INECO

ASSEMBLY WORKSHOP

CITET 15- 16 July 2008

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

Tunisia case Study

Tunisia

- ✓ Tunisia occupies an area of 163.900 km²
- ✓ The population is 10 millions
- ✓ The average altitude is 700 m,
- ✓ Tunisia is divided in 7 River Basin Districts, and 25 governorates
- ✓ The average rainfall ranges from less than 100 mm/yr in the south to more than 1500 mm/yr in the northern part of the country

Physical characteristics

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. These drivers put significant pressure on available resources and on the agricultural sector, leading to a significant increase in water use and pollution loads.

Hydraulogical balance

Natural water resources in Tunisia are relatively limited and equal to at 4.670 million m^3, of which 4.100 million m^3 are considered exploitable. The ratio of available water resources per capita had been estimated at 450 m^3 in 1996 and will decrease further to 315 m^3 in 2030. Thus, the country is considered one of the poorest countries in terms of natural water resources.

In 1996 total water demand was estimated at 2.528 million m3 and is expected to follow a tremendous and continuous growth. It is estimated that in 2010 exploitable resources will be equal to 4.600 million m3, whereas water demand is projected at 2.689 million m3.

Water Management issue

In the above perspective, policy makers have been compelled to develop additional resources and to take measures in order to preserve existing ones.

Currently the main components of the National Water Ressources Management strategy are surface water mobilization, soil and water conservation works, water harvesting, and use of non-conventional water resources, such as reuse of treated wastewater for crop irrigation and aquifer recharge.

Water Management Issue

Demand management: constitutes an important axis of futur water policies with the overall aim of controlling the consumption of the diffrent sectors, and in particularly that of agriculture which is the largest consumer.

Although at present the country does not experince extreme water shortage, there is an increasing pressure on available resources due to accentuated droughts, pollution problems and over-exploitation of resources, which render difficult the current decision-making precesses with regard to water management.

Therefore, there should be a better understanding of these phenomena and promote the use of non-conventional water resources in order to meet potable water demand in deficient regions and the exploitation of additional resources for the development of economic sectors, and especially agriculture

Water Management Issue

In this regard, Tunisia has engaged since 1990 an ambitious program for the exploitation and management of natural and non-conventional water ressources, At the end of 2002, the main water resources comprised 27 large dams, 182 small dams, 650 artificial lakes, 3.176 boreholes, 130.000 wells and 93 natural water springs.

Inter-bassin transfer is performed between northern regions, towards the coast and from the western to the eastern part of the country. Transferred water is primarily used for domestic and irrigation purposes.The conveyance network for inter-basin transfer is approximately equal to 30.000 km

Water Management Issue

In the most important water use is irrigation, wich uses 80% of the country's available resources.

The irrigated area is estimated at 400.000 hectars, whereas irrigation demand is actually estimated at 2.120 million m3. Irrigation water supply originates from large dams, boreholes and wells, and wastewater treatment plants and is managed by the CRDA's and development groups.

Domestic water demand concerns urbain, rural zones, as well as water sources in the Sahara and at present is estimated at 350 million m3/yr . Water supply is provided by SONEDE and the regional public services (CRDAs and Development groups in the rural zones).Industrial demand corresponds to 120 million m3/yr and tourism demand's is estimated at 30 million m3/yr, both are supplied by SONEDE

Water Management Problem

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 %, a fact that has resulted in the gradual depletion of productive aquifers and to incresed salinity levels in coastal ones.

Water Management Problem

The problem selected for Tunisia case Study is: Aquifer Degradation and Groundwater resources over exploitation: Which is mostly due to uncontrolled abstractions for irrigation purposes and the inadequacy of the presently applied alternatives and discincentives to groundwater overexploitation, the problem is further exacerbated by the lack of technical capacity in the agriculture sector, the limited application of water saving methods in irrigation and the current water-intensive cropping patterns.

Water Management Problem

Ground water resources of Tunisia are estimated in the year 2000 at 740 million m3 exploitable resources through equipped wells represent 106 % of the available resources. They were developed during the last 20 years, they are actually estimated at 780 Mm^3 while they were 395 Mm^3 in 1980 with an evolution rate of 97 %

Water Management Problem

- Goundwater exploitation is mostly used through surface wells and boreholes;
- The number of surface wells is estimated at 128400 in the year 2000 while it was 60415 in 1980.
- Equipped wells are 86965 units (authorized)
-The north- East region of the country is the biggest user of groundwater : 350 Mm^3 year which correspond at about 45 %.

Water Management Problem

Indicators relevant to the problem:

-Ground water resources of Tunisia are estimated in the year 2000 at 740 Mm3

-Distrubution of aquifer: 273 water tables

-12 water tables with salinisation < 1.5 g/l and a potential of 22,5 Mm3 /year: this represents 3 % of the national resources.

- 47 water tables with a salinisation < 3 g/l and a potential of 98,5 Mm3/year: 13 %.

-92 water tables with a salinisation: 3- 5 g/l and a potential of 300 MM3.

-122 water tables with a salinisation > 5g/l

Water Management Problem

Indicators relevant to the problem:

71 groundwater tables are exploited at a rate of 146%, renewable resources of theses water table are evaluated at 385 Mm3 which represents more than 52 %of the total renewable resources;

At this ruthm of exploitation, these aquifers will have a pollution and esploitation resources risks

However, desertification indicators were observed in the north east region which registered an overesploitation of the aquifer, high salinisation of groundwater.

Water Management Problem

STAKEHOLDERS ANALYSIS

Ministry of Agriculture and Water Resources, which undertakes all tasks related to water resource management and exploitation. The Ministry controls 11 institutes responsible for the assessment, monitoring, exploitation, distribution and evaluation of water resources and the construction, operation and maintenance of water works.

Ministry of Public Health, through its central and regional services is responsible for monitoring the quality of potable water and treated wastewater used for irrigation, in order to prevent and eliminate water-related diseases and epidemics.

Water Management Problem

STAKEHOLDERS ANALYSIS

Ministry of Environment and Sustainable Development, which undertakes through its 3 institutions (ANPE, ONAS and CITET) all tasks related to water pollution and quality.

Ministry of Technology and Communication, which controls the National Institute and Meteorology, responsible for the monitoring of meteorological, oceanographic and seismic data.

Ministry of Scientific Research, which controls the Research Centre on Water Technologies and the Arid Regions Institute.

In addition there is 1400 consumers associations, 570 farmers associations and 70 mixed groups.

Water Management Problem

Legislation

Water in Tunisia is considered as a patrimony such as defined in the code des eaux (law N° 75 –16 of 31 march 1975) where at the first chapter level, water is considered as hydraulic public domain and as an offered natural resource, its use should respect the national management rules of the national natural patrimony

Water regulation regulation in Tunisia started since 1885, but the main law which is applied in all the territory up to now is the law N° 75-16 of march 31, 1975 which consists of 9 chapters and 160 articles and focuses on water resources management mobilization, conservation protection and exploitation.

Water Management Problem

Legislation

One of the main chapters of code des eaux is chapter 7 which comprises 46 articles addressing the issues of pollution and flood control. Water pollution prevention is effected through the prohibition of liquid and solid waste discharges in water bodies, the establishment of protected areas in the vicinity of water supply sources and the obligation for wastewater treatment in urban areas.

Water Management Problem
Legislation

In terms of flood protection, the "waters regulation" requires the construction of infrastructure by the government, development groups of public interest or by individuals.

It should be noted that article 106 of chapter 7 regulates wastewater reuse in agriculture, setting the appropriate quality standards and the crops that can be irrigated with treated effluent.

Water Management Problem

Governing Problems

Despite the Institutional setting which we consider well organised, but some governing problems in ground water resources management still exist such us:

-Lack of regulation and control

-Illegal boreholes drilling without autorisation and extraction permits

-There is a need to reinforce the participatory management approch, notably through GDA's.

-Abstractions are not metered, mostly due to social and political pressure.

Efforts for problem Mitigation

Management of water level decline through:

a) Optimisation of monitoring and measurement (Network of piezometry and quality of Tunisia water tables) realized by 3602 safeguarding constructions of 3 categories:

- 2314 surface wells
- 1221 piezometers
- 67 boreholes

b) Instauration of safeguarding perimeters and interdiction of water tables.

c) Practice of artificial recharge in excedent conditions.

Efforts for problem Mitigation

Ground water Vulnerability :

The ministry of agriculture and hydraulic resources is aware of this problem and in order to reduce the effect of pollution by solid or liquid dismissals in the vulnerable ground water tables, some measures were taken into consideration notably:

- Safe guarding water ressources quality
- Establishing vulnerability maps of water tables to potential pollution sources.
- Survey of main hydrous pollution sources and putting in place a national network of safeguarding hydrous pollution.

Efforts for problem Mitigation

ANPE from the ministry of environment and sustainable Development is conducting actually a study about the vulnerability of most important aquifers of Tunisia.

Efforts for problem Mitigation

Ground water saving:

Starting from the importance of water and its rareness in Tunisia, many measures of capacity reinforcement were taken. In fact, the national program of water saving in irrigation which benefited of many measures of support and important financial incitements, taken in conformity with the legal frame instaured since 1995, which foresees to grant an investment bonus for using water saving techniques in irrigation.

This bonus vary from 40 to 60% of the global cost of investment according to the agricultural exploitation size, the climatic zones and the crop nature, A 10 % reduction on the equipement value and the suppression of the added value tax (TVA) and the cosumtion rights are also foreseen by the national code of invedtment

Efforts for problem Mitigation

Waste water treatment and reuse:

Tunisia has sewerage network of 12771 km and 98 waste water treatment plants. The volume is estimated actually at 201 Mm3/year it will be 260 Mm3 in 2011 and 480 Mm3/year in 2030 which represents 10 % of the mobilized conventional resourcesActually, only 32 % of the available volume is reused in agriculture.

Efforts for problem Mitigation

Artificial recharge of ground water tables:

The artificial recharge groundwater operation is one of the components of our national strategy of water resources mobilisation.

Since the beginning of this strategy(1992-2003) the volumes of water injected in the groundwater tables are estimated at 387 millions m3.

The main sources of water utilized to recharge groundwater tables are dams and treated wastewater.

The volume injected in the groundwater tables in 2003 is estimated at 43.2 millions m3.

Efforts for problem Mitigation

Groundwater extraction monitoring :

Some measures were put in place aiming to reinforce groundwater extraction monitoring such us:

-Means and instruments were provided to stakeholders for better water resources management.

-Instauration and putting in place a planning and hydraulic equipement bureau at the ministry of agriculture and hydraulic resources

-Evaluation of resources monitoring (networks optimization, improvement of telemeasurement system, GIS…)

-Execution of water tables strategy (data base GIS and numeric models, prototype of integrated management of phreatic water tables…)

-Pilot project of associative management of water demand for irrigation (participatory management approch)

-Control of the hydric pollution and treated wastewater reuse….

Efforts for problem Mitigation

Sustainable and Developed Grounwater Yield :

Aiming to attain the objectives of sustainable and developed ground water yields, many measures are undertaken such as:

a) The implementation of reviewed and detailed water researches work plans an the basis of recent studies » water saving 200 (1995) and water sector (1999)

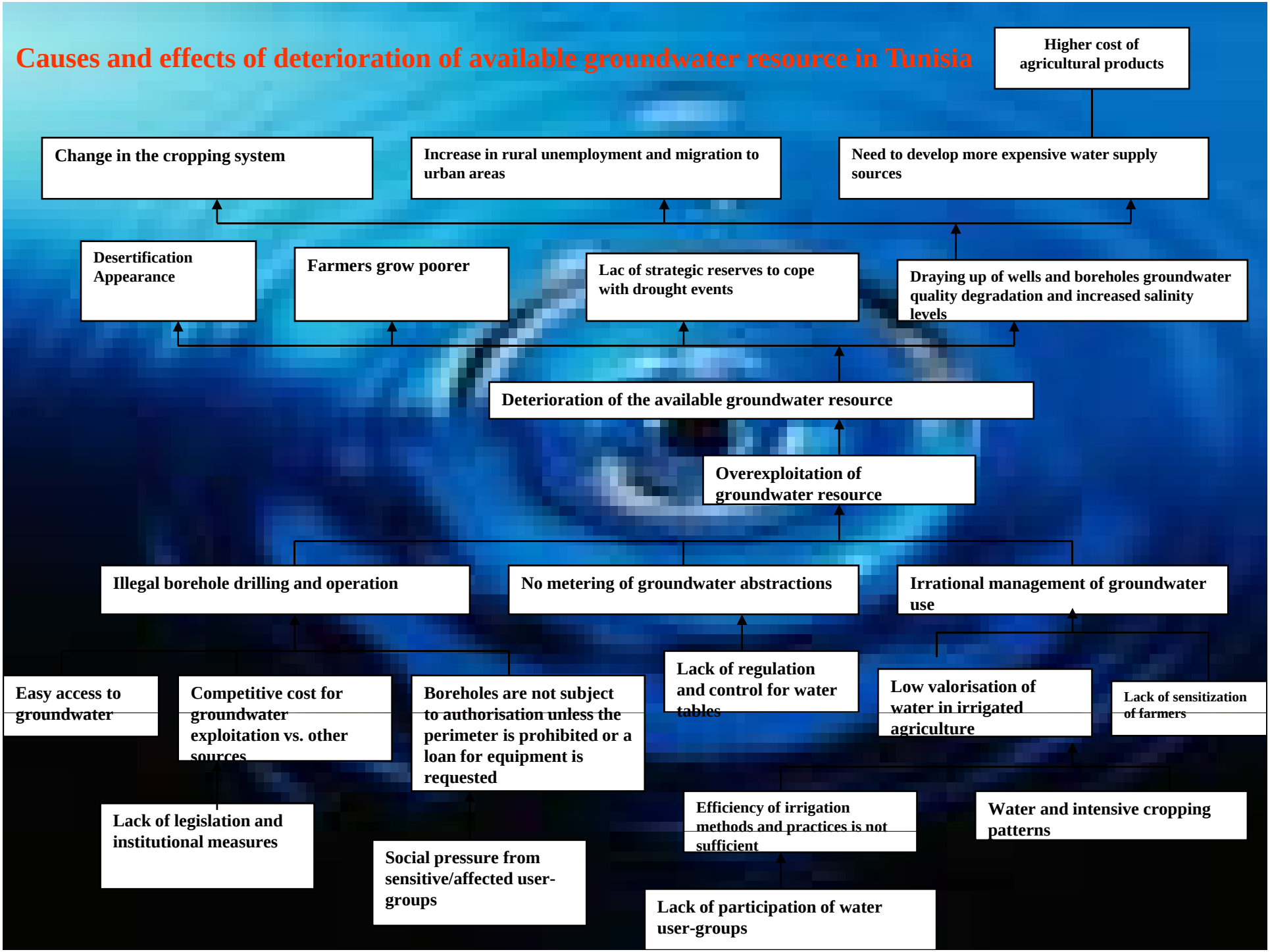
b) Elaboration, adoption and implementation of water resource management programs.

c) Putting in place a national network of safeguarding and monitoring groundwater resources.

INECO Participatory process and its outcomes:

Analysis of the problem

Causes and effects of deterioration of available groundwater resource in Tunisia



INECO Participatory process and its outcomes:

- Analysis of the problem

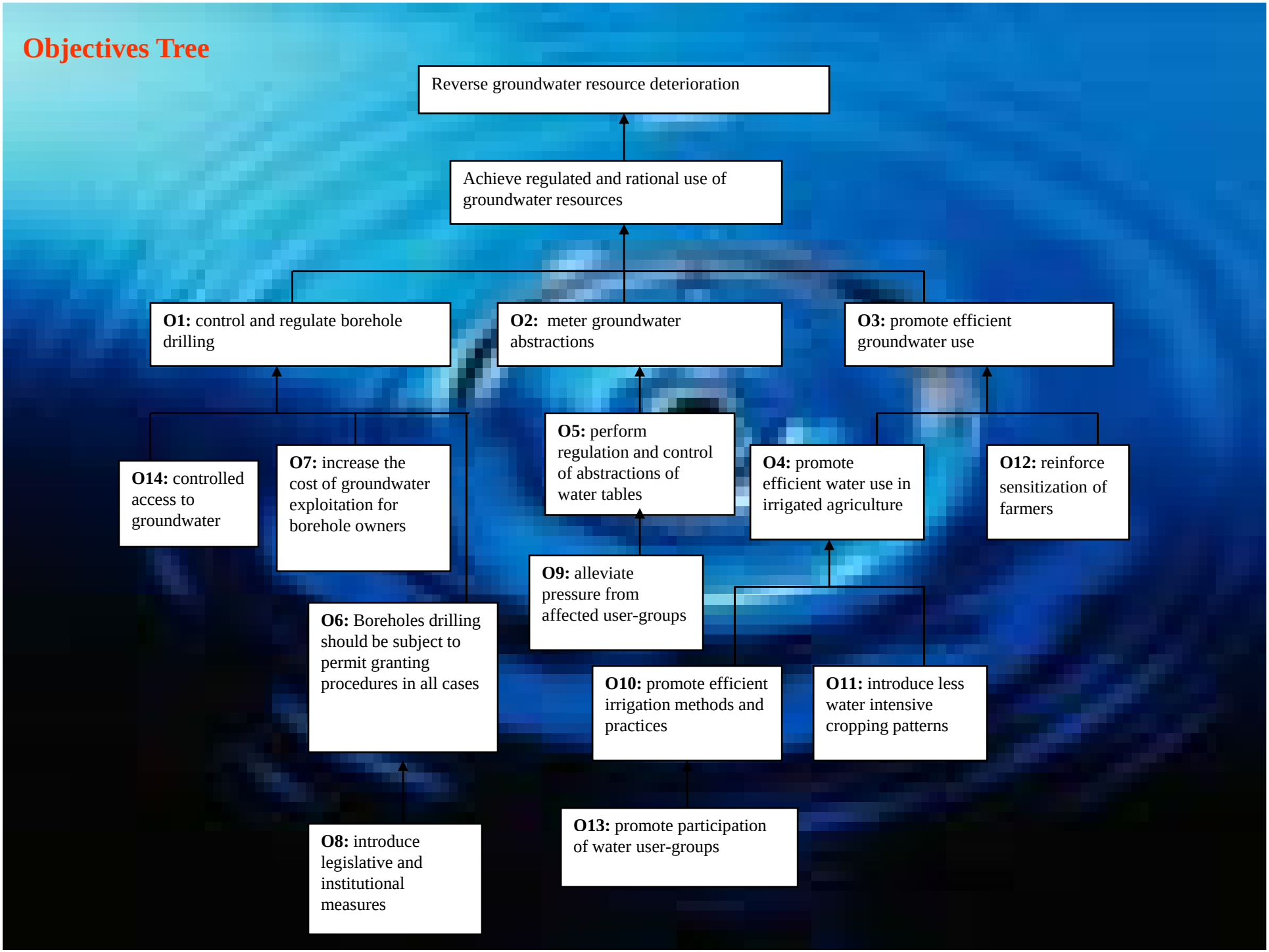
According to the problem tree the main (primary) cause of aquifer degradation is the overexploitation, wich is a result of:

- The operation of illegal (unauthorized) boreholes, whose operation is not monitored;
- The current irrigation practices and agriculture development patterns (low efficiency of irrigation methods, selection of low-value, water intensive crops
- The lack of meetering in groundwater abstractions.

INECO Participatory process and its outcomes:

Key possible objectives

Objectives Tree



INECO Participatory process and its outcomes:

- 2 key objectives are distinguished:

a) Reversing the availability of groundwater resources.

b) Rationalizing groundwater use through :

- Control and regulation over borehole drilling.

- Metering and regulation of groundwater abstractions

- Promotion of efficient groundwater use, especially in irrigated agriculture.

INECO Participatory process and its outcomes:

- Alternative options:

A set of proposed institutional and economic instruments (options) for the Tunisia Case study. Was drawn on the basis of the identified deficiencies and on international experience. Six categories of options were formulated for aquifer degradation:

-Category A: Options to control groundwater abstractions;

-Category B: options to enhance efficiency in irrigation water allocation and use, and thus reduce groundwater abstractions

-Category C: options to enhance the use of treated wastewater for crop irrigation.

-Category D: options to promote aquifer recharge with trated wastewater

-Category E: options to strengthen the socio-economic and institutional environment (enhance coordination and integration of policies and among institutions involved, develop collective management systems and enhance public involvement)

-Category F: options to improve the knowledge base on groundwater

Evaluation of options by local stakeholders :

questionaire INECO.pdf

INECO Participatory process and its outcomes:

- Analysis of suggested options:

Control of groundwater abstractions:

- Groundwater abstractions (Public and private) are monitored by the CRDA at the regional level.

- Inventory of groundwater abstractions points exist by ground and undergound water table.

- Groundwater abstractions authorisations are offred by CRDA if less than 50 m of depth if more than 50 m of depth, authorisations are offred by the ministry of agriculture.

- There is no limits of depth unless groundwater resources are limited .

INECO Participatory process and its outcomes:

Enhance efficiency in irrigation water allocation and use:

- Many forms of assistance for those who use water saving techniques.

- 70 % of public irrigated shemes are equiped with water saving equipements

- Strategic crops are compensated up to 1500 m3 of water per HA is provided free of charge. Prices of cereal are in continuous increase.

- Information and sensitization compains are reinforced.

After 2010, a decrease in irrigation water consumption will be observed as a result of practiced water saving (through the incitement of water saving techniques, tarrif rationalization, hydraulic networks efficiency improvement, incitement of less water consumer crop varieties….) or by reallocation of distributed volumes according to the resource valorisation degree by the different sectors of water use.

INECO Participatory process and its outcomes:

Increase the use of treated waste water for crop irrigation:

- The course to TWW constitutes an important to satisfy some of the needs of agriculture, Industry and Tourism sectors when conventional can not respond to all demands.

-Considering the urban development and the territory management, the volume of TWW will be estimated in 2030 at 480 Mm3/ year which represents 10 % of the total mobilized resources, and will allow the irrigation of 100.000 HA. This reuse can not be possible only if specific and benefical tratment for the environment and the national economy is undertaken.

-To insure the collectivity sanitation, the safeguard of environment equilibrium, the exploitation of these resources should be operated according to specific legislation besed essentially on the result of studies and extensive research in this domain.

INECO Participatory process and its outcomes:

Promote aquifer recharge with treated waste water :

- Artificial recharge with TWW did not developed and it's estimated actually at 1% of the total water used for recharge of aquifers.

-The quality of TWW should be improved by a tertiary treatment to avoid all risks of contamination.

INECO Participatory process and its outcomes:

Stengthen the socio-economic and institutional environment:

-Participation in decision-making:

- There is a need to reinforce the responsabilization and the participation of all users and the different local stakeholders, notably through the agriculture development groups (GDA's) in matter of water management and to really implicate them in the dicision making process, the rehabilitation and in the maintenance of hydraulic infrastructures.
- Reinforce sensitization, education and capacity building of all users.
- Foresee the development of institutional instruments for wide coordination between concerned organisms.

-Water demand:

Water demand is growing, and there's a need to manage cerefully this grouth.

-Tarrif regulation: Provision of potable water and water for irrigation of strategic crops should be respected. In this regard tarrif regulation and water pricing is an important issue.

- Legislative measures inciting the creation of agriculture development groups need to be improved.

INECO Participatory process and its outcomes:

Meeting and workshops, participation of stakehoolders:

-Participation in decision-making:

• 5 meeting with the main stakeholders were held since the begining of the project: 2 in CITET and 3 in Nabeul: the objectives were:

-Information and elaboration of the inception phase report

-Discuss the focal problems and select the most important one.

-Review both the instruments proposed and the evaluation framework for our case study.

-Elaboration of the questionnaire related to the evaluation for the feasability and applicability of economic and institutional instruments for adresing the problem.

-Elaboration of the checklist on currently applied and potential institutional and economic instruments for Tunisia case study.

-2 workshops were held in Nabeul:

- The first one was held on 8 May 2007 which gathered 47 participants to discuss and exchange opinions about Tunisia case study.

-The second one was held on 6 and 7 decempber 2007 and brought together 49 participants and aimed to develop a process towards constructively engaged integrated water resources managements.

Proposal For improved water management:

1- Management and recharge of aquifers:

- Manage water tables in a shared process.
- Instal meters on wells in order to measure the quantity of water extracted.
- Take profit from surface water to recharge aquifers in the winter season.
- Establish a management organism of recharge devices

2- Improve TWW quality:

-Practice a more efficient control of industrials dismissals.

-Develop institutional measures for a large coordination between various stakeholders.

-Reinforce capacity building and sensitization of users for a rational control of TWW reuse .

3- Surface water Management and water saving control.

-Better management of water values for a maximal exploitation.

-Equip public irrigated shemes with an appropriated water saving equipments.

-Up-grading, consolidation, and reinforcement of GDA means.

Proposal For improved water management:

4- Other proposals

- Unify the tarrif of irrigation water

-Continue the mobilization of water ressources not mobilized yet.

-Reinforce soil and water conservation works.

-More preoccupation of piloting irrigation and water valorization on the economic level.

-Draw farmers interest vis à vis of collective management.

-Better manage droughts and floods

-Bringing scientific research results closer to GDA's

-Apply the agriculture map.


THANK YOU FOR YOUR
ATTENTION