of the deterioration of available groundwater resources in Tunisia

Problem Identification

Causes and Effects:

As is described in the causes-effects tree the main problem causes are:

- Illegal borehole drilling and operation
- No meetring of groundwater abstraction
- Irrational management of groundwater in use

the main problem effects are:

- Reduction of agriculture incomes
- Desertification phenomena
- Lack of strategic reserves to cope with drought events
- Drying up of wells and groundwater quality degradation

Identifying instruments and priorities for problem mitigation

Seven (7) main policy instruments were discussed for addressing the problem; these were further ranked by the respondents of the survey, using a scale ranging from 1 (least effective) to 5 (most effective). These were:

- Option A:** Technical measures to enhance supply from alternative sources
- Option B:** Measures to increase efficiency in water use.
- Option C:** Economic instruments to promote water conservation.
- Option D:** Restrictions in water use in drought.
- Option E:** Landscape planning to increase water recharge.
- Option F:** Improvements in forecasting, monitoring, information and data sharing.
- Option G:** Stricter enforcement of legislation on abstractions.

Identifying instruments and priorities for problem mitigation

For the prioritization of suggested economic and institutional instruments a survey was conducted with stakeholders aiming to evaluate the feasibility and applicability of this instruments
Instruments and approaches that seemed to be most relevant and applicable comprise:

- **Decentralization of irrigation management**
- **Enhancement of regulatory approaches (stricter liability rules, command-and- control measures).**
- **Voluntary schemes are also considered pertinent and applicable**
- **Public participation**

Water pricing, as well as measures that would impose additional economic burden on water users are not favoured when compared to other soft approaches.



A Stakeholder Assembly Workshop was held at the premises of the Tunis International Centre of Environmental Technologies (CITET), in Tunis, Tunisia, on the 15th and the 16th July 2008.

The main aims of the INECO Stakeholder Assembly Workshop were to:

- Present and evaluate the outcomes of regional analyses on the applicability of institutional and economic instruments;
- Share, exchange and integrate experience associated with the application of solutions across the Mediterranean Basin;
- Assess the corresponding economic, environmental and social trade-offs; and
- Derive recommendations for enabling the effective implementation of proposed instruments.

The following slides present the suggested options for problem mitigation

- Regulation and control of groundwater abstractions

Easy access to groundwater leads to the drilling of illegal boreholes, which cannot be easily controlled by the relevant authorities. **regulation and control** can only be achieved indirectly by applying a mixture of

- Economic instruments, aimed at discouraging groundwater use;
- Institutional reforms, shifting responsibilities to communities and empowering them to manage groundwater exploitation and use,

Improvement of efficiency in irrigation water use

Encouragement towards water saving and change of cropping patterns, rationalization of water tariffs, efficiency improvements in hydraulic infrastructure are expected to become evident after 2010, through a decrease in irrigation water consumption. Furthermore, a change in the allocation of available supplies is to be expected, according to economic and social considerations.

Enhancement of the use of treated wastewater for crop irrigation

Wastewater reuse is considered extremely important in the effort to meet the increasing demand in agriculture, industry. However, reuse can only be possible and beneficial if: Specific standards are set for effluent quality, depending on the type of crop irrigated; Training of farmers and extensive awareness campaigning to improve acceptability both by farmers and the general public. Currently, the artificial recharge of overexploited water tables with treated wastewater has not been extensively developed.

Strengthening the overall socio-economic and institutional environment

The encouragement of community groundwater management is an option that is seriously considered both at the regional and national level. Efforts are being undertaken to promote the sharing of responsibilities and the participation of all users through the Agricultural Development Groups.

The real involvement of users in the decision-making process and in the day-to-day management, rehabilitation and maintenance of hydraulic infrastructures requires a long and resource-intensive process for building human and technical capacity.

Prerequisites for implementing prioritized options

A second survey was conducted with stakeholders aiming to identify prerequisites for implementing prioritized options the main results were:

- **Water conservation in irrigated agriculture**

- The need to encourage different cropping choices.
- The need for integrating approaches for sustaining the agricultural sector, while at the same time preventing further degradation of water resources.

- **Incentives for water saving**

The increase of water tariffs and the levying of taxes, as means to raise revenue for supporting technology shifts, receive limited acceptance from the majority of stakeholders; it is obvious that there is much concern over the affordability of water-related charges, as well as strong belief that all efficiency improvements should be financed through other sources of funding

Prerequisites for implementing prioritized options

- **Phasing out of low-value water use in stressed areas**

Half of respondents indicate that the offer of compensation would be a suitable incentive for mitigating water stress issues. On the other hand, responses with regard to the setting of water charges portray a significant opposition against free market operations.

- **Regulation of groundwater abstractions**

Almost 90% of interviewed stakeholders underline the pertinence of potentiating command-and-control regulatory measures.

- **Cost recovery and cost sharing issues**

The majority of stakeholders considered that allocation based on quantities used by the different users would be the equitable way of allocating costs, it is generally believed that some uses (e.g. tourism or industry) should be charged more than others, taking into account their increased ability to pay

Prerequisites for implementing prioritized options

- **Framework for water management and water service provision**

The involvement of the private sector is rather well received; given current efforts and initiatives for the re-organization of the two main public water service providers, there is good evidence that the enhanced contribution of the private sector would facilitate capacity building, technology transfer and enhancement of the efficiency of water management operations

- **Public involvement and participation**

common view that current efforts need to be strengthened. Approaches range from enhancing the involvement of the general public and water users, to the strengthening of the role of NGOs in pursuing inclusive processes and to awareness campaigning and reinforcement of civic responsibility.

Conclusion

The approach adopted by the INECO project for dealing with the water stress problem, and the steps followed in the elaboration of cause-effect and objectives trees, have contributed to an in-depth analysis of the issues at hand.

The participatory process adopted through targeted surveys and stakeholder workshops enabled the open exchange of ideas and solutions among persons who encounter water stress and groundwater management problems on a day-to-day basis; it also offered alternative perspectives of the problem, based on the elaboration of real solutions and options that can be useful, applicable and acceptable for determining suitable strategies for the mitigation of the problems faced.

It is generally perceived that recommendations derived by INECO can contribute to the mitigation of the deterioration of groundwater resources, particularly in the Cap-Bon region, provided that authorities commit to the implementation of the necessary changes and that public participation and community management of resources are encouraged through capacity building initiatives and empowerment of water users.

THANK YOU

