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INECO

Specific Measures in Support of International Cooperation (INCO)- Mediterranean Partner Countries (MPC)

INECO

Institutional and Economic Instruments for Sustainable Water Management in the Mediterranean Region

Coordination Action

DELIVERABLE NO 6

PROCEEDINGS FROM THE REGIONAL WORKSHOPS

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Preface

This document presents the main outcomes of a series of workshops organized by INECO within the framework of WP5 of the project (Stakeholder Workshops and web forum). These events were a crucial step in the overall effort undertaken by INECO, to promote the establishment of multi-stakeholder fora and enable a constructive dialogue process on what the real water management problems are and how these could be addressed in a desired and commonly agreed (integrated) water resources management situation. Furthermore, the workshops aimed at strengthening the alliance among the members of the project team and local stakeholders, and provide a platform for the exchange of knowledge and ideas on problems currently faced by local decision-makers and water users.

In total, 7 regional workshops were held, one in each of the Case Study countries of INECO, Cyprus, Tunisia, Egypt, Lebanon, Syria, Algeria and Morocco, as follows:

- "Building a common vision for mitigating water pollution in the Dakahlia Governorate" Mansoura Children's Hospital, Mansoura, Egypt, July 21st 2007;
- "Building a common vision for mitigating water pollution in the Barada River Basin" Sheraton Maaret Saydnaya, Damascus, Syria, September 10th 2007;
- "Building a common vision for managing water resources in the Damour River Basin" Mechref Country Club, Damour River Basin, Lebanon, September 12th 2007;
- "Building a common vision for managing groundwater resources in Cyprus" Coral Beach Hotel, Pegeia (Paphos), Cyprus, October 26th-27th 2007;
- "Building a common vision for managing groundwater resources in Tunisia" Kheops Hotel, Nabeul, Tunisia, December 6th 2007;
- "Protecting the Seybouse waters from pollution" Annaba, Algeria, January 19th 2008.
- "Irrigation water use in the Oum Er Rbia Hydraulic Basin", Afourer, Morocco, March 21st 2008.

In this regard, this Deliverable presents the overall approach of INECO for discussing shared problems across the Mediterranean Basin and the tools used to enable the initiation of dialogue on the significant water management challenges faced. Furthermore, it elaborates on the specific methodology adopted for the regional workshops, and presents their main results with regard to the Case Study development process of the project. Finally, a comparison of the main outcomes of the events is undertaken, with the aim to evaluate the implementation of the overall process at the regional level. The appendices to this document contain material from the individual regional workshops (full workshop reports, lists of participants, processed stakeholder questionnaires from the web and workshop surveys and the programme and fliers of the events.

The Deliverable was compiled by the International Office for Water on the basis of material and inputs received from the following INECO Partners:

- National Technical University of Athens, Greece
- Aeoliki Ltd and the Water Development Department of the Ministry of Agriculture, Natural Resources and the Environment (Cyprus);
- The Tunis International Center for Environmental Technologies (Tunisia);
- International Consultants – Egypt (Egypt);

- Conseil et Développement s.a.l (Lebanon);
- Studies and Integration Consulting (Syria);
- Agence de Bassin Hydrographique Constantinois-Seybousse-Mellegue (Algeria);
- ISKANE Ingenierie (Morocco).

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1 Introduction

1.1 The INECO Case Study development process

1.1.1 Methodology overview

INECO is a Case Study-driven project. The development of Case Studies on alternative institutional and economic instruments is primarily aimed at the adaptation of existing research efforts and results to cope with local water management problems by promoting the understanding of:

- The overall institutional and socio-economic environment that shapes water management policies;
- The reasons (barriers, inefficiencies, etc.) why effective solutions to existing problems have not been implemented, although they are well-known.

The overall process for the development of Case Studies is undertaken in three phases, presented in Figure 1:

- **Phase 1,** completed in the 1st year of the project**,** addressed the *"Situation, Problem and Stakeholder Analysis"* in each of the Case Studies. The focus is on the elaboration on one (or more) water management problems related to "governing", "sharing" and "valuing" water, described above in national water policy formulation, river basin management and the provision of water services.
- **Phase 2**, "*Formulation of alternatives and evaluation of proposals*", includes the development of alternatives, and their formulation into proposals. Alternatives and proposals are extensively discussed and evaluated at both the project and stakeholder levels.
- Finally, in **Phase 3,** planned for the third year of INECO, the "*Synthesis of results*" will be developed, in the form of policy recommendations derived from the integration of the different regional findings and the developed problematique, into a framework of adaptable guidelines on the application of institutional and economic instruments.

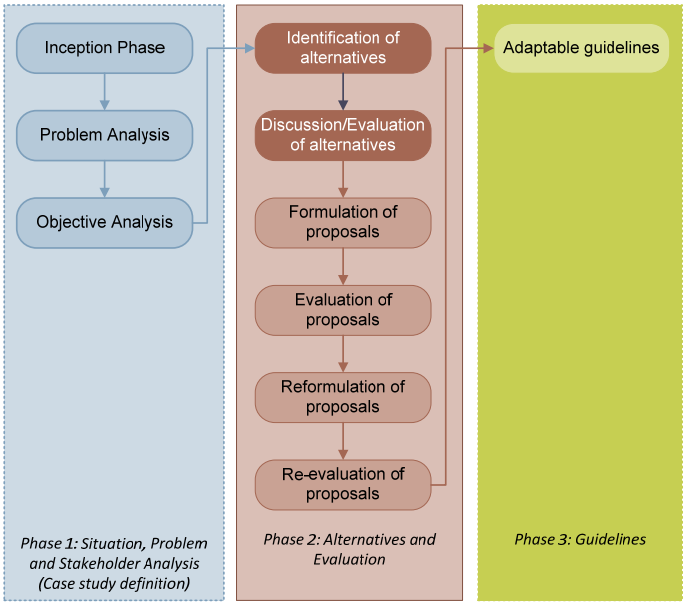


Figure 1: The INECO project phases

In this section, emphasis is placed on the methodological steps that are directly related to the implementation of Phases 1 and 2, as it is the activities in these Phases that shape the INECO Case Studies and define the scope of the Regional Workshops and activities. In more detail, the development of Phase 1 involved:

- The Inception stage of the project, where a first identification of significant water management problems was undertaken. Additional outcomes concerned:
  - A first (fast-track) identification of the current institutional and economic setting.
  - A preliminary identification of stakeholders, who will form part of the local Stakeholder Forum in each region.
- The "Problem Analysis" step, where identified problems were further analysed in terms of (a) causes, (b) effects (Impacts), and (c) current or past water management policies, aiming to address these problems, and lessons learned from their implementation.
- The "Objective Analysis" step, which aimed at elaborating on the selected water management problem, through the:
  - Identification of the specific inefficiencies of the current institutional and economic setting, which are directly or indirectly related to the problem. These inefficiencies should expand to the three functional levels analyzed within the project, i.e. constitutional, organisational and operational.
  - Preliminary formulation of objectives for the analysis, through stakeholder analysis and participation.
  - Selection and potential adaptation of the indicators reviewed within WP 4. Indicators should be relevant to the causes and effects of the problem analysed and adapted to the overall regional/national context.

For the "Formulation of alternatives and evaluation of water management proposals" (Phase 2), the overall methodology is structured along the following steps:

- "Identification of alternative options and formulation of proposals", which involves the selection from the wide range of instruments considered applicable, those that can be most suitable for the achievement of one or more of the objectives set for problem mitigation. As some options require additional (supporting) measures for their implementation, prerequisites are also specified and can form part of a proposal for the mitigation of the focal problem of each Case Study.
- "Discussion and evaluation of options and proposals", which involves a first, fast-track screening of suggested options in terms of feasibility and applicability. Feasibility depends on the timeframe for the implementation of an option and on the resources required (financial, human, technical etc.). Applicability depends on the already established institutional and socio-economic environment (perceptions, policies, laws, regulations etc). Then, and on the basis of this first evaluation outcomes, a more comprehensive evaluation is undertaken, on the basis of a set of generic criteria drawn from the IWRM "headlines", i.e. Environmental Sustainability, Economic Efficiency, and Social Equity.

It becomes clear that the overall process described above is strongly based on the participation of stakeholders; stakeholders are those who identify problems, discuss solutions on the basis of the proposals made by the INECO team, and consider, evaluate, accept or reject options

according to their particular interests and knowledge. This process is developed in an open, two-way discussion, to ensure that all contributors have an understanding of the issues at stake, and of the way that other participants perceive problems, objectives and instruments, in order to further identify trade-offs and draw policy recommendations.

In this regard, the following paragraphs describe in more detail the tools and methods that are used by INECO for fostering this process and the particular methodology developed for the regional workshops, which are the theme of this report.

1.1.2 The approach for discussing shared problems

Overview

The INECO approach towards the development of a participatory process for discussing alternative institutional and economic instruments for addressing water management issues is Objective Oriented Project Planning. The method, which is similar to the Logical Framework Approach, has been suggested as a tool to support urban participatory decision-making. In INECO, this method has been used as a tool to frame discussions with stakeholders, focusing on a water management problem that is commonly perceived as significant (focal) in the region of interest. The Analysis Phase of the method is divided into three stages (Figure 2):

1) **Problem Analysis**, which involves identifying stakeholders, their key problems, constraints and opportunities; determining cause and effect relationships between threats and root causes;
2) **Analysis of objectives**, which concerns the development of policy objectives from the identified problems, and the identification means to end relationships;
3) **Option analysis**, which involves identifying the different options that can contribute to the achievement of objectives. Options are then evaluated by stakeholders in order to determine the most suitable strategy for achieving problem mitigation.

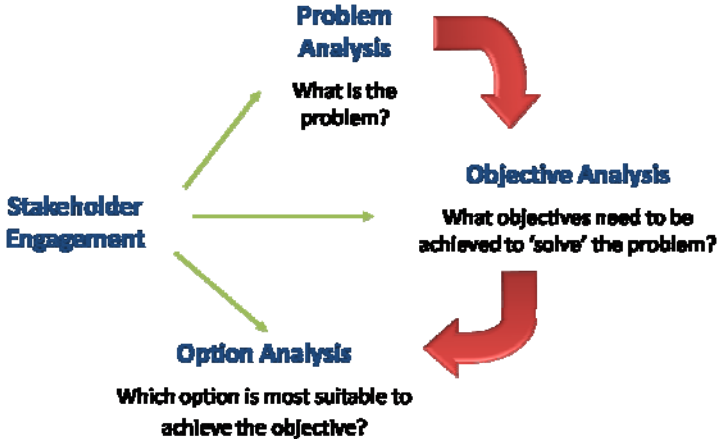


Figure 2: The method for public participation and engagement in INECO

The overall process is articulated through individual (preparatory or consultation) meetings with key stakeholders (decision and policy makers, representatives of key water users), workshops and public meetings open to stakeholders and all citizens concerned, surveys, discussion fora, dedicated questionnaires and distribution of material (data, indicators, analysis results) relevant to the issue at hand. The stages presented in Figure 2 are further detailed in the following paragraphs.

Process design and stakeholder analysis

Before initiating the process, a detailed assessment is undertaken for the definition of the "what", "why", "who", "when", "where" and "how" the effort should be pursued, following the guidelines of the Department of Urban Affairs and Planning - Virginia Tech – Blacksburg – USA, presented in Table 1.

Table 1: Analysed issues with regard to stakeholder involvement and collaboration in INECO

	Stakeholder Involvement and Collaboration
WHAT?	Stakeholder involvement is the early and extensive engagement of stakeholders in the process of planning, decision making, and implementation. Stakeholders are those effecting change in the community and those affected by it. Stakeholder collaboration uses a stakeholder group with sufficient authority to apply collaborative learning and conflict resolution techniques to formulate effective and acceptable decisions.
WHY?	Traditional public participation methods of informing public and obtaining their feedback on project and program proposals have not been effective in engaging citizens in community decisions and in resolving conflicts. Stakeholder involvement has three objectives: • Avoid Conflict: collaborative efforts aim to engage stakeholders in a process of resolving conflicts among them through negotiation, mediation, and collaborative learning. • Develop a "Shared Vision": collaborative efforts intended for the stakeholders to come up with a vision or direction that they can agree to and buy into. • Formulate Creative Solutions: all collaborative efforts hope to use dialogue and group processes to develop creative solutions that may not have emerged from traditional planning exercises.
WHO?	Stakeholders are those effecting change in the community and those affected by it. These may include government agencies, private land owners and developers, community and other interest groups, non-government organizations, and citizens. The list of stakeholders will depend on the project, conflict, or issues to be addressed. It should be as inclusive as possible, and stakeholders can be added as time goes on.
WHEN?	It is important to begin stakeholder involvement early in the process before interests become entrenched. However, the adage "better late than never" holds true here. While more difficult than starting early, in many cases stakeholder collaboration at a later stage of a process has helped to resolve conflict.
WHERE?	The location of stakeholder meetings should be left to the stakeholder group.
HOW?	• Identifying stakeholders; • Organizing stakeholder groups; • Creating opportunities for involvement ("Participation=Meetings"); • Providing the most appropriate forum for input; • Resolving conflicts.

	Stakeholder Involvement and Collaboration
STRENGTHS & LIMITATIONS	Stakeholder involvement and collaborative decision-making represent a high level of participation and a goal for a wide range of public involvement programs. However, it is not easy, and must be complemented in many cases with conflict resolution. To achieve effective collaboration, a number of conditions or prerequisites are needed, including: • Good information; • Time to participate, to build trust, to learn, to resolve disputes, to create solutions; • Commitment of participants; • Willingness to learn among participants; • Shared authority and responsibility to affect and implement decisions. Conversely, the lack of any of these conditions serves as a barrier to collaboration. Misinformation, insufficient time, lack of commitment and responsibility, entrenched positions, or uneven authority can undermine the collaborative process. In addition, if litigation or legal precedent is a goal of certain stakeholders, collaboration clearly will not work.

Problem-tree analysis

Problem analysis aims primarily at identifying the main problems and establishes the cause and effect relationships. The key purpose of this analysis is to ensure that 'root causes' are identified and subsequently addressed, and that the analysis does not simply focus on the symptoms of the problem(s). A clear and comprehensive problem analysis provides a sound foundation on which to develop a set of relevant and focused objectives. The different factors which cause a particular problem are usually described with the help of Cause-And-Effect Diagrams. Cause-Effect Diagrams can be represented as **problem** or **problem-cause trees,** which illustrate dependent and independent variables that affect a particular problem. Problem trees can be used to identify the underlying causes of complex problems.

The identification and prioritisation of problems is usually facilitated by the construction of tree diagrams. In a tree diagram the main (or focal) problem is represented as the tree-trunk. The causes of the problem are the tree's roots and the effects are the tree's branches. Tree diagrams are often part of participatory analysis processes in stakeholder workshops.

The main stages in creating a problem tree are:

- Brainstorming, where one or more problems are drawn from personal experience;
- Clustering of the problems identified during brainstorming;
- Identification of the cause(s) of each problem;
- Identification of the effects (or consequences) of each problem.

After (or during) the identification of problems, causes and effects, the "Problem Tree" is developed. The tree trunk constitutes the problem; each branch designates a separate dimension or effect of the problem. Each root represents a different cause. Each cause has a different degree of impact on the problem, and may be minor or major, one-time or permanent.

Important points in using the problem tree tool are:

- There are two main approaches that can be used to help give focus to the problem analysis, namely:
  - The '*focal problem*' method, whereby problems (or constraints) are identified in a brainstorming session. A core or focal problem is designated, and the cause - effect relationships then pivot around the focal problem; or
  - The '*objectives oriented' method*, whereby a broad/high level development objective is specified at the start of the analysis, and constraints to achieving this objective are then brainstormed, analysed and sorted in to a cause and effect logic.

The steps to undertake for constructing a problem tree are further described below.

The **first step** is to identify the problem(s) that will be addressed. A problem is generally defined as the discrepancy between the desired situation and the existing situation (Figure 3).

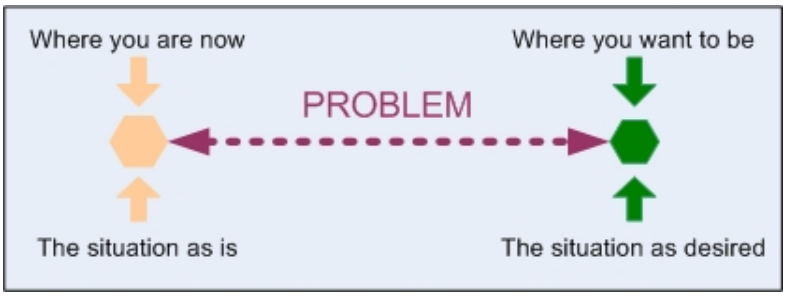


Figure 3: Identification of focal problems

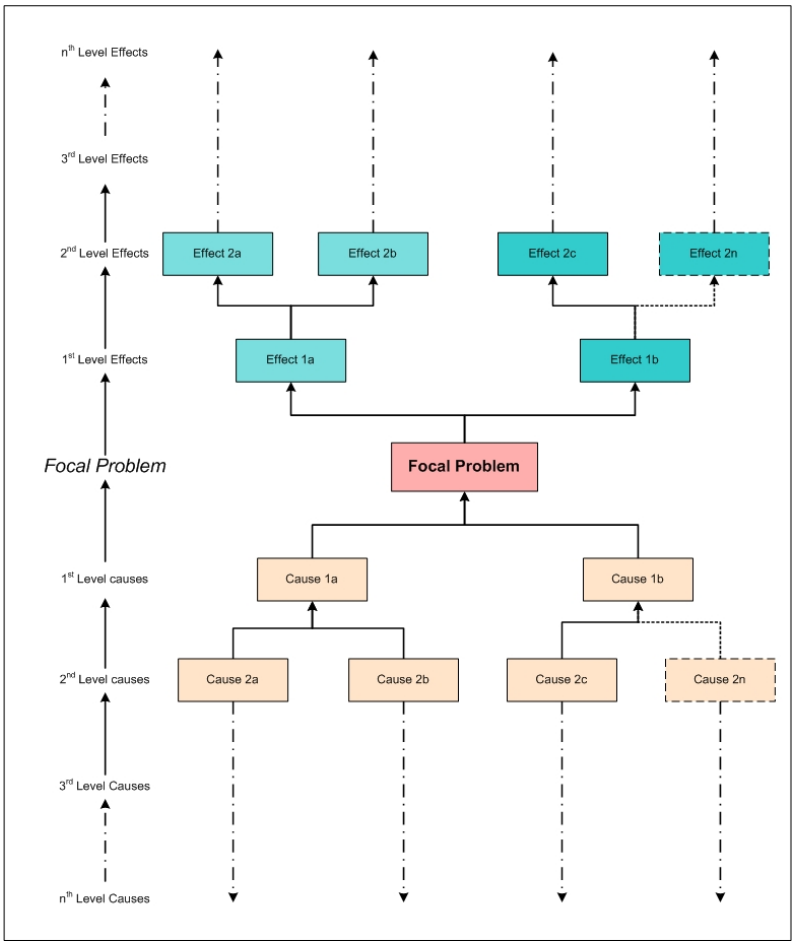


Figure 4: Problem Tree Outline

Once the overall problem has been established, the next step is to ask “why is this problem happening?” The answers can be problem statements by themselves and become the Level 1 causes. The process of cause(s) identification is iterative; this means that the question “why is this happening?” is repeated for each level, and answers are written down as second, third etc. level causes.

This step is similar to the identification of major causes. However, instead of asking "why?" a problem exists, the question is “to what does this problem lead to?”.

In the final step, the entire tree should be reviewed to make sure that it is valid and complete. The tree should 'read' like a logical sequence of cause and effect relationships (Figure 4).

Objective tree analysis

Following from problem analysis and the selection of a water management problem, the next step, is the definition of policy objectives. In this stage, the aim is to elaborate on the selected water management problem, through:

- The preliminary formulation of objectives for the analysis, through stakeholder analysis and participation, coupled with the identification of the specific inefficiencies of the current institutional and economic setting, which are directly or indirectly related to the problem.
- The selection and potential adaptation of indicators, which can be used for measuring the achievement of the objectives set. Indicators should be relevant to the causes and effects of the analysed problem and the developed objectives, and adapted to the overall regional/national context.

For the analysis of objectives, the first step is to translate problems (or causes) into objectives. The outcome is an objective tree, which is derived from the problem tree by doing the following:

- Reformulating problems into positive, desirable conditions.
- Changing relationships from cause-effect into means-ends.
- Deleting/adding objectives.
- Adding lines between means-ends relationships.

Subsequently, the objectives’ tree is revised by adding/deleting objectives. Stakeholder participation is a key element of the process, in order to ensure that (a) objectives are feasible, and within the scope of the analysis (b) inefficiencies and targets are in line with current policies, and contribute towards their implementation.

Option analysis

During the process of analysing the problems, stakeholder issues and developing a draft objective tree, views on the potential merits or difficulties and risks associated with different possible interventions are likely to be developed and discussed. These options then need to be further scrutinised to help firm up the likely scope of strategies for problem mitigation. The types of questions that may arise include:

- Should all of the identified problems and/or objectives be tackled, or a selected few?
- What is the combination of interventions that are most likely to bring about the desired results and promote sustainability of benefits?
- Which strategy will most effectively support institutional strengthening objectives?

- How can negative environmental impacts be best mitigated?

To assess alternative interventions it is useful to identify and agree on a number of assessment criteria against which alternative interventions can be ranked or scored.

Within the framework of INECO, and as suggested options focus more on "software" than on "hardware", a potential list of assessment criteria is developed under the following categories:

- Effectiveness criteria, which aim at evaluating contribution to the achievement of the objectives set, but also in enhancing collaboration, public participation and community empowerment.
- Social considerations' criteria, which describe effects in terms of social inclusion, affordability, equitable access and social sustainability.
- Economic efficiency, where criteria correspond to the overall economic impact that an option or proposal can have in regional economy and development strategies.
- Ease of implementation: Criteria pertaining to this category aim at describing the effort required for implementation, taking into account the current political environment, legislation and administrative structures.

Each option or proposal is evaluated by local stakeholders in terms of its contribution to the specified criteria of Table 1 using qualitative marks ("significant contribution", "medium contribution", "small contribution", "and no contribution"). The aggregated evaluation scorecard delineates which options can be considered mostly applicable for each Case Study.

Table 2: Criteria for the evaluation of alternative institutional and economic instruments (options) and proposals within the framework of INECO

Category	Criteria
A. Effectiveness	**A1.** Contribution to the achievement of the key objective **A2.** Mobilization of local community **A3.** Promotion of technological/institutional innovation
B. Social considerations	**B1.** Affordability for sensitive user groups (poor, women etc.) **B2.** Promotion of inclusion of all user groups **B3.** Cultural/ethical acceptance **B4.** Alleviation of conflict among user groups
C. Economic efficiency	**C1.** Financial cost of implementation **C2.** Negative economic impact on important sectors (agriculture, industry, tourism) **C3.** Impact on regional economic development strategies
D. Ease of implementation	**D1.** Need for institutional and legislative reforms **D2.** Required effort for integrating with existing policies for other sectors (e.g. agriculture, industry) **D3.** Administrative barriers to implementation

It should be emphasized however, that the overall approach is not a linear process. One does not move mechanistically from one step to the next, always in a forward direction, and arrive automatically at the best solution. Planning is an iterative and creative process, and selecting an option often involves significant leaps in thinking which cannot be neatly slotted into a 'stage' in the planning process.

In this regard, the regional workshops of INECO attempted to touch upon all three levels of the process, depending on the evolvement of debates. Emphasis was given however to the first stage, "Problem Analysis", as described below.

1.2 The Regional Workshops of INECO

1.2.1 Aims and scope

As mentioned above, the implementation of the INECO Regional workshops was a particularly important step of the overall effort to foster constructive dialogue among stakeholders at the Case Study level. Their themes were directly related to the scope of each INECO Case Study, and dealt with the following issues:

- Water pollution in the Seybouse River Basin (Algeria);
- Increasing vulnerability of groundwater bodies (Cyprus);
- Water quality deterioration in the region of Bahr Basandeila Canal (Egypt);
- Water stress in the Damour River Basin (Lebanon)
- Inefficient irrigation water use in the Oum Er Rbia River Basin (Morocco)
- Water pollution in the Barada River Basin (Greater Damascus Area) (Syria)
- Groundwater degradation (Tunisia)

The events were held during the period July 2007 – March 2008; they were oriented towards the presentation and discussion of the outcomes of the "Problem Analysis" and "Objective Analysis" steps, and where required, also included discussions on alternative options (Figure 5).

In a broader context, the workshops aimed to strengthen the alliance between the INECO Research Team and Local Stakeholders by:

- Discussing on the focal water management problem experienced in each region;
- Promoting the development of a process where each contributor gains both a better understanding of the problem and insight on how other participants see the problem;
- Initiating the participatory involvement of stakeholders in determining, defining and evaluating alternative institutional and economic instruments towards problem mitigation.

Furthermore, the workshops served as a discussion forum on the problems and challenges faced by stakeholders, and offered the opportunity for participants to share their experiences, knowledge, ideas, preferences, hopes, fears, opinions, and values.

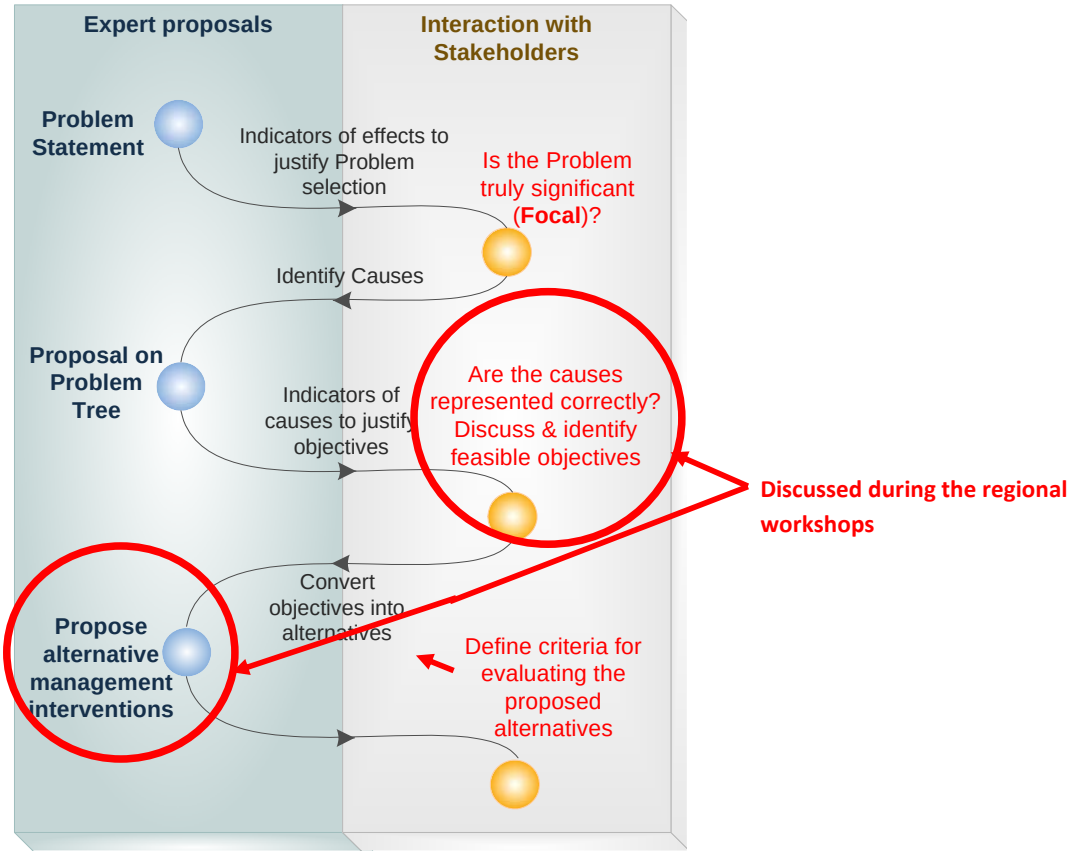


Figure 5: The scope of the INECO Regional Workshops

In this regard, and with the aim to better map perceptions and exchange of view, while at the same time disseminating the INECO approach, the overall methodology of the events was aimed at:

- Presenting the project, its aims and purpose to the wide audience of local stakeholders,
- Presenting and consolidating the "Problem Analysis", and discuss its relevance;
- Fostering the joint definition of policy objectives;
- Discussing potential alternative options and their implications;
- Formalizing stakeholder commitment;
- Performing a more detailed mapping of perceptions with regard to the causes/effects and the potentially applicable options, through dedicated surveys.

The following paragraphs outline the structure of the events, the structure of surveys and specific activities undertaken for facilitating information sharing before and during the events.

1.2.2 The structure of the events

As mentioned above, in an effort to assist in the development of a shared vision and shared terms of reference among participants, the events were structured around the first step of the Objective Oriented Planning Process, the "Problem Analysis" Stage. All events were held in the local language (Arabic, French, English/Greek) to facilitate communication. Furthermore, they were designed with similar structure, which was adapted to the particular regional circumstances.

The Introductory Section was primarily devoted to the presentation of INECO, its principles, methods and overall approach. It further included introduction to the workshop procedures and methods that would be used during the event.

Then, and in order to open the floor to local stakeholders and underline the importance of the local water management problem under discussion, the events included short inputs by local water authorities and decision-makers, presenting relevant data and the current approaches used for problem mitigation.

Subsequently, the corresponding INECO Regional Partner presented the work already undertaken by INECO for understanding the problem and quantifying its effects. Quantification was based on the development of relevant indicators, according to the analysis undertaken in WP 4 of INECO, and/or illustrative photos, depicting impacts and environmental degradation. This session closed with the presentation of a preliminary "Problem Tree", developed by the Regional Partner.

The presentation of the preliminary "Problem tree" was followed by an extensive discussion session, through open debate, where participants were asked to comment on the analysis and share their experiences on the issue. Depending on the number of participants, and in order to facilitate exchange and dialogue, participants were also asked to write on a piece of paper their views on (a) the effects of the problem, (b) the causes of the problem and (c) potential solutions. All comments and suggestions were opened for comment; after the completion of the discussion and the collection of views, suggestions on causes and effects were used to validate and adjust the existing "Problem tree".

Following from this debate, the workshops included a key note speech, by a member of the INECO project team. The presentation provided an overview of experiences associated with the implementation of institutional and economic instruments in other countries and in the EU for addressing issues similar to the one discussed.

Finally, the event ended with a second discussion session on potential objectives and options for the mitigation of the issue at hand, as well as their potential implications.

1.2.3 The workshop surveys

In addition to the open discussions, all workshops included the distribution and completion of a survey on the focal water management problem. These surveys served a dual purpose:

- To allow mapping the significance of the problem, its causes and effects, according to the perception of local stakeholders, as this cannot be easily performed through an open debate.
- To offer free space for narratives and opinions that would not be easily heard in an audience of 30 or more persons.

The structure of all surveys was similar, and followed the logic of Figure 6.

Questions were adapted to the regional problem, and divided in three groups, as follows:

- **Section A: Background questions** (educational level, age group, profession and area of residence of the respondent).
- **Section B: Water management issues**, including questions on:
    - Significant water management issues in the area;

- The significance of the focal water management problem (FP) discussed in the workshop;
- The most important cause and the most important effect of the FP;
- Personal experiences associated with the FP;
- Underlying causes to the FP;
- Administrative or institutional constraints that should be overcome for the implementation of effective solutions.

- **Section C: Prioritizing objectives and exploring alternatives**, including questions on:
  - The primary water use sector where action is needed immediately for the mitigation of the problem;
  - The ranking of potential options as to their effectiveness using a scale from 1 (no or limited contribution to problem mitigation) to 5 (very high contribution);
  - Financing alternatives for water infrastructure/water service costs;
  - Tools, ways and suggestions for enabling public participation at the regional/local level.

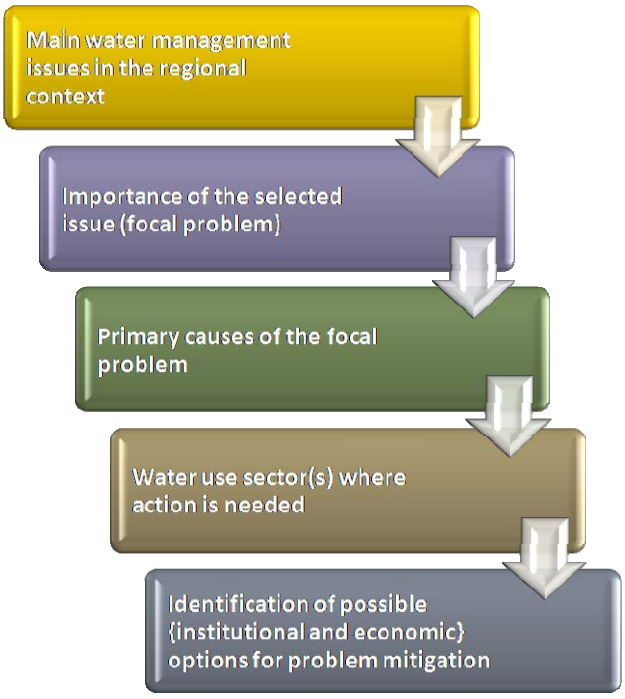


Figure 6: The logic of the workshop survey questionnaires

At the end of each questionnaire and in several questions, room was given for participants to suggest other options, identify further issues of concern and provide their experience and information.

1.2.4 Information sharing - Development and distribution of Proposition Papers

Information sharing and access to background information are milestones for successful public participation. In this regard, and in an effort to ensure that all workshop participants have a minimum amount of background information for an informed and constructive debate, INECO developed short "Proposition Papers" in local language and English.

Proposition papers are tools for profiling water management issues. In general, they summarize background information and proposes areas of action, highlighting possible intervention options. The paper should be carefully structured and highly focused, specifically to highlight issues, show how they are manifested and perceived, illustrate the variety of ways in which such issues have been or could be addressed (including from global "good practice"), and to set the stage for an informed and constructive debate. The overall structure of these papers is summarized in Table 3.

Table 3: Content of Proposition Papers developed for the purposes of Regional Workshops

Section	**Content**
Introduction	→ Problem statement; → Brief historical background on its evolution; → Potential future implications if the problem is not satisfactorily addressed → Recognition to efforts made so far.
Current institutional arrangements and the way the problem is being addressed	→ Responsibilities for addressing the problem → Past efforts for problem mitigation - successes and shortcomings
Problem analysis	→ Detailed description of the problem through indicators → Perceptions of stakeholders, as identified through previous consultations (reference to all opinions)
Lessons of experience	→ Past efforts where projects have been developed but have faced implementation problems → Information on (best) practice examples drawn from international experience
Proposal on objectives and courses on action	→ Possible areas of intervention, suggestions on policy objectives, suggestions on possible means to achieve objectives.

2 Overview of the regional workshops

This section provides an overview of the INECO Regional Workshops, briefly outlining (a) the structure of the events, (b) their main outcomes in terms of problem analysis and objective analysis and (c) the main recommendations, comments and suggestions that were raised during the events. The Appendices to this document (Individual Workshop Reports) contain (1) the full workshop reports, (2) lists of participants, (3) the results of the workshop surveys and (4) the programme and fliers of the events.

2.1 The Egypt WP 5 Stakeholder Workshop

2.1.1 Event overview

The Egypt WP 5 Stakeholder Workshop, "Building a common vision for mitigating water pollution in the Dakahlia Governorate", was held on Saturday, July 21st 2007 at the Conference Hall of the Mansoura Children's Hospital of the Mansoura University. The workshop was a first step in the initiation of a participatory dialogue among decision makers, citizens and other stakeholders on drinking water quality issues and pollution problems originating from the excessive pollution of the Nile Basandeila Canal, which is the main source of drinking water supply in the Basandeila village.

Photos from the INECO Egypt Stakeholder Workshop "Building a common vision for mitigating water pollution in the Dakahlia Governorate", Mansoura, July 21st 2007 and from the visit to the Basandeila Village and Hospital

The event was structured in 2 main sessions. Session 1 was dedicated to overview presentations, including:

- An overview of "The INECO project approach and methodology" by Prof. Dionysis Assimacopoulos, INECO Project Coordinator.
- The analysis of "Environmental and Health impacts of water pollution", by Prof. Dr. Ahmed Mansour, Professor of Pediatrics and Vice Dean of the Faculty of Medicine of the Mansoura University.
- An outline of "The role of Rural Communities & Guidelines on appropriate agricultural practices for water pollution mitigation", by Prof. Dr. Ebtehal Mohamed Kamal, Professor in the Faculty of Agriculture in the Mansoura University.
- A presentation of "The role of the Regional Branch of the Environmental Affairs Agency of the Eastern Nile Delta in water pollution prevention and control", by Dr. Ahmed Rakha, on behalf of Dr. Gamal El Saeedy, Director of the Regional Branch of the Environmental Affairs Agency of the Eastern Nile Delta.

- An overview of the current situation regarding "The provision of drinking water and sanitation services in the Dakahlia Governorate", by Eng. Mohamed Ragab, Head of the Dept. of Technical Support of the Dakahlia Water and Sanitary Drainage Company.
- A presentation on the "Psychological impact of water pollution on individuals and the society", by Prof. Dr. Eman, PhD in Sociology, Professor in the Faculty of Arts in the Mansoura University.
- An analysis of "Water pollution causes and effects in the deila area and the Dakahlia Governorate", by Prof. Dr. Samy El Fellaly, Agricultural Research Centre, Ministry of Agriculture and Land Reclamation.

During the 2nd session, Basandeila village residents presented their views, and queried the representatives of the corresponding authorities on the quality of waters of the Basandeila Nile Branch, the applied water treatment processes, and the quality of the water that actually reaches their homes. The workshop was attended by 48 local stakeholders during the 1st day and 27 local stakeholders during the subsequent meeting in the Basandeila Village, which was held on Sunday, July 22nd.

2.1.2 Workshop outcomes on problem tree and objective tree analysis

Figure 7 presents the consolidated problem tree analysis for the focal problem of water quality deterioration experienced in the Bahr Basandeila region. The problem is mainly attributed to the discharge of untreated wastewater (municipal and industrial effluents) and the unregulated use of fertilizers and pesticides in the agricultural sector.

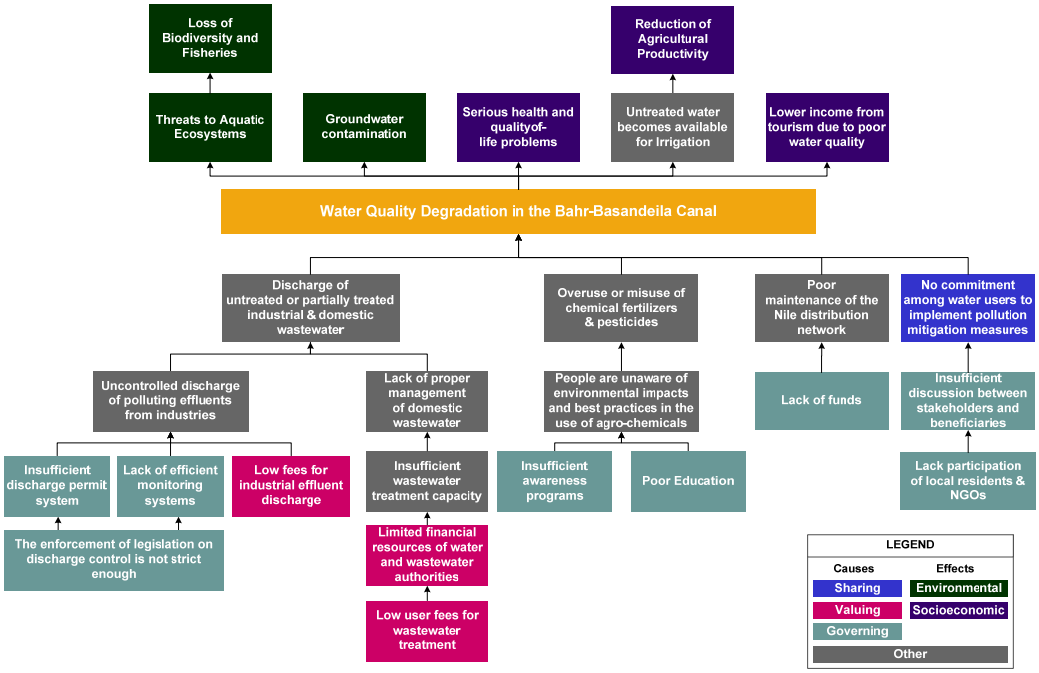


Figure 7: Problem-tree analysis of causes and effects of quality deterioration in the Egypt Case Study – The problem tree

Figure 8 presents the key objectives for reversing current trends, as developed according to the relevant recommendations and comments of the event. These comprise:

- Control over the discharge of industrial effluents;
- Controlled and wise use of chemical fertilizers & pesticides;
- Proper maintenance of the Nile distribution network;

- Commitment among water users to implement pollution mitigation measures and community empowerment.

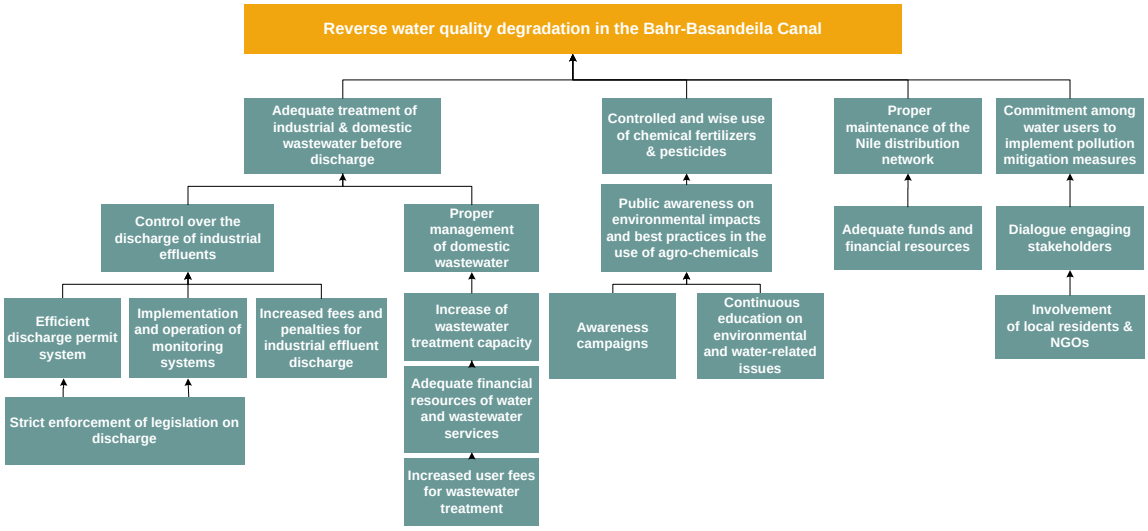


Figure 8: Objectives for addressing water quality deterioration in the Bahr Basandeila Canal

2.1.3 Summary of workshop recommendations

The recommendations agreed upon during the 1st workshop day were the following:

- A permanent dialogue should be established among official bodies responsible for health and pollution prevention and control, and the corresponding beneficiaries, with the aim to analyze the factors that contribute to the problem and try to address them.
- Views of all people concerned should be collected; this can be effected by encouraging everybody to fill the corresponding online questionnaire at the INECO web site.
- Water available for potable water uses should be increased.
- There is need for the rehabilitation of distribution networks in order to prevent mix with discharge.
- Using active carbon to absorb toxic substances, as well as other substances produced from the interaction of chlorine used for disinfection, and organic materials.
- A survey of water networks should be performed, in order to map the problems per village, assess their severity and inform people about how to deal with water.
- In areas of high risk, provisions must be made to provide bottled water at a very low price.
- Egyptian standards for drinking water must become stricter. Mechanisms for real control of water quality should be developed, including trained personnel and laboratory equipment.
- Simple, traditional ways should be sought in order to enable citizens to access safe water when (a) they do not have access to public water services or (b) there is a failure in the water supply system.
- Instead of using drainage water for irrigation, new water supply sources should be sought.
- Awareness on water resource protection and conservation should be enhanced, also through the organization of educational programmes on polluting activities and practices and on the current, significant environmental issues.

- Practices that have adverse effects on water quality should be prohibited.
- All sewage treatment stations should be equipped with modern technology.
- Laws that allow for the disposal of industrial waste only after full treatment should be activated.
- Disadvantaged villages must be supplied with sanitation and clean water services.

During the 2nd Session (Basandeila village), it became evident that drinking water quality problems exist and can be related to the condition of the water distribution network. Participants jointly decided that local initiatives are essential for addressing the quality problem, and discussed the following course of action:

- The Water Utility would check connecting pipes along the distribution network to ensure that there is no leakage or mix of domestic sewage and potable water.
- Residents and local actors should help in identifying problematic areas and inform the Water Utility on the future needs of the region in potable water, so that the local capacity expansion plan is updated.
- All local actors should try to enhance awareness among local residents on ways to protect the waters of the canal, and discourage the disposal of domestic waste, sewage and dead livestock bodies (water intake area).

2.2 The Syria WP5 Stakeholder Workshop

2.2.1 Event overview

The INECO Syria Workshop was held at Sheraton Maaret Saydnaya Hotel near Damascus, on Monday, September 10th 2007, and was titled "Building a common vision for mitigating water pollution in the Barada River Basin". The event was attended by 54 participants, from various ministerial departments, governmental agencies, regional authorities and NGOs.

As stated by its title, the event dealt with water pollution and environmental degradation in the Barada River Basin. The Basin extends over an area of 8,630 km² and is located in the southwest part of Syria. Being the basin where the capital of Syria, Damascus is located, and hence the region that concentrates most of the economic activity and population in the country, the area currently suffers from serious environmental issues.

A polluted canal in the Barada River Basin

Most manufactories discharge contaminants to the sewerage system or simply to land and rivers without treatment, free of charge and without penalties being enforced. In addition, the spatial dispersion of micro- and small-scale industries hinders the effective control over

discharges. The current agricultural practices, which include excessive application of fertilizers and pesticides, overexploitation of water resources and application of inefficient irrigation methods have also contributed to the exacerbation of water pollution in the area.

During the workshop, the following issues were presented and discussed:

- The INECO Project, Principles and Approach (Prof. Dionysis Assimacopoulos, NTUA)
- Water Management Problems in the Barada River Basin - A tentative identification of causes and effects (Mr. Malek Haddad, Studies and Integration Consulting);
- Discussion session on the collected views of causes and effects of water pollution in the Barada River Basin, moderated by M. Haddad and D. Assimacopoulos;
- Alternatives and best practice examples from international experience on water pollution prevention and control (Ms. E. Manoli, NTUA);
- Introduction on Objectives (Prof. Dionysis Assimacopoulos);
- Discussion session on objectives and next steps, moderated by M. Haddad and D. Assimacopoulos.

Photos from the INECO Syria Stakeholder Workshop "Building a common vision for mitigating water pollution in the Barada River Basin", Damascus, September 10th 2007

2.2.2 Workshop outcomes on problem tree and objective tree analysis

Figure 9 presents the "Problem tree" analysis for water pollution in the Barada River Basin, as consolidated in the workshop. According to the qualitative "problem tree" analysis, efforts undertaken to address the problem remain incomplete due to: (a) the inadequate enforcement of environmental law, (b) legislative limitations, and (c) lack of environmental awareness. Most manufactories discharge contaminants to the sewerage system or simply to land and rivers without treatment, free of charge and without penalties being enforced. In addition, the spatial dispersion of micro- and small-scale industries hinders the effective control over discharges. The current agricultural practices, which include excessive application of fertilizers and pesticides, overexploitation of water resources and application of inefficient irrigation methods have also contributed to the exacerbation of water pollution in the area.

On a first level, causes to the problem comprise the discharge of untreated sewage and industrial effluents. Illegal connections to networks and arbitrary disposal of sewage onto lands in the vicinity of populated areas, resulting also from the lack of infrastructure are rather common. With regard to industrial wastewater, the pertinent legislation imposes pre-treatment prior to discharge to the sewerage network. However, sometimes industrial wastewaters are mixed with municipal wastewater, without the required pre-treatment. The current agricultural practices, which, in some cases, involve the uninformed and uncontrolled excessive

application of fertilizers, contribute to the exacerbation of the problem. Nitrate and ammonia ions' concentrations in some wells in the Damascus countryside have exceeded the standards for drinking water quality. Furthermore, the irrigation with untreated sewage water, and discharge to the agricultural land of the Ghouta add to the problem. Overall, the current water pricing system can be considered inefficient, as sewage collection and wastewater treatment costs are not fully charged to the users. Furthermore, costs for industrial wastewater treatment are not recovered, whereas fines for exceeding the current discharge standards are not applied. Currently, the decreasing ability of industry to pay wastewater fees, the poor management and maintenance of industrial wastewater treatment plants, the lack of systematic, periodical monitoring and poor law enforcement play an important role. The limited financial resources and capacity of water and wastewater service providers, resulting also from poor cost recovery, inhibit the expansion of existing and implementation of new sanitation programmes and wastewater treatment infrastructure. Additionally, erosion of existing sewerage systems, resulting also from poor maintenance is often reported.

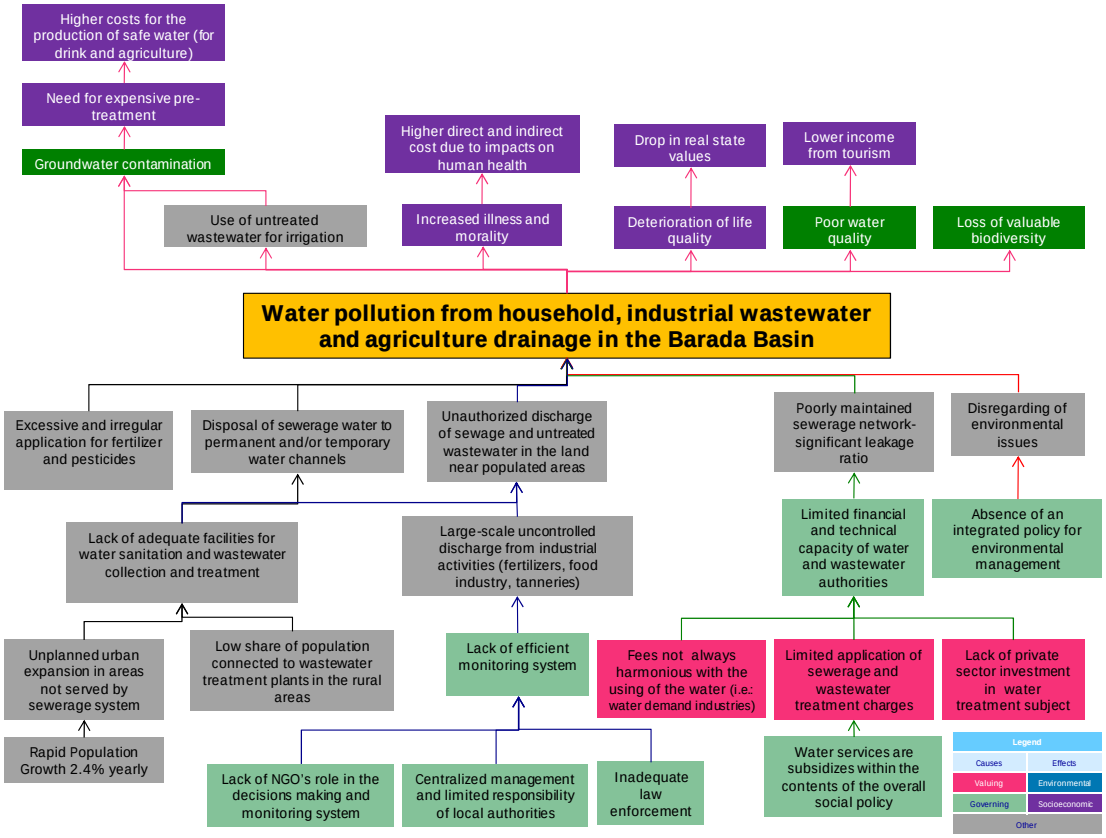


Figure 9: Causes and effects of water pollution in the Barada River Basin – The problem tree

With regard to the analysis of objectives and on the basis of discussions held, five main objectives were defined for achieving the general goal of improving water quality in the Barada River Basin:

- Control over the application of fertilizers and pesticides;
- Elimination of the discharge of untreated sewage onto land and canals/streams;
- Minimization and control of the discharge of untreated wastewater onto land and in the vicinity of populated areas (city & village outskirts);
- Improvement of the maintenance of the sewerage network;

- Prioritization of environmental issues and integration of water-related problems in developmental policies.

These are further presented in the Objective Tree of Figure 10.

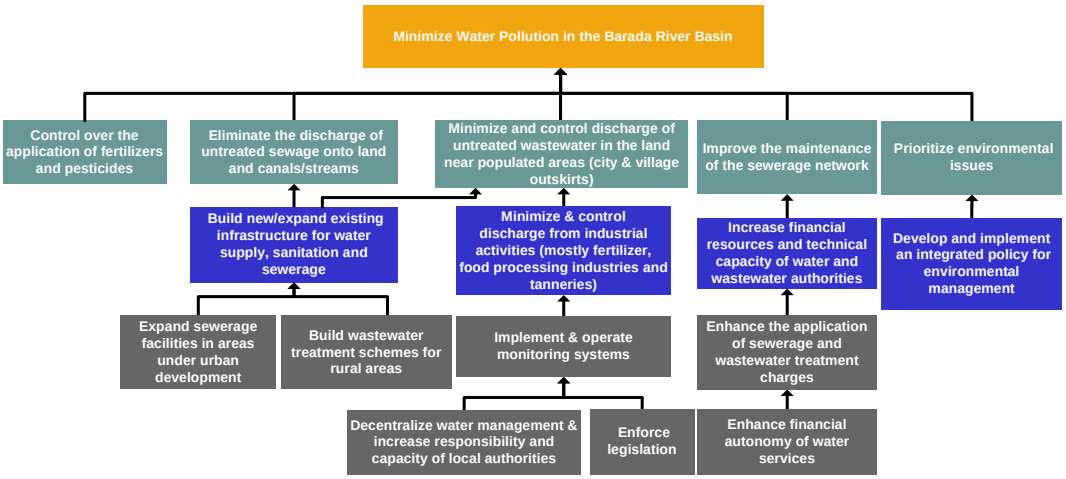


Figure 10: Objectives for addressing water pollution in the Barada River Basin

2.2.3 Summary of suggestions and comments

Different points have been underlined:

Fees for wastewater treatment are calculated as an additional percentage of 7-8% of the water supply bill. These fees are collected only for the few large cities that have wastewater treatment plants. Presently, studies have been launched for 23 wastewater treatment plants in the Damascus countryside, in order to alleviate the pollution of the Barada River.

Concerning the application of water-related legislation, the provisions of Environmental Law No 50 are very clear on issues that concern law violation. The application of the law for both private and public sector establishments is a very crucial issue, and that it is very important to harmonize and integrate the different sectoral policies.

Currently, the Barada River Basin is the one which faces the most important deficit in Syria. There are many studies on this issue and their results need to be implemented.

In fact, “the Environmental Law is still not applied because there are many difficulties to apply it in the public sector due to the lack of political will”.

As pointed out, “the solutions to problems are already known. What are needed are decisions, and their application should originate from decision-makers at the high political levels, and not from experts, as is the common problem in the Arab world. All ministries should be involved, in order to create a very specific, targeted and clear water policy. This should be presented to the high-level decision makers in order to be applied.”

2.3 The Lebanon WP 5 Stakeholder Workshop

2.3.1 Event overview

The INECO Lebanon Workshop, "Building a common vision for mitigating water stress in the Damour River Basin" was held at the Mechref Country Club, in the Damour River Basin on Wednesday, September 12th 2007. The workshop was attended by 43 participants, from the local municipal authorities, end-users' representatives, the Beirut and Mount-Lebanon Water Authoritiy and NGOs.

The workshop focused on the analysis of the water stress situation in the Damour River Basin, a catchment located 20km south of Beirut. Compared to other regions, it can be argued that the Damour River Basin is characterized by a relatively high water abundance of both surface and groundwater resources. However, during the past few years, the basin has started to experience water stress, resulting from both the reduction in the availability of surface and groundwater resources, and the deterioration of water quality which restricts the use of available resources for certain purposes. This in turn, provokes conflicts among the water users in the basin and between local authorities, as significant groundwater supplies are transferred to Beirut to meet urban demands.

During the workshop, the following issues were presented and discussed:

- The INECO Project - Principles and Method (Prof. D. Assimacopoulos, NTUA);
- Water management problems in the Damour River Basin - Causes and Effects (Mr. Claude Tabbal, Conseil et Developpement s.a.l.);
- Discussion session on causes and effects of water stress in the Damour River Basin - Collection of views, moderated by Mr. C. Tabbal;
- Integrated water resources management: Principles, issues and constructive engagement (Ms. E. Manoli, NTUA);
- Introduction to objectives (Mr. Claude Tabbal and Prof. D. Assimacopoulos);
- Discussion session for the preliminary identification of objectives and follow-up steps.

Photos from the INECO Lebanon Stakeholder Workshop "Building a common vision for mitigating water stress in the Damour River Basin", Meshref, Damour, September 12th 2007

2.3.2 Workshop outcomes on problem tree and objective tree analyses

Figure 11 presents the consolidated "Problem tree analysis" for water stress issues experienced in the Damour River Basin. The focal problem is caused by several factors including uncontrolled discharges of industrial and domestic wastewater in surface water, uncontrolled surface water allocation, and seawater intrusion in groundwater. These are in turn attributed to limited law enforcement, inadequate regulatory instruments, limited capacities of authorities (particularly for law enforcement), limited financial resources, lack of a clear planning framework, lack of a participation and coordination platform, and inefficient monitoring. Inter-basin transfer of groundwater resources is leading to deterioration of groundwater quality in the coastal area. These issues are further exacerbated by lack of relevant awareness and technical capacity, by social and political pressure from user groups, and lack of integrated management of the water resources of the area. It is expected that the focal problem could further lead to an increased number of conflicts among water users, and

to increased social costs incurred from health problems associated with the use of polluted water.

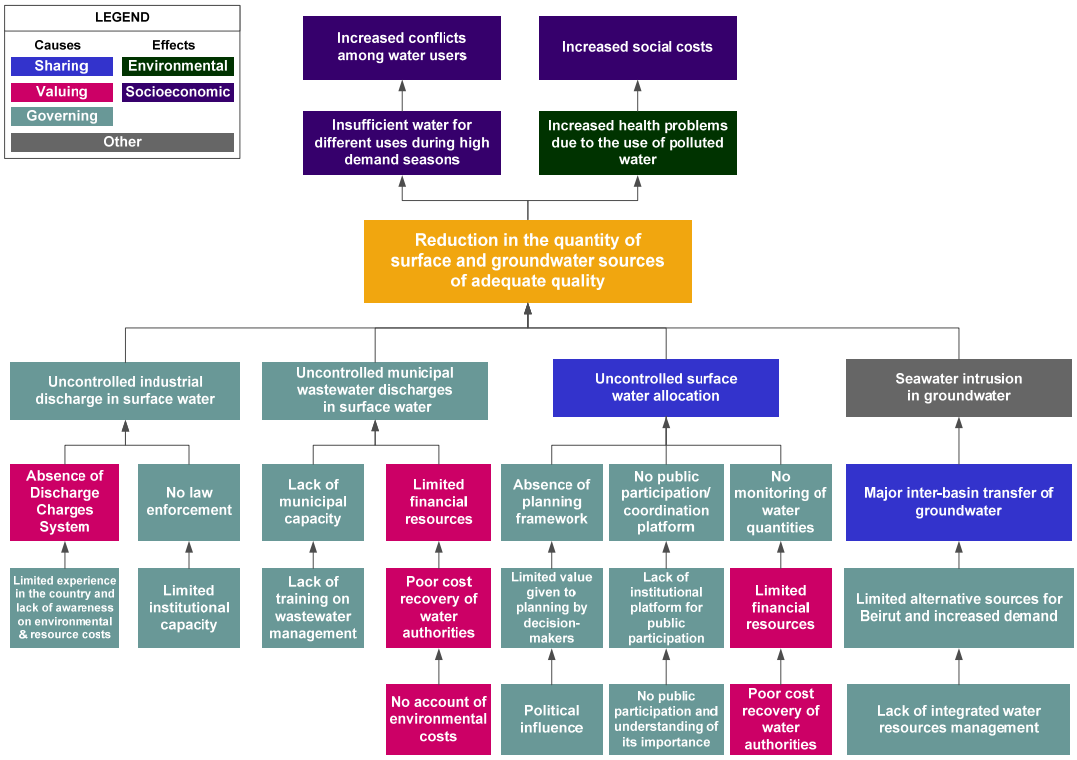


Figure 11: Causes and effects of water stress in Lebanon – The problem tree

On the basis of the workshop discussions, key policy objectives defined for water stress mitigation were:

- Monitor and control over industrial effluents' discharge;
- Collection and treatment of domestic sewage;
- Agreement and control over surface water allocation;
- Regulation and control of groundwater abstractions, in order to minimize overexploitation.

These are further elaborated in Figure 12, below.

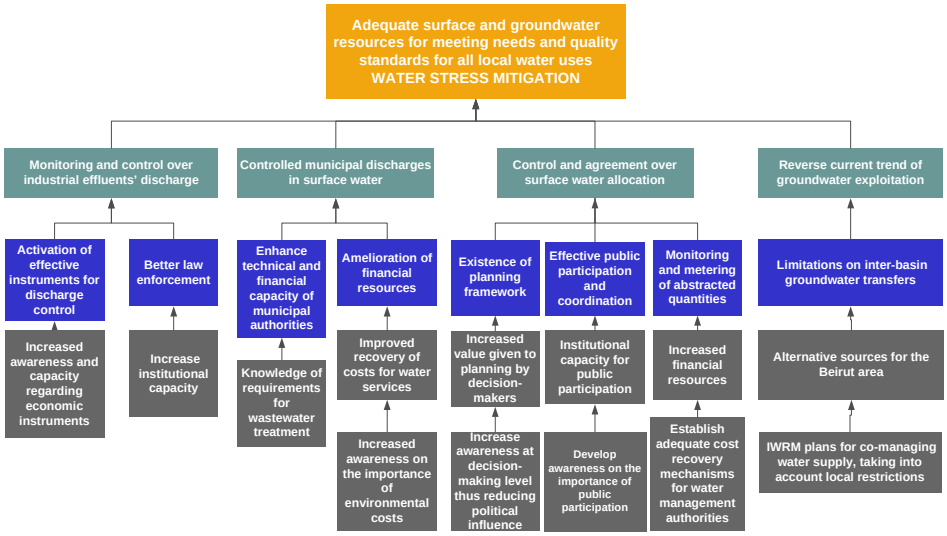


Figure 12: Objectives for addressing water stress in the Damour River Basin

2.3.3 Summary of comments and recommendations

In summary, problem causes identified by participants during the meeting were:

- Pollution originating from communities located upstream, which affects water quality downstream.
- Conflicts over water allocation between traditional water rights owners and new users, combined with an outdated legislation on the regulation of abstractions, which does not take into account the decreasing trends in river flow and the increase in water demand.
- Inadequate governmental support for addressing the lack of water supply and wastewater collection and treatment infrastructure in the River Basin.
- The need for an integrated water management plan, which would also address inter-basin transfer (presently groundwater from the Damour area is used for supplying the region of Beirut) and would promote water conservation and use of alternative water sources (wastewater reuse).

All participants underlined the need for new infrastructure for water supply enhancement (mostly river damming and water recycling projects). However, other participants insisted on adopting a global water management scheme that would address the technical, environmental and health, financial and institutional issues at all water management levels and operations.

Several participants stressed the need for closer monitoring of water and environmental quality in the river basin, and that solutions should seek after the long-term preservation of the natural capital and heritage and the development of a "water culture" among water users.

It was further pointed out that due to the political nature of water-related issues in the Basin and in Lebanon, sustainable solutions can only be achieved through strong political commitment and governmental support. In this regard, participants proposed that the outcomes of the INECO Case Study in Lebanon should be formed as a comprehensive policy proposal, which should be submitted to higher-level policy makers for appropriate action.

2.4 The Cyprus WP 5 Stakeholder workshop

2.4.1 Event overview

The INECO Cyprus workshop was held at the Coral Beach Hotel in Pegeia, Paphos on the 26th and 27th October 2007. The workshop was aimed at providing a platform for constructively engaged dialogue on how to develop and implement alternative options for addressing the current trends of overexploitation of the Pegeia aquifer. The workshop was attended by 48 persons, including 26 local stakeholders and 22 INECO participants.

The event involved an overall presentation of the INECO project, by Prof. Dionysis Assimacopoulos, NTUA, INECO Project Coordinator. Following from this introduction, the floor was given to local stakeholders, citizens and decision-makers to present their information and data on the issue and share opinions and experience. The event was structured on the basis of the following presentations:

- Groundwater overexploitation in Pegeia: Effects and underlying causes (Mr. Christodoulides, Water Development Department);
- Key note speech on Economic and institutional instruments for enhancing sustainable water management in the context of the WFD implementation (Prof. Antonio Massarutto, IEFE);

- Defining objectives and identifying alternatives – Aims and expected outcome (Dr. I. Glekas & Prof. D. Assimacopoulos)
- The EU policy for groundwater protection and the current situation in Cyprus (Mr. C. Omorphos, Water Development Department, MANR&E)

Furthermore, two discussion sessions took place in the following thematic areas:

- Discussion Session on Identifying causes and effects of groundwater overexploitation;
- Discussion Session on Objectives for addressing groundwater overexploitation [All participants;
- Joint Discussion and Decision on follow-up activities

2.4.2 Workshop outcomes on problem tree analysis and option identification

The developed "Problem Tree" is presented inFigure 13. Stakeholders, according to their knowledge of the overall situation regarding groundwater depletion in Cyprus, tried to develop a common analysis background, describing the causes and effects of groundwater overexploitation throughout the island.

According to this framework, groundwater depletion is attributed to low recharge and groundwater exploitation patterns, the latter considered the main cause of the problem. **Low Recharge** of the coastal aquifers can be mainly attributed to *limited and variable rainfall* as well as *high evapotranspiration* (corresponding to as much as 82% of the total annual precipitation) as a result of the pertaining *climate conditions* (semi-arid region). Due to these climate conditions the Government of Cyprus embarked in 1960 into an ambitious programme of exploiting surface run-off by constructing many dams for storing water for drinking and irrigation needs. This, however, resulted to the *reduction of the natural replenishment of downstream (riverbed) aquifers, by the effected cut-off*. Further pressures resulted from the *non-effective exploitation of many water development schemes*, which also included the development of new irrigated areas, which helped in achieving the economic sustainability of these new projects, but also created new demands that did not exist before. At present, *competing demands* and tension between different dynamic economic sectors (agriculture, urban growth including tourism) and the environment are also challenging the existing water management practices in the island. Finally, *water reuse in agriculture is still far from accepted*, especially when alternative water sources are available.

Overexploitation of groundwater resources can be mainly attributed to the uncoordinated existing groundwater management framework, leading to ineffective and conflicting decision making processes, *social pressures from user groups* during the process of issuing boreholes permits and the application of penalties. *Equity* between farmers that depend on surface water and those that depend solely on groundwater is not yet fully applied, especially when water tariffs for public (surface) water supply are increased. Such increases encourage further exploitation and mismanagement of groundwater resources, as exploitation costs are still lower than surface water tariffs. *Environmental concerns were disregarded* during the 60s and 80s and many waterworks did not seriously take into account the effects of these structures to downstream users. Public participation sessions and efforts for integrating interests of all those concerned were minimal. This further affected the degree and way of involvement of farmers in the development of projects and fostered their adherence to traditional practices (cropping patterns, groundwater abstractions etc.). Finally *the limited institutional capacity* within the governmental departments, and especially in the Water Development Department,

as a result of the retirement of the staff that took part in the feasibility and implementation studies of the water infrastructure in the 1970s to 1990s without adequate replacement makes management decisions, operations and implementation of the water policy and *regulation and control* much more difficult than before.

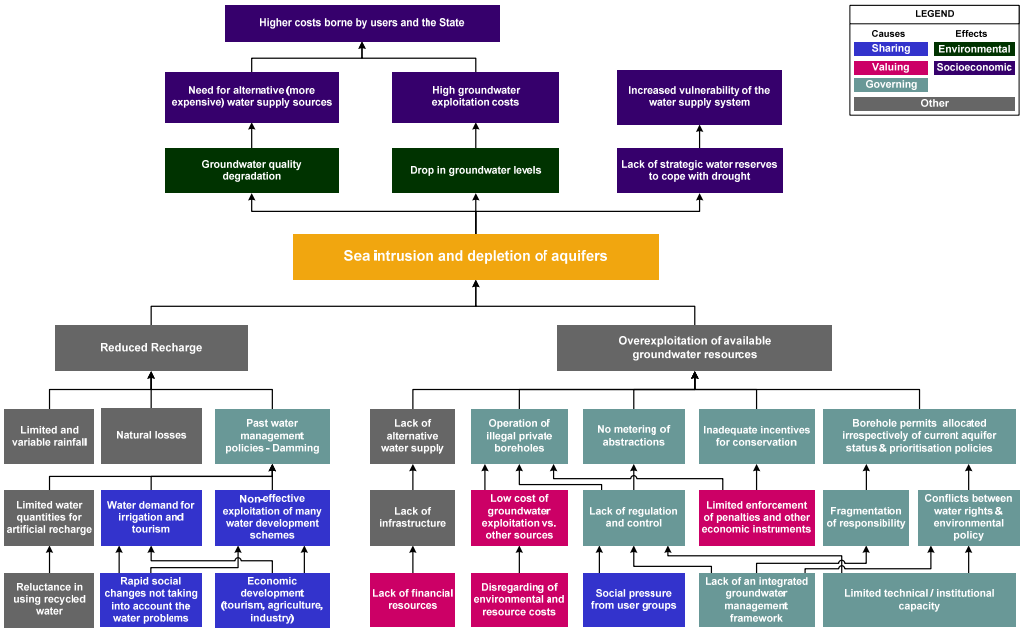


Figure 13: Causes and effects of aquifer depletion in Cyprus – The problem tree

On the basis of the discussions held during the workshop, the following types of measures were defined towards the protection and better management of the Pegeia aquifer:

- Improving efficiency in groundwater use (domestic & hotel sector), and reduction of freshwater supplied by the aquifer;
- Measures to protect the aquifer from contamination;
- Options targeting awareness creation, and enhancement of public participation;
- Measures to enhance efficiency in irrigation water use.

2.4.3 Summary of comments and recommendations

During the two-day discussions, the status of the Pegeia aquifer was discussed in great detail, and authorities responded to the comments and questions of citizen associations of the region. Identified issues included:

- Groundwater quality, in terms of sea-water intrusion, impact of agricultural practices and problems arising from the lack of a sewerage system.
- The carrying capacity of the region, in terms of water supply, as it is considered that existing and foreseen building permits and tourism development exceed the capacity to provide water in Pegeia and are bound to result in the depletion of the aquifer.
  The seasonal variation in water use, especially in the hotels of the region, which has major impacts on the exploitation of the aquifer.
- The lack of information on water-related issues, and the lack of a "water culture" among local residents.

Suggestions made by citizens and authorities towards sustainable exploitation of the aquifer concerned:

- The implementation of small sewage treatment units for every house or group of houses. The recycled water can be used for irrigation of open spaces and gardens.
- The control over the use of fertilizers and other chemicals in agriculture.
- The need to address the potentially significant losses in the water distribution system and water over-consumption, especially during the summer period.
- The reduction of the significant amount of potable water abstracted from the aquifer which is used in hotel units, possibly through the adoption of small-scale desalination for meeting tourist demand.
- The need for optimization in the monitoring of the water table and groundwater salinity evolution.

2.5 The Tunisia WP 5 Stakeholder Workshop

2.5.1 Event overview

The INECO Tunisia Workshop, "Building a common vision for managing groundwater resources in Tunisia" was held in Nabeul on Thursday, December 6th 2007. During this workshop the debate was initiated on the **mitigation of groundwater exploitation in the Nabeul Governorate and in Tunisia** as a whole. In total, 46 persons attended the event.

Photos from the INECO Tunisia Stakeholder Workshop "Building a common vision for managing groundwater resources in Tunisia", Nabeul, December 6th 2007

The following issues was presented and discussed:

- The INECO Project – Principles and Approach (Prof. Dionysis Assimacopoulos, INECO Project Coordinator, National Technical University of Athens)
- Water Resources Management in Tunisia (Dr. Rachid Khanfir, DG RE)
- The focal water management problem of groundwater overexploitation - Recharge of water tables in the Governorate of Nabeul (Dr. Moncef Requaya, CRDA of Nabeul)
- Groundwater overexploitation - An analysis of causes and effects (Mr. Ahmed Bouzid, CITET)
- Analysing causes and effects to groundwater overexploitation (all participants)
- Building the problem tree (by the workshop moderator)
- Institutional and Economic Instruments for Groundwater Management (Dr. Jean-Marc Berland, International Office for Water)
- Building the objective tree – Discussion on alternative solutions and implications (all participants - introduction by Prof. D. Assimacopoulos)

2.5.2 Workshop outcomes on problem tree and objective tree analysis

Figure 14 summarizes the problem tree as consolidated on the basis of the relevant discussions that were held during the workshop. Overall, the issue is linked to current

groundwater exploitation patterns, mostly for irrigation supply. The main comments that were made in relation to the problem tree during the INECO workshop were the following:

- The increasing water demand, coupled with the degradation of groundwater bodies both in terms of quantity and quality, constitute major challenges at all levels of decision-making and policy implementation.
- Overexploitation of groundwater is partly due to the easy access to the resource, as abstractions are free of charge and uncontrolled.
- Wasteful water use in irrigated agriculture stems mostly from: (a) lack of technical capacity of farmers, (b) weak valorization of water in irrigated agriculture, (c) limited demand for surface water, due to its high charge (d) limited farmer awareness on improved irrigation practices.
- Institutional and legislative measures are not adequate for addressing the issue. Participation of end-users in the formulation of water management policies should be pursued.

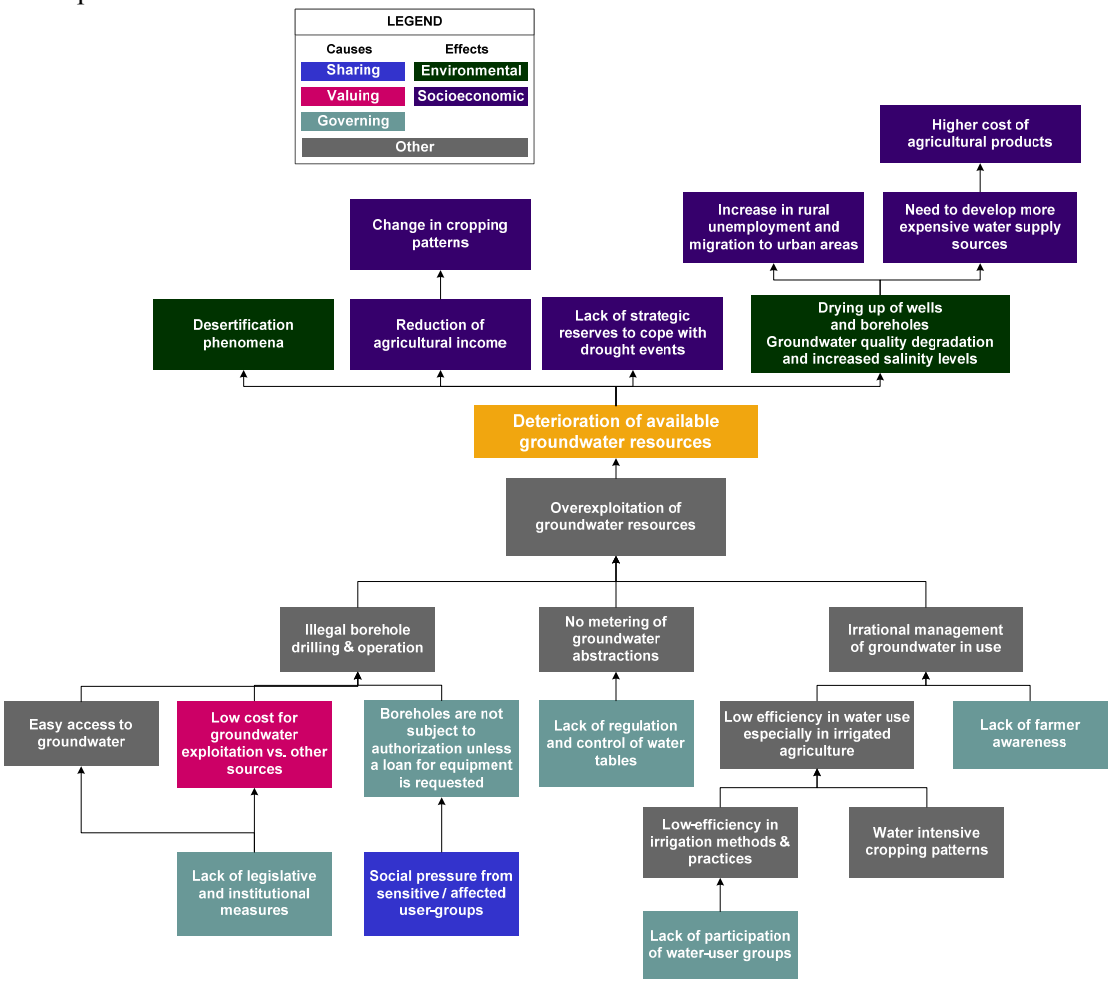


Figure 14: Causes and effects of groundwater degradation in Tunisia – The problem tree

Figure 15 summarizes the main objectives that were developed on the basis of discussion outcomes. The main objectives are:

- Control and regulation over borehole drilling;
- Metering and regulation of groundwater abstractions
- Promotion of efficient groundwater use, especially in irrigated agriculture.

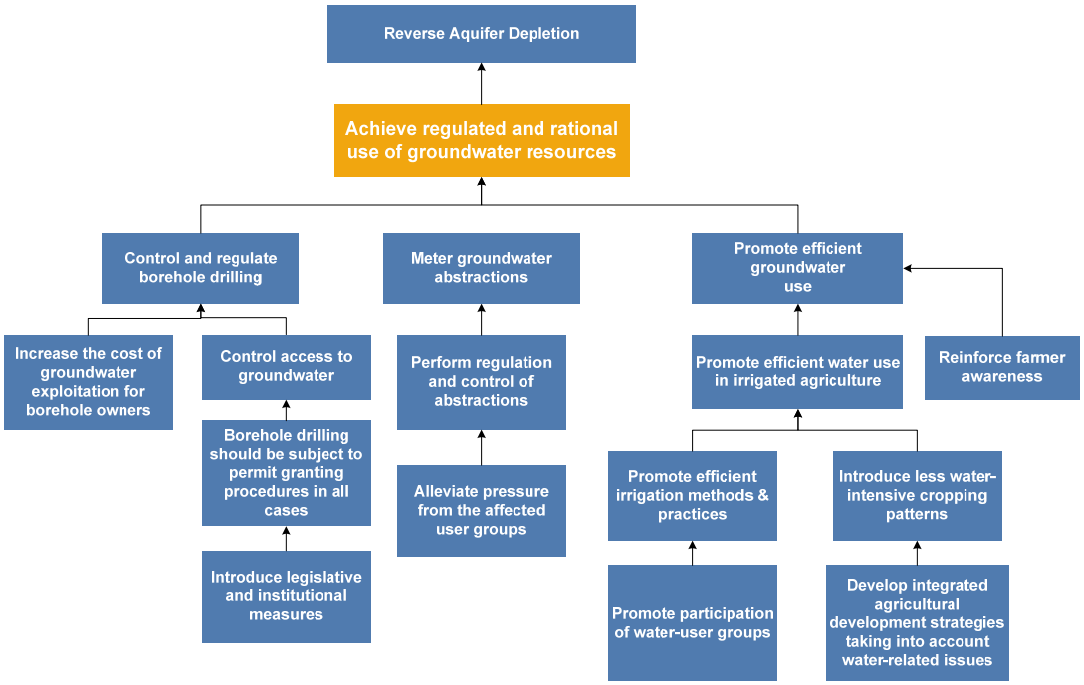


Figure 15: Objectives for addressing groundwater degradation in Tunisia

In this regard, directions to which future policies should be oriented comprise:

- The development of new approaches for groundwater management and the wider promotion of water saving methods;
- The improvement of institutional and legislative measures.
- The reinforcement of programs for treated wastewater reuse.
- The reinforcement of awareness campaigns.

2.6 The Algeria WP5 Stakeholder Workshop

2.6.1 Event overview

The INECO Algeria Workshop on protecting the Seybouse waters from pollution was held in Annaba, Algeria, on January 19th 2008. The workshop gave the opportunity to local stakeholders to express their views, perceptions, interests on water pollution issues faced in the Seybouse River Basin. The workshop was the first step in the participatory process developed by the project for proposing and evaluating options which would contribute to the protection of the Seybouse River. In total, 50 persons attended the workshop, including 46 local stakeholders and 4 INECO project participants and collaborators.

The event was structured around the following presentations:

- The INECO Project – Principles and Approach (Dr. Jean-Marc Berland, Office International de l'Eau);
- Water pollution in the Seybouse River Basin. Effects and causes, by Mr. Khatim Kherraz, General Director of the ABH CSM;
- From the analysis to the problem to the definition of objectives (Prof. B. Barraque, CNRS-LATTS);
- The next steps: Identification and evaluation of instruments (Prof. D. Assimacopoulos, NTUA, INECO Project Coordinator).

Photos from the INECO Algeria Stakeholder Workshop on "Protecting the Seybouse waters from pollution", Annaba, January 19th 2008

Furthermore, two discussion sessions, with the participation of all participants were held with the aim to:

- Identify causes and effects of water pollution in the Seybouse River Basin, and consolidate the corresponding Problem Tree Analysis;
- Discuss objectives and solutions, involving also the development of the Objective Tree.

The following paragraphs briefly discuss the outcomes of the workshop, by presenting the problem tree and objective tree analysis and the recommendations derived from the event.

2.6.2 Workshop outcomes on problem tree and objective tree analysis

Figure 16 presents the outcomes of the workshop in terms of problem tree validation and consolidation. At present, there are significant water pollution issues associated with the discharge of both domestic and industrial effluents from the cities and the industries located along the river banks. The annual effluent discharge is approximately 4.5 million m³, of which 3 million are used oils. The problem entails significant risks for human health, as children often play at the river banks but also in irrigation, as many farmers abstract water directly from the river. Fauna and flora are also seriously threatened, as well as soil productivity and the overall river ecosystem.

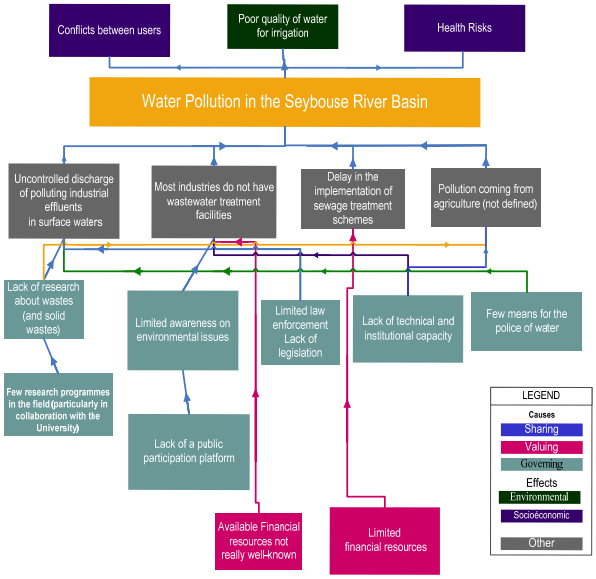


Figure 16: Causes and effects of the pollution of the river mainly by domestic sewage and industrial effluents in Algeria – The problem tree

Figure 17 summarizes key policy objectives developed on the basis of the workshop discussions and inputs. As presently the State has launched a programme for the development of sewage collection and treatment facilities in major urban centres, the developed objectives focus primarily on issues related to water pollution prevention and control.

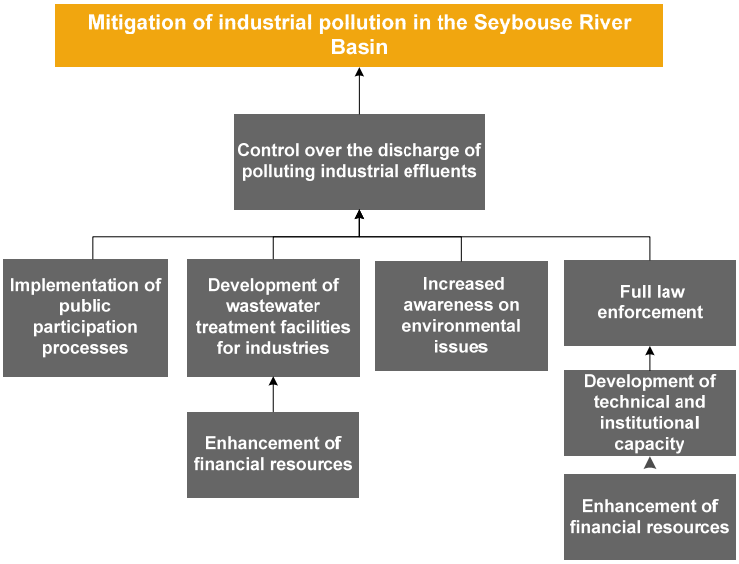


Figure 17: Objectives for addressing water pollution in the Seybouse River Basin

2.6.3 Summary of workshop recommendations

Workshop recommendations were primarily related to knowledge acquisition and further research requirements, means to achieve the empowerment and effective operation of institutions dealing with water pollution issues and enhanced cooperation among stakeholders and actors to overcome deficiencies in pollution monitoring and legislation enforcement. In brief, participants suggested the following:

- Acceleration of data acquisition for the basin, according to the programme given to the Basin Agency or the ANRH, with contribution from the University, but on the basis of a contract and clear payments;
- Strengthening of awareness programmes and actions towards manufacturers and farmers, but also towards the locally elected officials;
- Enhanced coordination between the different departments in charge of monitoring and control: Water Resources, Health, Environment, Industry and Agriculture.
- Acquisition of mobile laboratories, able to undertake random, but also regular inspections;
- Increased efforts to implement laws on water pollution, particularly with regard to the obligations of polluting industries to provide information on loads and quality of discharges, and to the prohibition of discharging industrial waste in the sewerage system without prior advanced treatment;
- Enhancement of the economic and financial knowledge, particularly with regard to the possibility of using special funds from the Ministries of Water Resources and of Environment. Possibly, financial incentives for installing wastewater treatment plants can be provided through inter-ministerial coordination and be in the form of contracts with specific industrial sectors;

- Capacity building for the water police, possibly through the establishment of a main department in charge of monitoring environmental violations, and through coordination with the different security bodies.

2.7 The Morocco WP 5 Stakeholder Workshop

2.7.1 Event overview

The INECO Morocco Workshop, organized with the support of the Oum Er Rbia Hydraulic Agency, was held at the Tazarkount Hotel in Afourer (20km from Beni Mellal) on Wednesday, March 2[1st] 2008. The workshop aimed at strengthening the alliance between the INECO Project Team and Local Stakeholders, and constituted a first step in the establishment of a participatory process for agreeing upon sustainable solutions for **increasing the efficiency in irrigation water management**.

The followed issues were presented and discussed:

- The INECO Project - A short introduction (Prof. D. Assimacopoulos, INECO Project Coordinator);
- The INECO Project - Principles and Approach (Dr. J.M. Berland, Office International de l'Eau) ;
- Overview of water management in the Oum Er Rbia Basin (Mr. M. Slassi, Head of the Water Management and Planning Division of the ABHOER);
- Water losses in the Oum Er Rbia Basin - An analysis of causes and effects (Dr. A. Affia, ISKANE Ingenierie);
- Water economy in the ORMVAH - Office of Agriculture of the Haouz (Mr. M. El Amghari, Chief Engineer of the Rural Management Department of the ORMVAH)
- Water economy in the ORMVAT - Office of Agriculture of the Tadla (Mr. M. Saaf, Department Head of the ORMVAT)
- Water economy in the ORMVAD - Office of Agriculture of the Doukkala (Mr. Guemini, Department Head of the ORMVAD)
- Irrigation water management in the Provincial Direction of Agriculture of Beni Mellal area (Mr. A. Messadi, Chief Engineer of the Beni Mellal DPA)
- Drinking water supply and wastewater management in the Chaouia Ouardigha and the Tadla Azilal areas (Mr. M. El Hanani, Head of the ONEP Development Division);
- Lessons Learnt from the Tadla water economy experiment (Mr. M. Riad, President of the Confederation of Farmers' Associations of the Tadla region)
- Introduction on Options and Instruments for more efficient water use in the agricultural sector (Prof. B. Barraque, ENGREF, France)
- Discussion on problem analysis and mitigation options - Recommendations

The workshop was attended by 35 persons, including 30 local stakeholders and 5 INECO partners' representatives.

Photos from the INECO Morocco Workshop on "Efficiency in irrigation water management in the Oum Er Rbia Hydraulic Basin", Afourer, March 21st 2008

2.7.2 Workshop outcomes on problem analysis

Figure 19 summarizes the problem tree developed through the workshop. The focal problem analysed in the Oum Er Rbia Basin is related to inefficient and wasteful water use in the agricultural sector. The problem results from increased demand, combined with low efficiency, especially in irrigation distribution networks and in the currently adopted irrigation practices (non-efficient irrigation methods and water intensive, non-economically sustainable cropping patterns).

2.7.3 Recommendations formulated at the end of the workshop:

At the end of the workshop, 15 recommendations were formulated in summary form:

- Encouraging a global vision of the water saving issue that integrates technical aspects, coordination between different players (managers and users) and the value per m^3 of water;
- Involvement in the water saving process of politicians, researchers and users (farmers, ORMVA, ONE, professional associations, etc.) and the private sector;
- Avoiding interference between institutions involved in the water sector while strengthening the role of coordination structures such as basin agencies;
- Strengthening water user associations so they can foster capacity building of farmers (education, training, increased awareness, etc.) and act as intermediaries with public authorities. In this respect, it is recommended to revise regulatory texts which concern agricultural water user associations in a way that allows more effective action;
- Participants recommend that a 60% grant is agreed by the FDA to be paid directly to those who install water saving equipment in order to avoid a common problem that small landowners face in finding initially the money to buy the equipment;
- Ensuring equity in the sharing of costs for the management and maintenance of water conveyance networks;
- Making the water savings challenge a regional priority, following the Souss experience, where water saving projects will be carried out as part of a partnership between the state (60%), the ABH Souss (20%) and the regional assembly (20%);
- Initiating the promulgation of texts which regulate agency assistance in terms of water saving;
- Creating a strategic tracking unit;

- Making water tables a strategic resource to be monitored and known in terms of quality and quantity;
- In parallel with the additional supply that will be gained through demand management, analyses should also be carried on wastewater reuse, siltation and eutrophication of water reserves in dams;
- Encouraging public-private partnerships;
- Carrying out investigations on the cost per m^3 of water saved and the corresponding positive impacts on farmers;
- Ensuring continuity in time and consultation through the INECO and ABHOER websites;
- A summary of workshops from the seven partner Mediterranean countries will be carried out and uploaded on the INECO website during the INECO project meeting planned for June.

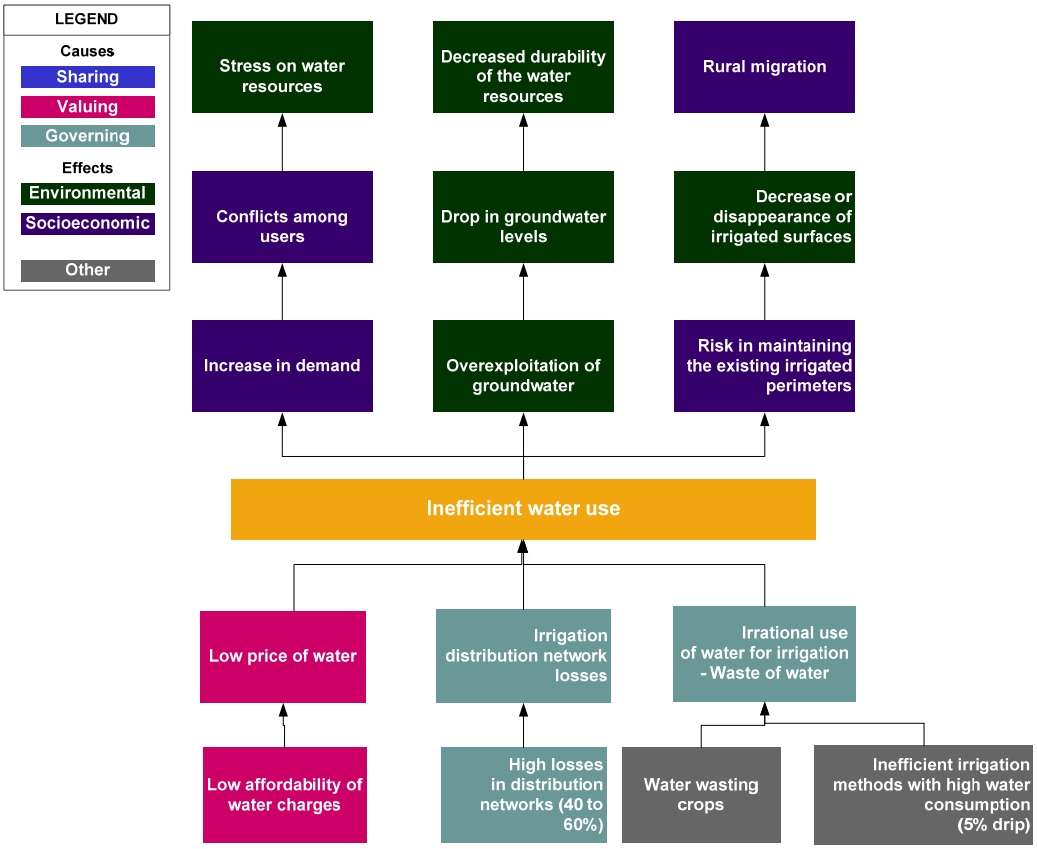


Figure 18: Causes and effects of efficient and wasteful water use in the agricultural sector in Morocco – The problem tree

3 A synthesis of main workshop outcomes

This section of the report summarizes the main outcomes of the 7 regional workshops in terms of (a) representation of stakeholders and affected groups, (b) discussions and recommendations with regard to the "sharing", "valuing" and "governing" challenges that frame the INECO methodology, and (c) outcomes of the individual workshop and web surveys that were undertaken in the opportunity of the organization of these events. Finally, the section closes with concluding remarks concerning commonalities and specific issues that emerged during the events.

3.1 The representation of stakeholders

The representation of all those who hold an interest with regard to the water management problem analysed in each Case Study has been a key element and premise in the development of the overall process and the organization of the regional workshops. In cases that it was not possible to involve everyone concerned, and especially important actors, additional information meetings, discussion sessions and workshops were organized by the INECO partners to further strengthen collaboration, discussion and engagement in the process.

For the purposes of the workshop events, the audience was diversified, depending on the nature of the problem at hand and the perceived underlying causes of the Project Team, as identified through individual consultation meetings with key actors. In this regard, representatives of the central administration were the majority of participants during the Syrian workshop, more than 40% during the Morocco and Algerian workshops and more or less the ¼ of participants during the Cyprus, Egyptian and Tunisian workshops. They were no more than 12.2% in Lebanon. Organisations of farmers were largely represented in the Tunisian workshop. Riparian land ownerships were represented in the workshop in Cyprus but they were more then 48%. Elected representatives were between 11 and 17 % in the Cyprus, Egyptian and Tunisian workshops. Journalists were present except in Morocco. In Egypt about 19% of participants were medicine doctors, as the problem experienced in the Bahr Basandeila Canal also has significant health impacts to the local population. Industrialists were few in the cases that they were present. Table 4 summarizes representation of stakeholders in the events.

As it can be expected, the background of the participants (along with the local specificities of each problem) had a real impact on discussions and issues raised. In this regard, the Algeria workshop focused on the importance of knowledge and collaboration, a key factor in better understanding the dynamics of the Seybouse River Basin. The Cyprus workshop revealed strong conflicts among the residents of Pegeia of foreign and Cypriot nationality, with the former supporting the view that the carrying capacity in terms of water availability has already been reached in Pegeia, and the latter supporting the view that this is not the case, and that the current economic development pattern should continue. The Tunisia workshop focused on the agricultural uses of water. The Lebanon event unveiled different perceptions on causes, potential options and instruments, and underlying sources of conflict among water users in the Damour River Basin. The participants of the Morocco workshop focused on irrigated agriculture and conflicts over water allocation and use in the Oum Er Rbia Hydraulic Basin. The Syria workshop emphasized on the efficiency of options already in place and on ways and approaches that could be applied to achieve better collaboration and increased impact.

Table 4: Registered participants in the INECO Workshops

	DZ	CY	EG	LB	MA	SY	TN	Total
Administrations	17	7	9	5	13	32	10	93
Farmers or Farmers Organisations		0	2	7	6	0	21	36
Riparian		13	0	0		0	0	13
Elected representatives	1	3	7	6		1	0	18
Employees of municipalities	1	0	0	4		5	0	10
Journalists	2	0	4	3		5	2	16
Technical and or research institutions	11	0	6	2	2	5	2	28
Local associations	1	1	0	2		2	0	6
Medicine Doctors		0	8	1		0	0	9
Water company	1	2	4	2	4	0	0	13
Wastewater company	3							3
INECO Local Partners	6	4	6	5	2	3	6	32
INECO Consortium members	3	17	2	3	4	3	2	34
Private consultants	3	0	0	5	2	0	0	10
Industry	1	0	0	1	1	1	0	4
Not known		0	0	0		1	2	3
Other	1	1	2	2	1	1	0	8
Total	51	48	50	48	35	59	45	336

3.2 Outcomes in terms of discussions and recommendations

3.2.1 Sharing water

In **Egypt** the recommendations relating to sharing water were:

- Increasing the amount of the available water for potable uses.
- Trying to find new water supply sources of irrigation instead of using different types of drainage water for irrigation in Dakahlia Governorate.
- Eliminating practices that affect water quality.

In **Syria** a representative of the Water Department of the Ministry of Local Administration and the Environment, elaborated on the change of current concepts related to water, stating that *"everybody talks about food security; however we need to be aware of the relation between food security and water security. For example, if we have an agricultural plain which produces water-demanding crops for export, we need to mention the cost of water and the cost of exploiting our own resources. This use aggravates water deficiency, not just for future generations but also for this generation. Currently, the Barada River Basin is the one which faces the most important deficit in Syria."*

In **Lebanon**, several participants insisted on the construction of dams to collect river and rain water as a solution for regulating surface water supply and mitigate allocation conflicts. Farmers present at the workshop insisted on asking the Government to secure enough water for crop irrigation, to treat groundwater water and avoid degradation. Furthermore, they also underlined the need for constructing a dam in the Damour region to secure water for the community. Similarly, a representative of the Ministry of Agriculture insisted on implementing a global water management plan, and on the fact that the quantity of water in

the country must be increased through the construction of dams to cope with increasing water demands. He also commented that the main problems are the "misuse" of water, the non-existence of water distribution networks and sewerage systems, and storage reservoirs. He further underlined that the Damour River Basin problems must be solved along with those of the Safa river. A representative of the *Ministry of Energy and Water* proposed that the basin should be developed in terms of tourism, in order to secure funds for water projects, such as dams, etc. A farmer attributed the lack of sufficient water and quality of water in Damour to the continuous and excessive extraction from the wells of the Beirut Water Agency for meeting domestic demand in the Beirut Metropolitan Area.

In **Cyprus**, participants identified the following issues relating to sharing water: (a) building permits exceed the capacity to provide water in Pegia and will affect the depletion of the aquifer; and (b) there is need to change the cropping patterns in the region, which, at present are highly water consumptive.

In **Tunisia** there were no main comments relating to the "sharing" dimension of groundwater overexploitation. It was however underlined that there is need for "Sharing management of aquifers".

In **Algeria**, during the discussions it was pointed out there is a need for efforts to raise awareness among water users and especially industrialists and farmers, on practices that can lead to an increase of production but also to a decrease of pollution. It was pointed out that the pollution of resources can evolve to an insurmountable obstacle to production, especially in the agricultural sector.

Conflicts with regard to the allocation of scarce resources are of relevance and importance in the **Oum Er Rbia River Basin, Morocco**. A participant described conflict over water use in the case of the city of Doukkala. In this regard, it was noted that bilateral or trilateral agreements (between farmers, cities, industries) can help in preventing such conflicts, as the Agency cannot intervene in all cases. ONEP is the institution that provides potable water in bulk; distribution is in the responsibility of the local authorities. Along the same line, it was underlined that energy requirements can enter into conflict/competition with farming requirements. Farmers need stable flow rates; hydroelectricity requirements however require abrupt releases of water. In this regard, water used for hydroelectricity cannot be used by irrigation, which corresponds to wastage. A better coordination of water releases would be required. Nevertheless, this action is very difficult to implement, because the primary aim of hydroelectricity production is to meet peak energy demands. In this regard, water releases will remain subject to these intermittent requirements and their irregular nature will remain. The establishment of rules that are known by all those involved should of course remain a priority.

3.2.2 Valuing water

In **Egypt** and **Cyprus**, no issues relating to valuing water were identified.

In **Syria** a participant focused on fees for wastewater treatment. He explained that these are calculated as an additional percentage of 7-8% of the water supply bill. These fees are collected only for the few large cities that have wastewater treatment plants. Presently, studies have been launched for 23 wastewater treatment plants in the Damascus surrounding areas, in order to alleviate the pollution of the Barada River. Concerning the application of water-related legislation, it was mentioned that the provisions of Environmental Law No 50 are very clear on issues that concern law violation. Another participant focused on the re-allocation of

water through the use of economic instruments, as means to reduce resource overexploitation, pointing out that the achievement of this goal should be based on a participatory approach, involving all the responsible bodies in order to identify and agree upon solutions.

In **Lebanon**, a stakeholder insisted on adopting a global water management scheme that would include a series of parameters covering the technical, environmental and health, financial and institutional levels.

In **Tunisia** the main comments relating to overexploitation of underground water and dealing with valuing water were

- Weak valorisation of irrigation water.
- The profitability of irrigation techniques and practices is not sufficient.
- Evolution of unemployment rates due the overexploitation of aquifers
- Limited demand on surface water due to its tariff

The main alternatives dealing with valuing water concerned:

- The unification of irrigation water tariff
- Fostering activities on piloting irrigation and water valorisation on the economic level.

The shortcomings relating to valuing water identified in **Algeria** are the lack of knowledge on:

- The real status of the different funds available, and especially their use for environmental purposes.
- The actual financial support offered to industries for the installation of wastewater treatment units in relation also to their own investing capacity.
- The actual financial supports for wastewater treatment required by industrialists (estimated costs for the treatment units), and their investment capacities in this field.

Participants suggested the enhancement of the economic and financial knowledge, particularly with regard to the possibility of using special funds from the Ministries of Water Resources and of the Environment. Possibly, financial incentives for installing wastewater treatment plants can be provided through inter-ministerial coordination and be in the form of contracts with specific industrial sectors and units.

In **Morroco**, the possibility of using water pricing as an instrument for discouraging wasteful water use was discussed. Participants pointed out that low cost recovery through water tariffs often has detrimental effects. It is also necessary to correctly assess resource and opportunity costs (value of next best alternative solution). Furthermore, it is presently considered that the financing schemes for drip irrigation projects in small farms need to be revised. Grants must be provided to those who install the equipment, so that farmers do not longer have to pay for equipment by themselves and then wait for receiving the financial contribution. Currently, for studies, 60% of the cost is borne by the government, 20% by the agency and 20% is guaranteed by the region. A proposal is being made for 80% to be covered by the government and 20% by the agency. In terms of recommendations, the following were derived:

- Participants recommend a 60% grant to be agreed by the FDA to be paid directly to the water saving equipment installer just like farming equipment in order to avoid the small landowner having to initially find the money for the equipment;
- Ensuring the equity of sharing of costs in the management and maintenance of water transport networks;

- Making the water savings challenge a regional priority just like the Souss experience where water saving projects will be carried out as part of a partnership between the state (60%), the ABH Souss (20%) and the regional assembly (20%);
- Carrying out investigation on the cost price per m3 of water saved and positive impacts on farmers.

3.2.3 Governing water

In **Egypt** the recommendations relating to governing water were, for most of them technical:

- Activation of a permanent dialogue between the official bodies responsible for the health and water conservation against pollution and the beneficiaries from the service in order to analyze the problem and try to solve it.
- Developing awareness on how to deal with water in terms of quality and preservation.
- Organization of education programs to raise awareness on the activities that lead to water pollution and definition of the pressing environmental issues.
- Provision of bottled water at low cost in areas that face drinking water quality issues.
- Introduction of stricter standards for drinking water and provide a real monitoring mechanism, adequate in terms of human and technical capacity.
- Activate and enforce all laws relevant to industrial discharge standards.

In **Syria** a representative of the Water Department of the Ministry of Local Administration and the Environment, pointed out that there are many studies on the pollution of the Barada River, and their results need to be implemented. He further mentioned that the Environmental Law is still not applied because there are many difficulties to apply it in the public sector due to the lack of political will. Subsequently, a representative of Water Directorate of the League of Arab States pointed out that solutions to problems are already known. What is needed are decisions, and their application should originate from decision-makers at the high political level, and not from experts. She also stressed that all ministries should be involved, in order to create a very specific, targeted and clear water policy. This should be presented to the high-level decision makers in order to be applied.

In **Lebanon**, for the *Association of the Friends of Ibrahim Abdel Aal*, the problem of water is a political one and they commented that the local community of Damour should put pressure on the government to solve their problems, and insisted to put water issues on their political agenda. The *Ministry of Environment* insisted on adopting a global water management scheme that would include a series of parameters covering technical, environmental and health, financial and institutional aspects. He also commented that the causes of non enforcement of laws stem from political interferences on the one hand, and from financial issues on the other. He also insisted that the recommendations from INECO should be addressed to the decision-makers, and that the follow-up must be secured to reach the objectives set.

In **Cyprus** participants identified the following issues relating to governing water: (a) lack of awareness and education of local residents on water conservation; (b) lack of information on water issues in the area.

In **Tunisia**, the main comment relating to overexploitation of groundwater and dealing with different water governance aspects was that the problem is due to non-authorized boreholes

and the easy access to underground water resources which is free of charge and not controlled. Furthermore, the following were noted:

- Limited awareness campaigns targeting farmers and end users.
- Insufficient technical capacity of farmers.
- Lack of participation of end-users in the water resources management policies.
- Insufficient institutional and legislative measures.

The main alternatives that were identified to that respect were the following.

- Development of new approaches for better valorisation of groundwater and reinforcement of water saving.
- Establishment of standards for artificial recharge of water tables with treated waste water.
- Improvement of treated waste water quality through supplementary treatments (tertiary, infiltration percolation procedures) which will reinforce public acceptance.
- Concentration on the existing irrigation schemes instead of developing new irrigation perimeters.
- Installation of meters for monitoring groundwater extractions.
- Reinforce the institutional role of Agricultural Development Groups.

In **Algeria** there are shortcomings with regard to law enforcement, and especially concerning the operation of the water police, which is still inadequately equipped and protected. Efforts to raise awareness among water users and especially industrialists and farmers, on practices that can lead to an increase of production but also to a decrease of pollution should be made. It was pointed out that the pollution of resources can evolve to an overwhelming problem to production, especially in the agricultural sector. With regard to water governance, participants suggested the following:

- Acceleration of data acquisition for the basin, according to the programme given to the Basin Agency or the ANRH, with contribution from the University, but on the basis of a contract and clear payments.
- Strengthening of awareness programmes and actions towards manufacturers and farmers, but also towards the locally elected officials.
- Enhanced coordination between the different departments in charge of monitoring and control: Water Resources, Health, Environment, Industry and Agriculture.
- Acquisition of mobile laboratories, able to undertake random, but also regular inspections.
- Increased efforts to implement laws on water pollution, particularly with regard to the obligations of polluting industries to provide information on loads and quality of discharges, and to the prohibition of discharging industrial waste in the sewerage system without prior advanced treatment.
- Building of capacity of the water police, possibly through the establishment of a main department, in charge of monitoring environmental violations and through coordination with the different security bodies.

The recommendations developed in the **Morocco** workshop in relation to water governance were the following

- Encouraging a global vision of the water saving issue that integrates technical aspects, coordination between different players (managers and users) and the economic value of water;
- Involvement in water saving process of politicians, researchers and users (farmers, ORMVA, ONE, professional associations, etc.) and the private sector;
- Avoiding overlap between institutions involved in the water sector and strengthening the role of coordination structures such as the Basin agencies;
- Strengthening water user associations so they can play a role in building the capacity of farmers (education, training, increased awareness, etc.), while acting as intermediaries with public authorities. In this respect it is recommended to revise regulatory texts which organise agricultural water user associations in a way that allows more effective action;
- Promotion of consultation between different users by carrying out pilot experiments followed by a technical committee involving farmers' representatives.
- Initiating the promulgation of texts which regulate agency assistance in terms of water saving;
- Creating a strategic tracking unit;
- Perceiving water tables a strategic resource to be monitored and assessed in terms of quality and quantity;
- Encouraging public-private partnerships.

3.3 Synthesis of workshop survey results

This section provides an overview of the outcomes of the surveys undertaken in the workshops with regard to the importance of water management issues, their causes (direct and underlying), and their primary effects, as this was the primary theme of the workshops. The detailed results of the surveys, including answers on (a) the background of respondents, (b) significance of water management issues, causes and effects, and (c) prioritization of objectives and identification of alternatives, are presented in the individual workshop reports of the Appendices to this Deliverable.

According to the respondents of the surveys, the **most significant water-related problems** currently faced are:

- Water pollution (57% of the answers) and lack of infrastructure (30% of the answers) in the Dakalia Governate (Egypt);
- Water pollution (62,5% of the answers) and water shortage (81% of the answers) in the Damour River Basin (Lebanon);
- Water shortage (48.15% of the answers) and water pollution (33.4% of the answers) in the Barada River (Syria).
- Water shortage (69.6% of the answers) and water pollution (47.8% of the answers) in Pegeia, Cyprus;
- Water shortage (54.5% of the answers) and water pollution (36.4% of the answers) in Tunisia;
- Water pollution (54.8% of the answers) and lack of infrastructure (35.7% of the answers) in the Seybouse River Basin (Algeria);

- Water shortage (68.8% of the answers), water pollution (43.8% of the answers) and lack of infrastructure (37.5% of the answers) in the Oum Er Rbia Basin (Morocco).

It is notable that both water pollution and water shortage are considered important by stakeholders in all cases considered, although with varying percentages, depending on the theme and acuteness of issues faced. In fact, when asked about the priority area of action (water pollution mitigation or water scarcity mitigation, depending on the workshop theme), the participants replied as follows:

- The vast majority of participants in the cases of Egypt, Syria, Algeria (water quality degradation), and Lebanon (water stress having also a quality dimension) consider that water pollution is very important and that action is needed immediately.
- The vast majority of participants in the cases of Lebanon, Tunisia, Cyprus and Morocco consider that water shortage/stress and/or groundwater depletion is very important and that action is needed immediately.

With regard to the **direct causes** to water management problems, opinions are diversified in the case of water pollution in Egypt (use of agrochemicals: 36%, discharge of untreated industrial effluents: 24%, inadequate domestic wastewater collection and treatment 27%; solid waste disposal: 13%). Similarly, respondents cite as underlying causes to the problem (a) the lack of awareness (27%), (b) the lack of an action plan (24%) and (c) the lack of funding of schemes for problem mitigation (20%).

In Lebanon, the most important cause of the deterioration of water quality of the Damour River is considered to be domestic sewage. According to the majority of stakeholders, the underlying causes to water quality degradation are believed to be the non-strict enforcement of legislation and the lack of an appropriate action plan. With regard to water shortage, the underlying causes are considered to be the lack of a joint agreement on the allocation of available supply, and again, the non-strict enforcement of legislation on abstractions.

In the Barada River Basin, the vast majority of stakeholders identify two primary causes: (a) domestic sewage disposal (41.3%) and (b) discharge of untreated industrial effluents (32.6%). In terms of underlying causes, respondents identify (a) legislation enforcement problems (73.9%) and (b) lack of awareness (54.3%) and mobilization (39.1%).

In Tunisia, the problem of groundwater depletion is associated with inefficient water use (36.4%) and lack of alternative water supply (36.4%). Underlying causes to the problem are limited awareness for water conservation (45.5%), and lack of joint agreement/management of water tables (45.5%).

In the Seybouse River Basin, Algeria, the majority of respondents consider that the discharge of untreated effluents is the primary cause to water pollution (78.6%). Underlying causes concern (a) poor legislation enforcement (76.2%) and lack of mobilization (47.6%).

In Morocco, the most important cause of water stress is considered to be inefficient water use (40% of replies). Important factors that contribute to inefficient water use in agriculture are (a) limited efficiency of current irrigation methods and (b) water intensive cropping patterns.

In Pegeia, Cyprus, the primary cause of groundwater overexploitation is considered to be wasteful water use, followed by lack of alternative water supply. Underlying causes were considered to be lack of joint planning for exploiting alternative water sources, and limited awareness on water saving.

On the effects of water pollution, the survey respondents noted the following:

- 64% think that there is a danger for human health and 28,5% think that agricultural products are not safe anymore in Egypt;
- 60,9% think that there is a danger for human health and 17,4% think that groundwater supplies are becoming contaminated and are not safe anymore in Syria;
- In Algeria, 78,6% think that there is a danger for human health.

In relation to water shortage/stress perceived effects comprise the following:

- In Tunisia, 72,7% think that groundwater supplies are decreasing and threatened by sea-water intrusion and 18,2% think that there is not enough water to irrigate and secure agricultural production;
- In Morocco, 62,5% think that there is not enough water to irrigate and secure agricultural production, 33,1% think that groundwater supplies are decreasing.
- In Pegeia, Cyprus the most important effect of groundwater depletion is related to future water supply provision, especially during drought episodes.

Except for the Tunisia Case Study, the a majority of people think that there are **administrative problems or constraints** that should be overcome for effective solution to be implemented (88% in Egypt;100% in Lebanon; 93,5% in Syria; 45,5% in Tunisia; 69% in Algeria; 74% in Cyprus; 62% in Morocco)

3.4 Concluding remarks

The principal aim of the INECO Regional workshops were to foster the constructive engagement of stakeholders for discussing what the main problems are, and how these could be addressed in a commonly agreed water management situation. In this regard, and in the terms of developing "shared terms of reference" and "shared goals" the workshops can be considered to be a "success story". In many cases, the events managed to bring together representatives of different administrations and organisations that were not accustomed to debate around the same table.

Furthermore, common principles and ways-of-thinking that emerged in and were extensively discussed during the events can be summarized and are not limited to:

- Legislation enforcement and the limitations of the "command-and-control" approaches;
- Enhance technical and financial capacity of actors;
- Economic incentives and approaches (tax fees, internalizing external costs, pricing reforms…);
- Cost recovery in relation to the technical and financial sustainability of water services;
- "Soft" technical solutions (rehabilitation of network, change of crop, metering…);
- Involvement, stronger engagement and empowerment of local actors/ stakeholders.

It is clear that constructive engagement, participation and development of policies taking into account the interests of all parties concerned are goals that expand well beyond the three-year duration of INECO. However, towards this end, it becomes clear that these first events, along with many others organized by the INECO Regional Partners, are slowly beginning to build capacity towards more participative and inclusive decision-making.

APPENDICES: INDIVIDUAL WORKSHOP MATERIAL AND REPORTS

INECO Egypt Stakeholder Workshop

"Building a vision for mitigating water pollution in the Dakahlia Governorate"

Conference Hall, Mansoura Children's Hospital
Saturday, July 21st 2007

1 Workshop Report

1.1 Introduction

The INECO workshop, titled "Building a vision for mitigating water pollution in the Dakahlia Governorate", was held at the Conference Hall of the Mansoura Childrens' Hospital of the Mansoura University. The workshop was organized under the supervision of:

- Prof. Dr. Magdy Abou Rayan, President of Mansoura University and Chairman of the Industrial Water and Sanitary Drainage Project Center (INECO Regional Partner), and
- Prof. Dionysis Assimacopoulos, School of Chemical Engineering, National Technical University of Athens, Greece and Coordinator of the INECO Project.

This document comprises the minutes of the workshop, and is organized as follows:

- Section 2 outlines the presentations made during the workshop on water pollution issues in the Dakahlia Governorate and in the Basandeila area.
- Section 3 presents the main recommendations and outcomes of the workshop.
- Section 4 comprises the minutes of the Discussion Session, between citizens of the Basandeila area and local authorities' representatives.

1.2 Presentation Session Summary

During the first session of the workshop, presentations focused on the impact of water pollution, with particular focus on issues concerning human health. In more detail:

- Prof. Dr. Ahmed Mansour (Professor of Pediatrics and Vice Dean of The Faculty of Medicine of the Mansoura University), focused on the "Environmental and Health Impacts of water pollution".
- Prof. Dr. Ebtehal Mohamed Kamal (Professor in the Faculty of Agriculture of the Mansoura University) focused on "The Role of Rural Communities & Guidelines on agricultural practices for water pollution mitigation".
- Dr. Ahmed Rakha, on behalf of Dr. Gamal El Saeedy, Director of the regional branch of the Environmental Affairs Agency of East Delta Region presented "The Role of Regional branch of Environmental Affairs Agency of the East Delta in protecting water resources from pollution".
- Eng. Mohamed Ragab, Chief Of the Technical Support Division in the Dakahlia Water & Sanitary Drainage company, representing also the Major general Ahmed Abdeen, Head of Dakahlia 's Water & Sanitary Drainage company, presented the situation on "Water & Sanitary Drainage in the Dakahlia Governorate ", and described the current situation regarding the provision of potable water.
- Prof. Dr. Eman, PhD of Sociology, Faculty of Arts, Mansoura University, focused on the "Psychological impact of pollution on the individual and society".

Furthermore, Prof. Dionysis Assimacopoulos, the INECO project Coordinator presented the methodology and scope of the INECO project. Prof. Dr. Samy El Fellaly, from the Egypt INECO team, outlined the analysis of causes and effects of water pollution in the region of Basandeila.

1.3 Recommendations

The main outcomes and the recommendations drafted from the workshop were the following:

1. A permanent dialogue should be established among official bodies responsible for health and pollution prevention and control, and the corresponding beneficiaries, with the aim to analyze the factors that contribute to the problem and try to address them.
2. Views of all people concerned should be collected; this can be effected by encouraging all to fill the corresponding online questionnaire at the INECO web site.
3. Water available for potable water uses should be increased.
4. There is need for the rehabilitation of distribution networks in order to prevent mix with discharge.
5. Using active carbon to absorb toxic substances, as well as other substances produced from the interaction of chlorine used for disinfection, and organic materials.
6. A survey of water networks should be performed, in order to map the problems per village, assess their severity and inform people on how to deal with water.
7. In areas of high risk, provisions must be made to provide bottled water at a very low price.
8. Egyptian standards for drinking water must become stricter. Mechanisms for real control of water quality should be developed, including trained personnel and laboratory equipment.
9. Simple, traditional ways should be sought in order to enable citizens to access safe water when (a) they do not have access to public water services or (b) there is a failure in the water supply system.
10. Instead of using drainage water for irrigation, new water supply sources should be sought.
11. Awareness on water resource protection and conservation should be enhanced, also through the organization of educational programmes on polluting activities and practices and on the current, significant environmental issues.
12. Practices that have adverse effects on water quality should be prohibited.
13. All sewage treatment stations should be equipped with modern technology.
14. Laws that allow for the disposal of industrial waste only after full treatment should be activated.
15. Disadvantaged villages must be supplied with sanitation and clean water services.

1.4 Discussion Session: Summary of issues raised during the workshop

Basandeila village residents participated in the workshop, by presenting their views and questions on the status of the Basandeila Nile Branch. Eng. Mohamed Ragab, who is a representative of the

local Water Utility, replied to all questions. Issues raised and corresponding replies are presented below.

Eng. Ahmed Atyia Younes, on sewage treatment in Mansoura:

Water is very polluted; Law 124 prohibited fish farms to use Nile water and water from the drainage canals, because it would lead to the production of contaminated fish. Furthermore, the existing water treatment stations do not remove pesticides and pollutants originating from the drainage canals.

Reply of Eng. Mohamed Ragab (Head Of Technical Support in Water & Sanitation Drainage Dakahlia):

In stations, water is mixed and passed through filters; there is no filter that can provide a water ratio above 90%; we are trying within the limits of our ability to deliver water of acceptable quality. With regard to fish farms, there is sewage treatment; however, water quality has deteriorated due to the previous uncontrolled disposal of sewage without treatment. However, water has been tested in the laboratory, and test samples have shown that water would not have side effects on animals.
the animals.

Dr.Ibrahim Yousef on the rehabilitation of the Compact Unit:

Most of the existing units are old, some may have been constructed in the 1960s, and we haven't heard of rehabilitation or technical control of their operation.

Reply of Eng. Mohamed Ragab:

Compact units are much smaller than the drinking water treatment plants installed in the cities. Their operation is not complicated to require technical control. Any trained technician can easily ensure their operation.

Sherif Mahmoud, Broadcaster in the Mansoura University Channel and Student in the Faculty of Commerce in the Mansoura University):

How can we avoid the very high concentration of chlorine in drinking water? The repair of breaking pipes is taking a long time, and they break again.

Reply of Eng. Mohamed Ragab:

Chlorine is used for disinfection in all countries and not only in Egypt. We use quantities that have been calculated. Sometimes, the dose can be slightly increased, but it is certainly not harmful. Pipe repairs depend on the region; the process can take a long time in one area and much less in another. Our goal is to completely rehabilitate the distribution network.

Mohamed Saad from Temay al Amdid (Student in the Faculty of Commerce of the Mansoura University, from the Mansoura University Media Center):

- What is the role of local community councils in villages for the control of equipment used for pumping drinking water?

- We heard that there is a project for the installation of a sewerage system in our village, about 5 years ago. Nothing has happened yet.
- Water supply in our village is interrupted for a long time. Furthermore, is drinking water getting mixed with sanitary drainage water?
- Water is insufficient in many places and not only in Dakahlia. There are a lot of promises for projects and reforms.

2 Report on the visit to Basandeila

The meeting between the Egypt INECO team and local stakeholders in the Basandeila Village was organized on Saturday, July 22nd 2007. The aim of this meeting was to discuss with local stakeholders on the water pollution of the Basandeila Nile Branch and to activate dialogue among the different social actors and water management authorities in order to develop commonly agreed options for addressing the problem.

The meeting was held at the local hospital, and was attended by officials of the local unit, leaders of the National Democratic Party, hospital employees and officials of the Drinking Water Treatment Plant of Basandeila, in the presence of Dr. Dionysis Assimacopoulos (INECO project Coordinator) and Eng. Mohamed Ragab, responsible of the Potable Water and Sanitary Drainage in the Dakahlia Governorate.

During the meeting it became clear that drinking water quality problems result from the mixing of potable water and sanitary drainage in the distribution network. In more detail:

- Mr. Amer El-Sayed Mowafi (Financial and administrative inspector of the municipality), having reviewed the problem, asked Eng. Mohamed Ragab to check connecting pipes in the distribution network, in order to ensure that there is no leakage in the sanitary drainage network.
- Mr. Atyia Shlaby, Chairman of the Council, commented on the situation and asked not to set a specific time for providing water supply to residents.

- In view of the above remarks, Eng. Mohamed Ragab requested authorities to develop an official document presenting the problem, which will be sent to the Water Company, depicting also the geographic distribution of damages in the network. He further requested demographic projections for the region, in order to include them in the overall workplan.
- Mr. Hashem El Shenawy, a former Manager in the Presidency, asked local residents to change their practices towards the environment, pointing out that they should not dispose waste or dead animal bodies in the Basandeila Nile Branch. He further requested to designate a particular space for domestic waste disposal.

Following from the above interventions, two questions was set from the audience on whether "The problem is in the water itself OR in the way it is managed?" and on whether "it is a pollution problem OR a water shortage problem?" The answer was that the problem lies in the shortage of treated water of appropriate quality for potable uses.

Stakeholders participating in the meeting further suggested the following:

- Mr. Abd Allah El Sayed (official in Basandeila Public Communities), suggested to have more than one water outlet. He demanded that livestock manure is not disposed in the water outlets, so that they do not block the sewerage network.
- Mr.Lotfy El Hussiny (Director of the Basandeila High School), asked to build sedimentation tanks along the network, and also requested the construction of septic tanks.
- Dr. Nashwa El Mahly (the Women Secretary), promised to develop an educational programme for the general public for informing on appropriate ways for manure disposal and animal bathing in order to ensure protection of drinking waters, and for proper sanitary drainage and pipe maintenance. She also asked to upscale the initiative to other Egyptian Governorates and promised to deliver this message to every household.

After the meeting, the INECO team visited the compact water treatment unit, which provides water also for other small villages and communities surrounding Basandeila (approximately 12 villages).

At the end of the discussion, Dr. Assimacopoulos stressed the importance of the dialogue between actors, water users and citizens for having a commonly agreed, accepted and effective solution to the issue at hand.

Dr. Ibrahim (Director of the Basandeila Hospital) promised to walk along the Nile Branch, and personally warn anyone who attempts to pollute it.

3 List of workshop participants

1) Dr.Ahmed Rakha , Environmental Affairs Agency
2) Dr.Ebethal Mohamed Kamal , Agriculture College –Mansoura University
3) Dr.EL Baz Ibrahim EL Baz , Health Management In Basendeila Village
4) Dr.Ibrahim Yousef Zayan , Basendeila Hospital Manager
5) Prof.Dr. Fathy Saad EL Gamal, Manager of the Institution of water management Researches
6) Eng.EL Sayed Rezea Abd EL Motaleb, The General Management of west Dakahlia Irrigation
7) Eng.Mohamed Ragab, Vice President of The Water Company
8) Alaa EL Sayed Mohamed Ahmed , Computer Specialist
9) Mohamed EL Sayed Abd EL Bary , Student In Faculty of commerce English Department
10) Hany Ahmed EL Shrebeny, Student In 4th Year In Faculty of Commerce English Department
11) Hashim EL Shinway, Ex-General Manager In Presidency
12) Dr.Nashwa EL Mahaly El Gamal , The Woman organization general secretary
13) Wahid Baredy , Belkas
14) Abd El Ghany Bealasy, The Secretary Of Belkas Center
15) Rady Abd El Aziz EL Saay , Belkas education management
16) Hamalish Mohamed Ouof , Basendeila Council
17) Amal Mohamed EL Baialy , Basendeila local Council
18) Amina Ahmed Mansour , Basendeila local Council
19) Mohamed Abd EL Aaty EL Emam, Basendeila local Council
20) Rabee'a Ali Salem, Basendeila local Council
21) Ahmed Mohamed Ali Hamady, Head Chief Of The agriculture Community
22) Dr.Zenib Abd EL Halim, Medical Affairs Directorate
23) EL sheshetawy Goma'a, National Party In Belkas
24) Nevneen Mansour , Water Company
25) Eng. Amal Mansour, Water Company
26) Walaa El Awady, Water Company
27) Chmeist. Sabila Anan, Environment Affairs
28) Atyia Mohamed , Local Health Unit In Basendeila
29) Maged Abd EL kalek Ahmed Mohamed , Belkas Center Presidency
30) Marwa Ali EL Atreby , Media Center
31) Hamdy Abd EL razak , City Council In Belkas
32) Samy Ali EL araby , Irrigation organization
33) Nafesa Mahoud Ibrahim , Education Ministry
34) Ghada Abd EL hafez , EL Masry Yom Newspaper
35) Mahmoud Mohamed Omda , GM IN education Ministry
36) EL said Abd EL Hady , Medicine College
37) Eman Ahmed Yousef, Children Hospital
38) Saleh Ramadan , Destour Newspaper
39) Mohamed Nagah Mahmoud , The preaching and guidance

40) Tamer Abd EL Ghany El Mahdy , Shabab Masr Newspaper
41) Abd EL Menom Saleh , Irrigation Engineering In Basendeila
42) Farrag Mohamed Farrag , Consultant
43) Alyia Farrag , Psychological Researcher
44) Abd Allah El Sayed Moahmed , Responsible for local communities
45) Dr. Abd Allah Mohamed Saleh , Basendeila Party Secretary
46) Molhem Roushdy Abd EL Malak , PR Manager
47) Abd EL hamid Abu EL Eneen, Middle east News Agency
48) Hossam El Din , Medicine College

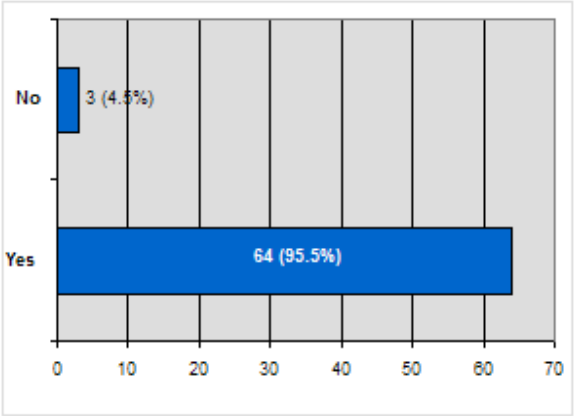
4 List of attendants in the visit to Basandeila

1) Hanan Ibrahim Shoman, Supervisor of rural pioneers, Basandeila Hospital
2) Magda Abd El Rahman , Medical Service Administrator
3) Allia Salah, Nurse
4) Sahar Hawas, Technician
5) Amal Mohammed, Technician of Medical statistics
6) Mahmoud soror, Administrator
7) Mohammed El Solfy , Teacher
8) Khairia Hamed , Laboratory Technician
9) Alia Ramzy , Nurse
10) Eman Mohammed, Nurse
11) Shaimaa awad, Pharmacist
12) Dina Ebrahim0, Pharmacist
13) Mohammed Abd El Atti, Local Council Unit, Basandeila
14) Amer El-Said , Financial and Administrative Inspector
15) Hamdi Mahmoud, Technician
16) Fatma Youssef,
17) Lobna Mahmoud, Nurse
18) Lotfi youssef, Director of Mobarak Secondary Scool, Basandeilanicia
19) Mohammed Mansour ,
20) Abd Allah Abou El Naga , Technician, Ministry of Irrigation
21) Attia Shebl, Head of the local council, Basandeila
22) Nashea El Mehali, Secretary of Women in the local council
23) Abd allah mohammed, Director of Non Governmental Societies, Basandeila
24) Berge Ohans , Ass. Professor, Faculty of Engineering, Mansoura University
25) Mohammed Ragab, Chief Of Technical Support Divisions In Dakahlia 's Water & Sanitary Drainage company.
26) Hashem El Shennawi , Director in Presidency
27) Ebrahim Youssef , Director of Basandeila Hospital

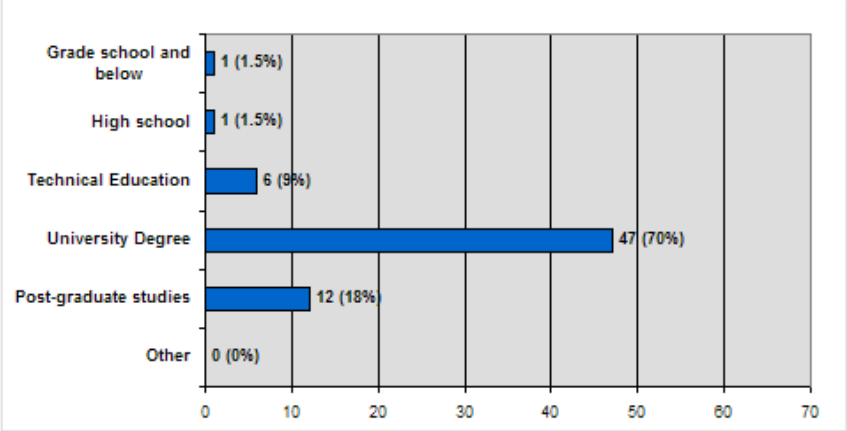
5 Workshop survey results

5.1 Respondents' background

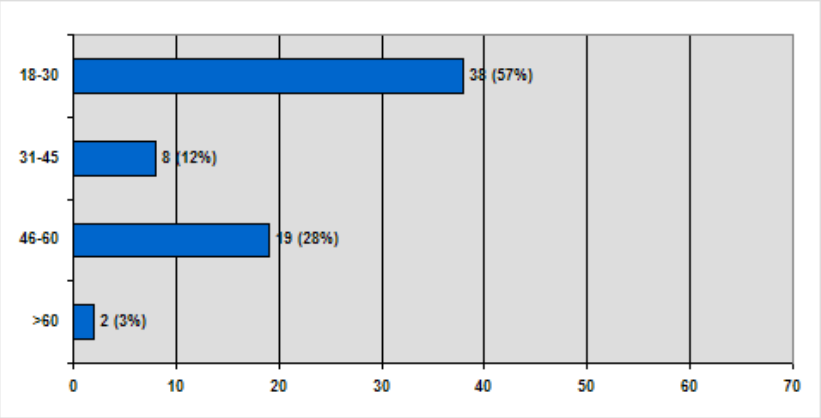
Permanent residents of the Dakahlia Governorate



Educational Background

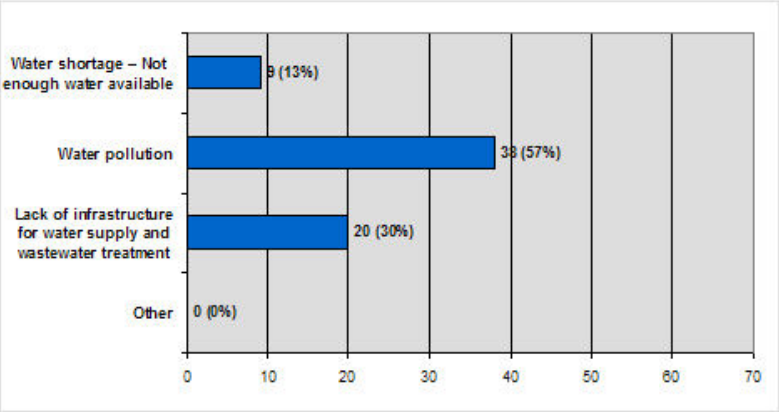


Age Group

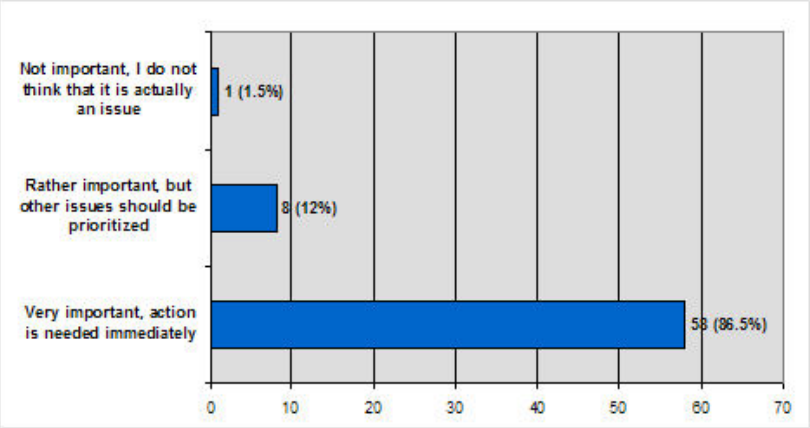


5.2 Perceptions on significant water management problems – Causes and effects to water pollution in the Dakahlia Governorate

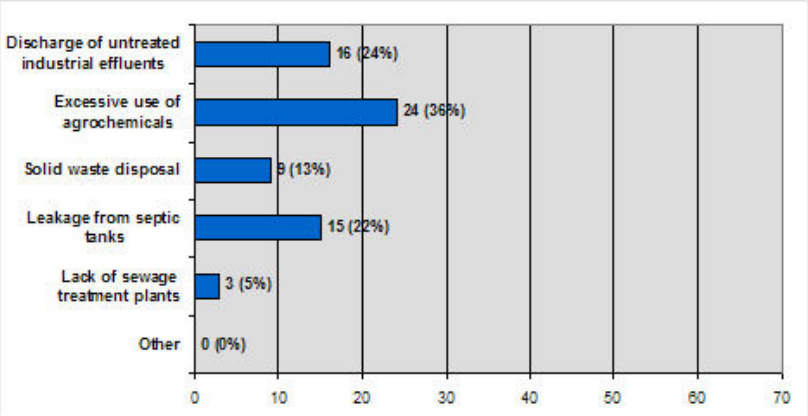
Which do you think is the most significant water-related problem currently faced in the Dakahlia Governorate?



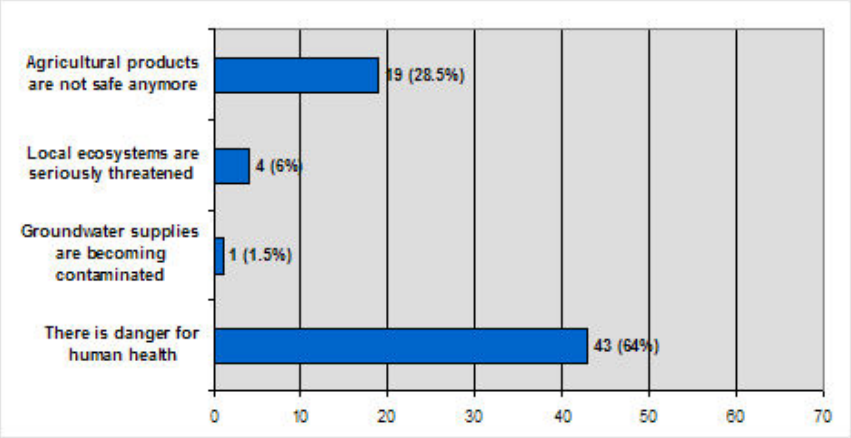
How significant do you think that water pollution is in your region?



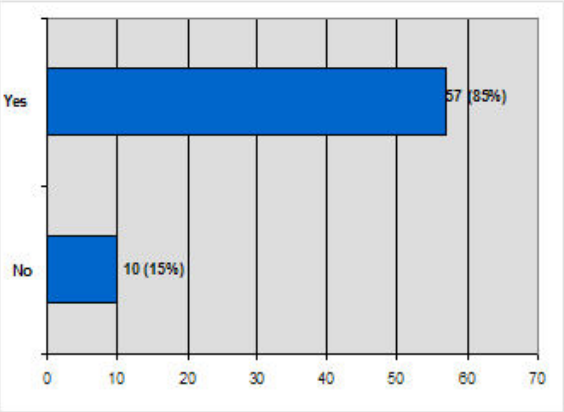
Which, according to your view, is the most important cause of water pollution? (only one answer possible)



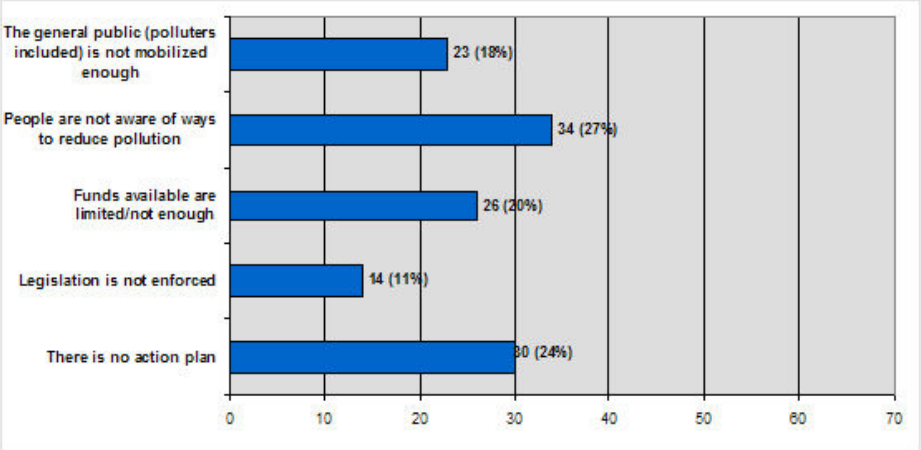
Which, according to your view, is the most important effect of water pollution? (only one answer possible)



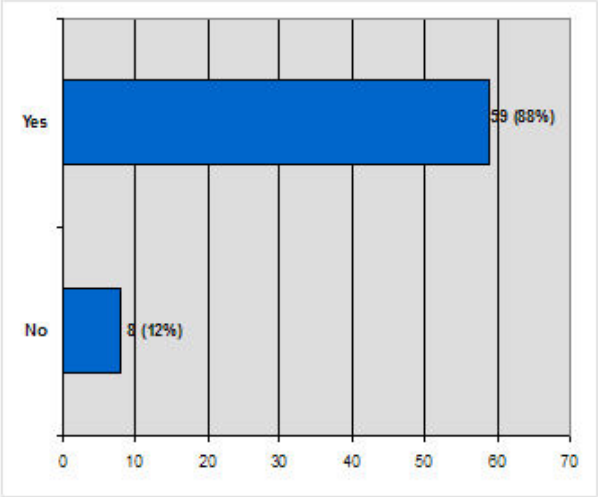
Does water pollution affect your daily activities?



Which, according to your view, are the underlying cause(s) of water pollution? (more than one answer possible)

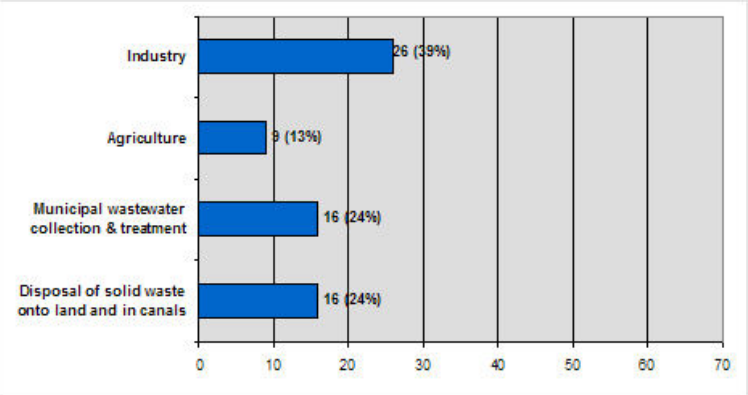


According to your personal view, are there administrative problems or constraints that should be overcome for effective solutions to be implemented?

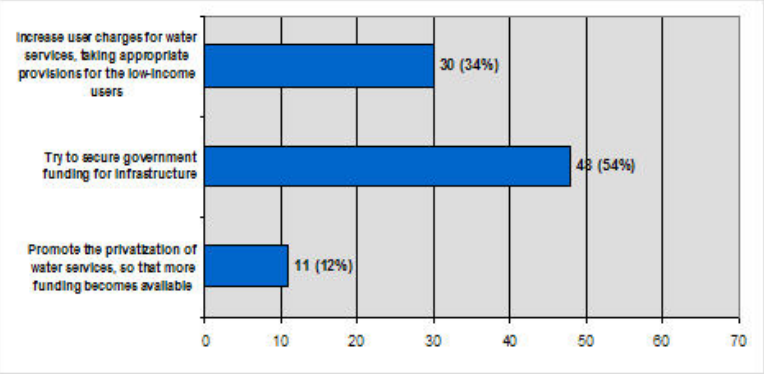


5.3 Prioritizing objectives and exploring alternative options

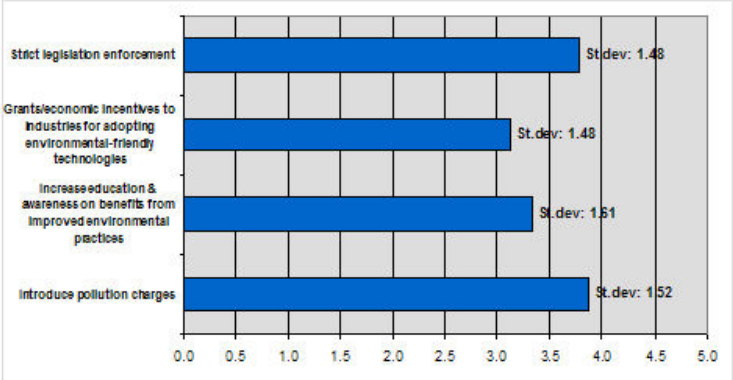
Which, according to your view, is the primary area where action is needed? (only one answer possible)



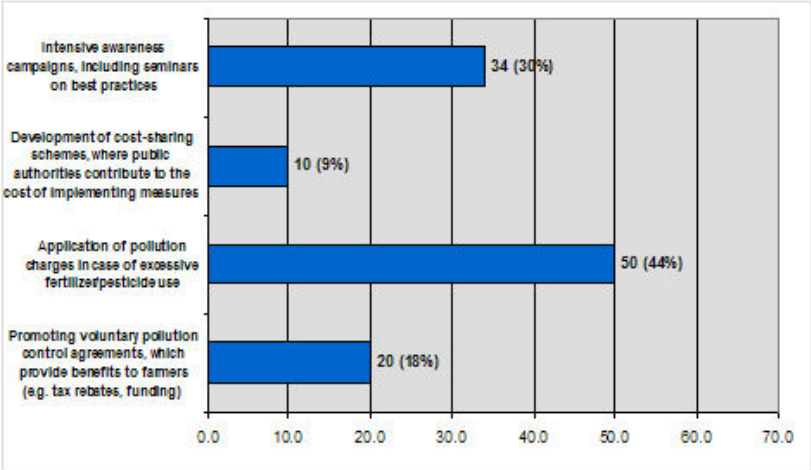
It is reported that municipal water services cannot respond to the increasing need for new infrastructure, due to financial constraints. How do you think that this issue can be addressed? (more than one answer possible)



Industries, including small manufactories, are considered primary contributors to water pollution. Please rank the measures below according to the possible impact that they may have, using a scale from 1 (no contribution) to 5 (high contribution).



Pollution from agrochemicals is often attributed to lack of awareness of farmers on how to apply fertilizers and pesticides. Which of the following measures you think would be most likely to have a significant impact on the current agricultural practices? (more than one answer possible)



Other suggestions

1. Increase farmer about the importance of rationalizing the consumption of pesticides and chemical fertilizers
2. Stimulation of farmers through the introduction of incentives to ensure their response to the "correct" way of using pesticides and chemical fertilizers
3. Monitoring and periodic follow-up on the use of agricultural chemicals and imposition of fines for misuse
4. The awareness of citizens and consumers in food preparation is one of the best ways to reduce the impact of pesticides on human health

General comments and suggestions by respondents:

1. Establishment of a mailing address for receiving complaints from citizens on water-related issues.

2. Deal with citizen complaints and receive their views through neighborhood consultation programmes.

3. Mutual meetings between beneficiaries and officials in water field through workshops and Non governmental organizations (NGOs).

4. Engaged community participation between all authorities/bodies of the country and the civil society as an accredited actor, with the aim to reflect the opinion of citizens on water-related issues.

5. Increase citizens' awareness on the importance of finding a way to make their views on water-related issues known to officials bodies and reassuring citizens that their points of view will be taken into consideration in decision-making.

6. Increase the awareness of citizens through the media on the importance of their participation and on providing their views on water quality and pollution issues.

7. Making compulsory questionnaires on water quality and services provided by water utilities in order to collect citizen views on the quality of services provided and map problems faced, so as to find solutions to address them.

6 Event flier, programme and posters

6.1 Event flier and programme (English)

WORKSHOP AGENDA

09:00 Registration

09:30 Welcoming Addresses

10:00-11:00 1st Session: Water Quality Issues in the Dakahlia Governorate

Chairpersons:
Prof. Dr. Magdy Abou Rayan,
President of Mansoura University and INECO Regional Partner
Dr. Dionysis Assimacopoulos, INECO Project Coordinator

10:00 Environmental and Health Impacts of Water Pollution
Prof. Dr. Ahmad Mansour

10:15 The Role of Rural Communities & guidelines on agricultural practices for water pollution mitigation
Prof. Dr. Ibtehal Mohammed Kamal

10:30 Water and Sanitary Drainage Problems in the Dakahlia Governorate
Major General Ahmed Abdoon

10:45 The Role of the Regional Branch of the Environmental Affairs Agency of East Delta in protecting water resources from pollution
Dr. Gamal El-Saady

11:00 Break

11:15-12:15 2nd Session: The INECO Project - Framework and problem analysis for water quality issues in Dakahlia Governorate

11:15 The INECO Project: Framework and Scope
Prof. Dionysis Assimacopoulos

11:45 Water Pollution: Problem Analysis & Problem Tree
Prof. Samy El Fallaly

12:15-14:00 3rd Session:
Discussion on objectives and Recommendations
- Discussion on the problem and its causes
- What is next (Brief Introduction by Prof. D. Assimacopoulos)
- Discussing on objectives and building the objectives tree

Contact for queries and further information:

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INECO
Institutional and Economic Instruments
for Sustainable Water Management in the Mediterranean Region
web site: http://environ.chemeng.ntua.gr/ineco

STAKEHOLDER WORKSHOP

"Building a common vision
for mitigating water pollution
in the Dakahlia Governorate"

Saturday, 21st July 2007,
Ramada Hotel, Mansoura, Egypt

INECO is a Coordination Action supported by the European Commission through the 6th Framework Programme, and addressing the "Specific Measures in Support of International Cooperation (INCO Programme) - Mediterranean Partner Countries (MPC)" Priority (Contract no: INCO-CT-2006-517673).

THE INECO PROJECT

INECO is a Coordination Action Project supported by the European Commission through the 6th Framework Programme, addressing the "Specific Measures in Support of International Cooperation (INCO Programme) - Mediterranean Partner Countries (MPC)" Priority. The INECO Consortium brings together 14 institutions from 10 Mediterranean Countries (Greece, France, Italy, Cyprus, Tunisia, Egypt, Lebanon, Syria, Algeria and Morocco), including public (6), private (7) and international organisations (1).

The goal of INECO is to introduce an interdisciplinary approach to water management building upon the integration of three major aspects: environment, economics and society. INECO will discuss shared problems in the decision-making process and the deficiencies of the present governance structures around the Mediterranean Basin. Research focuses on alternative institutional and economic instruments which can promote equity, economic efficiency and environmental sustainability in the sharing and governing dimensions of water resources management.

The INECO Framework of Activities

The Egypt workshop is one of the stakeholder workshops organised by INECO in Cyprus, Tunisia, Egypt, Lebanon, Syria, Algeria and Morocco. The workshops aim to develop a process towards constructively engaged Integrated Water Resources Management, and lay the foundations for reaching a common understanding on what the real problems are and how these could be addressed in a commonly desired water resources management situation.

INECO IN EGYPT

THE REGION OF THE BAHR BASANDEILA CANAL IN THE DAKAHLIA GOVERNORATE

The area selected for the implementation of the INECO Project in Egypt is the region of the Bahr Basandeila Canal in the Dakahlia Governorate. The canal irrigates an area of 3000 acres in the Basandeila village (also irrigated by the Basandeila Canal), with a permanent population of 25,000 inhabitants.

The region faces water quality problems, similar to those encountered in the Nile water distribution network in general. Waste disposal, heavy use of pesticides, inadequate domestic wastewater treatment, and uncontrolled discharge of industrial effluents have transformed open waterways to repositories and conveyors of liquid waste, and have created major pollution issues. In the region of the Bahr Basandeila Canal, water pollution is due mostly to the discharge of industrial and municipal effluents without prior treatment. Furthermore, current agricultural practices, including the excessive application of fertilizers and pesticides, result in high nutrient concentrations in the canal surface water, and exacerbate eutrophication and water quality deterioration. Large amounts of wastewater (domestic, industrial, and agricultural) are discharged onto land, and from the Bahr Basandeila Canal

Causes and effects of water quality deterioration in the Bahr-Basandeila Canal

end up in the Damietta Branch of the River Nile, posing a serious threat on human health, agricultural production, and the river and coastal ecosystems.

THE EGYPT WORKSHOP OBJECTIVES

The workshop aims to strengthen the alliance between the INECO Research Team and Local Stakeholders in the region by:

- Discussing on the focal water management problem experienced in the region;
- Promoting the development of a process where each contributor gains both a better understanding of the problem and insight on how other participants see the problem;
- Initiating the participatory involvement of stakeholders in determining, defining and evaluating alternative institutional and economic instruments towards problem mitigation.

The workshop will serve as a discussion forum on the problems and challenges faced by stakeholders. It will offer the opportunity for participants to share their experiences, knowledge, ideas, preferences, hopes, fears, opinions, and values.

6.2 Event flier (Arabic)

6.3 Event Programme (Arabic)

أنشطة قطاع شئون خدمة المجتمع بكلية الطب بالتعاون مع جمعية تكنولوجيا المياه ومركز بحوث المياه والصرف بالجامعة :

١- مؤتمر تكنولوجيا المياه فى الفترة من ١٥ إلى ١٨ مارس ٢٠٠٧ جلسة (المياه والصحة) ١٦ مارس - شرم الشيخ .
٢- المشاركة فى كرنفال اليوم العالمي للمياه (WORLD WATER DAY 2007) مارس ٢٠٠٧ بمدينة الإسكندرية بالاشتراك مع جمعية البيئة العربية ومكتبة الإسكندرية تحت عنوان (معاً لمواجهة ندرة المياه) .
٣- الاحتفال بيوم المياه العالمي بجامعة المنصورة ضمن فعاليات الأسبوع البيئي الخاص بالمحافظة على المياه تحت عنوان " نقطة مياه = حياة " واستضافة مسرحية (حابى بحاكمنا) المسرحية تهدف لحماية مياه النيل ١٥ / ٥ / ٢٠٠٦ كلية الطب - جامعة المنصورة .
٤- تنظيم ندوة " المياة والصحة " بقاعة المؤتمرات بمستشفى الأطفال الجامعي مايو ٢٠٠٧ .

توصيات ندوة المياة والصحة :

- نشر الوعي البيئي وتفعيل شعار نقطة مياه تساوي حياة .
- دعم برامج التوعية بترشيد استخدامات المياه ووقف الممارسات البشرية الخاطئة والتي تضر بجودة المياه .
- استخدام أساليب الري الحديثة لتقليل الفاقد من المياه .
- الحد من استخدامات المبيدات و الأسمدة الكيميائية إلا بالكميات المقررة .
- ترشيد استهلاك المنظفات الصناعية والتي لها أثر سلبي على المياه .
- تفعيل كافة القوانين لحظر التخلص من المخلفات الصناعية إلا بعد معالجتها تماماً .
- التوسع فى مد خدمات الصرف الصحي للقرى المحرومة وإنشاء نظام رشيد لإدارة المخلفات الصلبة .
- تفعيل وتطبيق نظرية الإدارة المائية المتكاملة .
- دعم المشاريع البحثية التطبيقية فى مجال المياه و الصرف .
- وضع مقاييس معينة ومحددة لخزانات المياه والعمل على نظافتها المستمرة على مدار العام .
- الحد من ظاهرة النمو العشوائي للمباني والارتفاعات العشوائية ومدي تأثير ذلك على الشبكات .
- تفعيل إنشاء محطات المياه و الصرف المعتدلية التكاليف .
- إحكام الرقابة على كبائن رش الموبليا بدمياط و مصادر الصرف بها .

تحت رعاية

السيد الأستاذ الدكتور
مجدى أبو ريان
رئيس الجامعة

الأستاذ الدكتور
محمد حامد الشابورى
نائب رئيس الجامعة لشئون خدمة المجتمع وتنمية البيئة

ندوة توعية لمواجهة مشكلات تلوث المياه بمحافظة الدقهلية

ينظمها

قطاع شئون خدمة المجتمع وتنمية البيئة - كلية الطب - جامعة المنصورة

بالتعاون مع

مركز مشروعات المياة والصرف الصحي والصناعي بالجامعة
وجمعية تكنولوجيا المياه
ومشروع الإدارة المتكاملة للموارد المائية
وجمعية وفاء النيل
السبت ٢١ يوليو ٢٠٠٧ فى تمام الساعة العاشرة صباحا
رمادا - المنصورة

رئيس الندوة
أ.د / أحمد منصور
وكيل كلية الطب لشئون خدمة المجتمع وتنمية البيئة

مقررا الندوة
أ.د / سامي الفلالي
أستاذ بالمركز القومي للبحوث
د/ زيهان منير
مدرس م- كلية الطب وعضو لجنة شئون خدمة المجتمع وتنمية البيئة

المتحدثون

أ.د/ أحمد منصور — وكيل كلية الطب لشئون خدمة المجتمع وتنمية البيئة
أ.د/ ابتهال محمد كمال — أستاذ بكلية الزراعة- جامعة المنصورة
اللواء/ أحمد عابدين — رئيس هيئة المياه و الصرف الصحي- محافظة الدقهلية
د/ جمال الصعيدي — مدير الفرع الإقليمي لجهاز شئون البيئة لشرق الدلتا بالمنصورة
أ.د/ديونسيس اسيماكوبولوس — منسق مشروع الإدارة المتكاملة للموارد المائية
أ.د/ سامي الفيلالي — أستاذ بمركز البحوث الزراعية

برنامج ورشة العمل :

التسجيل : ٩- ١٠

الجلسة العلمية الأولي — قضايا جودة المياة في محافظة الدقهلية — ١٠-١١

رؤساء الجلسة

أ.د/ مجدي أبو ريان — رئيس جامعة المنصورة وممثل مشروع الإدارة المتكاملة للموارد المائية بمصر
د/ ديونسيس اسيماكوبولوس — منسق مشروع الإدارة المتكاملة للموارد المائية

المتحدثون

أ.د/ أحمد منصور — ١٠:٠٠ - ١٠:١٥
"الأثر البيني لتلوث المياة على الصحة"

أ.د/ ابتهال محمد كمال — ١٠:١٥ - ١٠:٣٠
"دور المجتمع الريفي و الارشاد الزراعي في المحافظة علي المياة من التلوث"

اللواء/ أحمد عابدين — ١٠:٣٠ - ١٠:٤٥
" مشكلات المياة و الصرف الصحي بمحافظة الدقهلية "

د/ جمال الصعيدي — ١٠:٤٥ - ١١:٠٠
"دور الفرع الإقليمي لجهاز شئون البيئة لشرق الدلتا بالمنصورة في حماية المياة من التلوث بالإقليم "

استراحة : ١١:٠٠ - ١١:١٥

الجلسة العلمية الثانية (مشروع الادارة المتكاملة للموارد المائية هيكل المشروع وتحليل قضايا جودة المياة في محافظة الدقهلية)

١١:١٥ - ١٢:١٥

رؤساء الجلسة

أ.د/ أحمد منصور — وكيل كلية الطب لشئون خدمة المجتمع وتنمية البيئة
اللواء/ أحمد عابدين — رئيس هيئة المياة و الصرف الصحي-محافظة الدقهلية

المتحدثون

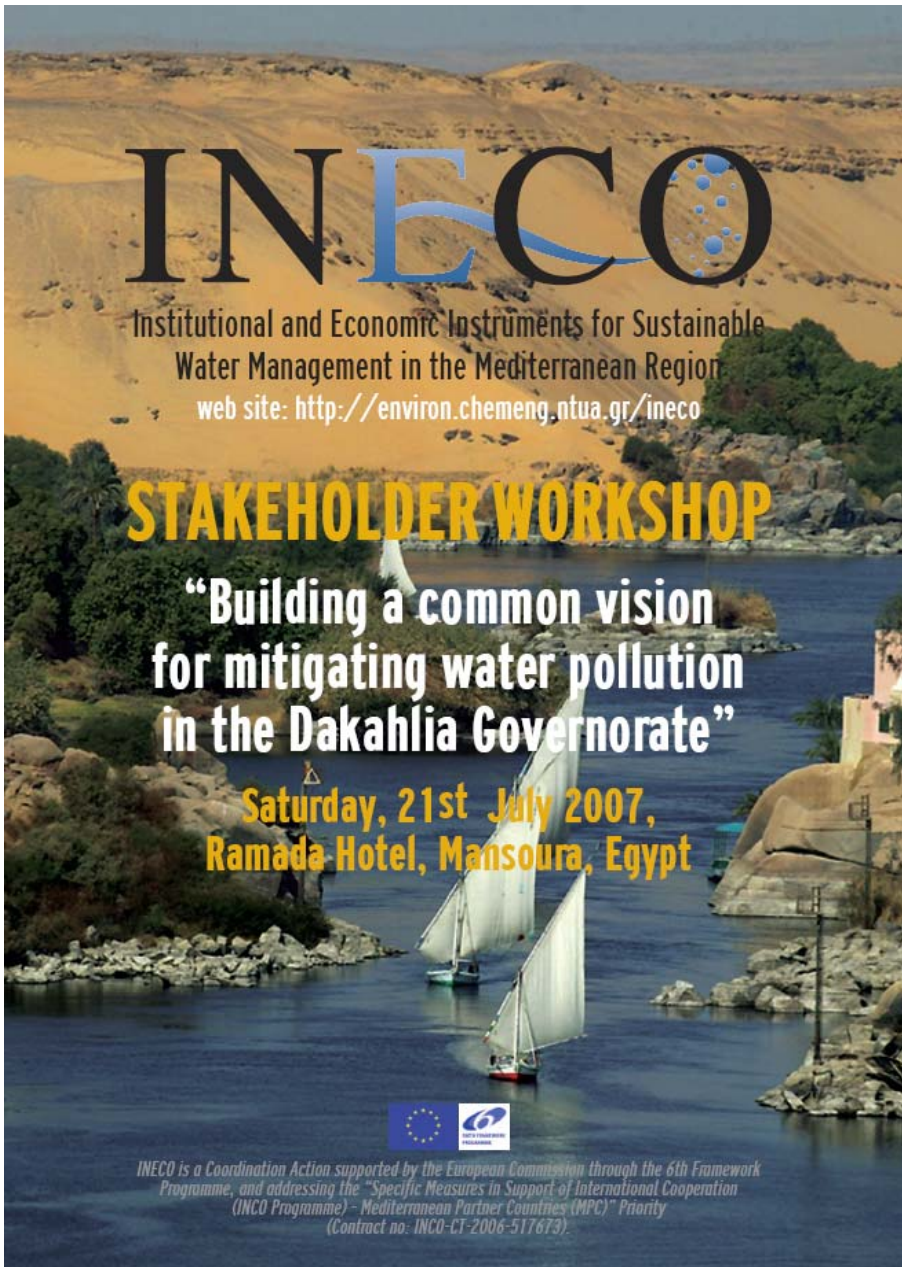
د/ ديونسيس اسيماكوبولوس — ١١:١٥ - ١١:٤٥
"مشروع الادارة المتكاملة للموارد المائية : هيكل المشروع ونظرة عامة"

أ.د/ سامي الفيلالي — ١١:٤٥ - ١٢:١٥
" تلوث المياة: المشكلة و التحليل"

الجلسة العلمية الثالثة (مناقشة أهداف وتوصيات ورشة العمل) ١٢:١٥-٢

- مناقشة مشكلة تلوث المياة و أسبابها
- الحلول المقترحة
- مناقشة موضوعية وخطوات الحل للمشكلة

6.4 Event poster



INECO Syria Stakeholder Workshop

"Building a common vision for mitigating water pollution in the Barada River Basin"

Sheraton Maaret Seydnaya, Damascus
Monday, September 10th 2007

1 Workshop report

1.1 Introduction

The INECO Syria Stakeholder workshop was held under the auspices of the Deputy Minister of Irrigation, Dr. Souliman Ramah, at the Sheraton Maaret Seydnaya Hotel, on Monday, September 10th 2007. The workshop aimed at strengthening the alliance between the INECO Research Team and Local Stakeholders, and at providing a platform for constructively engaged dialogue on water pollution in the Barada River Basin. Furthermore, it aimed at exploring the perceptions of participants on causes and deficiencies contributing to the water management issue, and at initiating a constructive discussion on possible actions to address these. The workshop was attended by 54 participants from various ministerial departments, governmental agencies, regional authorities and NGOs (Annex II of this document provides a complete list), and by local press representatives.

This document provides a comprehensive summary of the event in terms of discussions held and outcomes achieved, and is structured as follows:

- Section 2 provides a comprehensive summary of discussions held during the workshop.
- Section 3 presents the outcomes of the workshop survey on water pollution causes and effects, and on possible alternative solutions.

All material relevant to the workshop can be found at the corresponding section of the INECO web site at: http://environ.chemeng.ntua.gr/ineco/Default.aspx?t=382 .

1.2 Discussion Summary

1.2.1 Session 1: Introduction

The workshop started with the welcoming address of Dr. Jamil Falloh, Water Resources Manager in the Greater Damascus area, and representative of the Ministry of Irrigation. Dr. Falloh elaborated on water pollution issues in the Barada River Basin, explaining that wastewater discharged without prior treatment imposes great health and environmental concerns. He pointed out that the Government is undertaking new projects, and has embarked on a large investment programme, aimed at the building of new wastewater treatment plants.

After the opening, Prof. Dionysis Assimacopoulos, the INECO Project Coordinator made an introduction to the concepts of INECO by presenting the broader context and challenges for water management in the MENA Region, and the specific purposes and methodology of INECO. He explained the purposes of the workshop, and the opportunities that it can offer to both the project but most importantly to the local stakeholders who are participating in this effort.

1.2.2 Session 2: Water pollution in the Barada River Basin – Causes and Effects

Session 2 of the workshop was initiated by Eng. Malek Al Haddad (Studies and Integration Consulting, SIC). Eng. Haddad pointed out that respect towards the environment is a responsibility which is shared among individuals, communities, organizations and the Government. He specifically stressed that the role of policy makers is to establish and implement

a practical and applicable framework for integrating the management of water resources in the national context, taking into account the experience and best practices already applied in other countries.

Then, he presented an overview of the current institutional and economic setting for water quality management in Syria, and made an introduction to the water management issue that was the theme of the workshop, i.e. "Water Pollution from household, industrial and agricultural drainage water in the Barada River Basin. Eng. Haddad showed many photos from the Barada River, from its source to the Otayba Lake, and the end point of the river. The photos unveiled many pollution sources around the river. Furthermore, he pointed out the increased urbanization of the greater Damascus Area during the last 40 years, demonstrating satellite photos. He closed his presentation by providing a tentative illustration of the institutional and economic causes and effects of the water management issue to be further discussed in the next sessions. This illustration is presented in Figure 19.

Subsequently, Ms. Eleni Manoli (Chemical Engineer, National Technical University of Athens), presented the concepts for Integrated Water Resources Management, and instruments and approaches for preventing and controlling water pollution. During this presentation, workshop participants were asked to complete on several pieces of "post-it" paper, their perceptions on the causes and effects of water pollution in the Barada River Basin. The new cause-and-effect tree, according to the perception of local stakeholders is depicted in Figure 20.

1.2.3 Session 3: Introduction to building objectives

The 3rd Workshop Session involved discussions among the workshop participants on causes and potential solutions to the problem, which has become extremely acute and raises big concern among all authorities and parties concerned.

Mr. Jamal Jarad, (Ministry of Housing) focused on fees for wastewater treatment. He explained that these are calculated as an additional percentage of 7-8% of the water supply bill. These fees are collected only for the few large cities that have wastewater treatment plants. Presently, studies have been launched for 23 wastewater treatment plants in the Damascus countryside, in order to alleviate the pollution of the Barada River. Concerning the application of water-related legislation, Mr. Jarad mentioned that the provisions of Environmental Law No 50 are very clear on issues that concern law violation.

Ms. Rim Abedrabboh (Water Department of the Ministry of Local Administration and the Environment), noted that the application of the law for both private and public sector establishments is a very crucial issue, and that it is very important to harmonize and integrate the different sectoral policies. She further talked about the re-allocation of water through the use of economic instruments, as means to reduce resource overexploitation, pointing out that the achievement of this goal should be based on a participatory approach, involving all the responsible bodies in order to identify and agree upon solutions. Additionally, she elaborated on the change of current concepts related to water, stating that *"everybody talks about food security; however we need to be aware of the relation between food security and water security. For example, if we have an agricultural plain which produces water-demanding crops for export, we*

need to mention the cost of water and the cost of exploiting our own resources. This use aggravates water deficiency, not just for future generations but also for this generation. Currently, the Barada River Basin is the one which faces the most important deficit in Syria." She further pointed out that there are many studies on this issue and their results need to be implemented, and mentioned that the Environmental Law is still not applied because they are many difficulties to apply it in the public sector due to the lack of political will.

Subsequently, Ms. Shahira Kasea (Water Directorate of the League of Arab States), pointed out that solutions to problems are already known. What is needed are decisions, and their application should originate from decision-makers at the high political levels, and not from experts, as is the common problems in the Arab world. She stressed that all ministries should be involved, in order to create a very specific, targeted and clear water policy. This should be presented to the high-level decision makers in order to be applied.

Subsequently, Prof. Assimacopoulos explained that possible thematic areas for exploring solutions to water pollution pertain to five different areas: (a) Enforcement, (b) Encouragement, (c) Engineering, (d) Education, and (e) Economics.

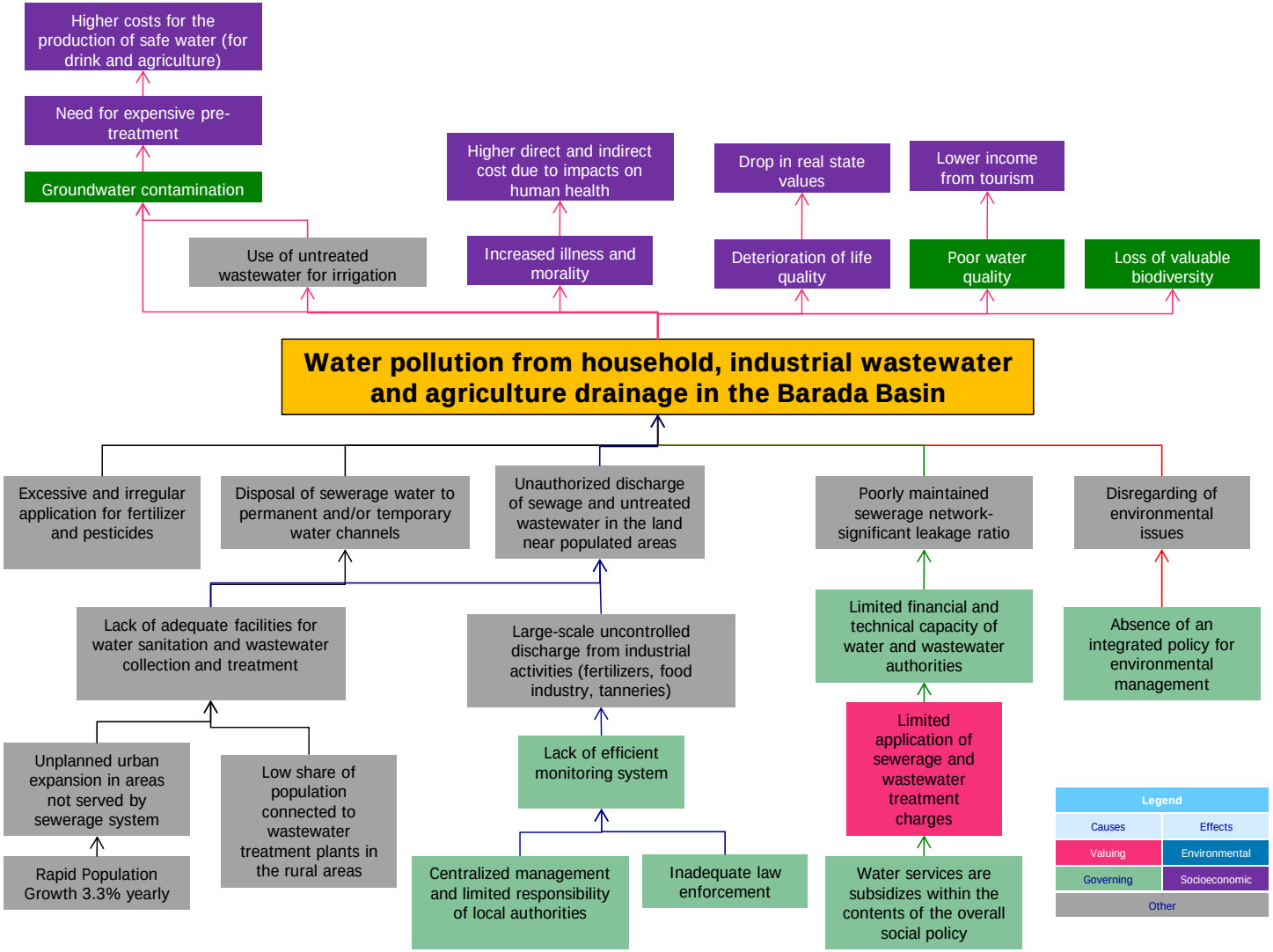


Figure 19: Tentative illustration of causes and effects of water pollution in the Barada River Basin (as presented by Eng. Malek Al Haddad)

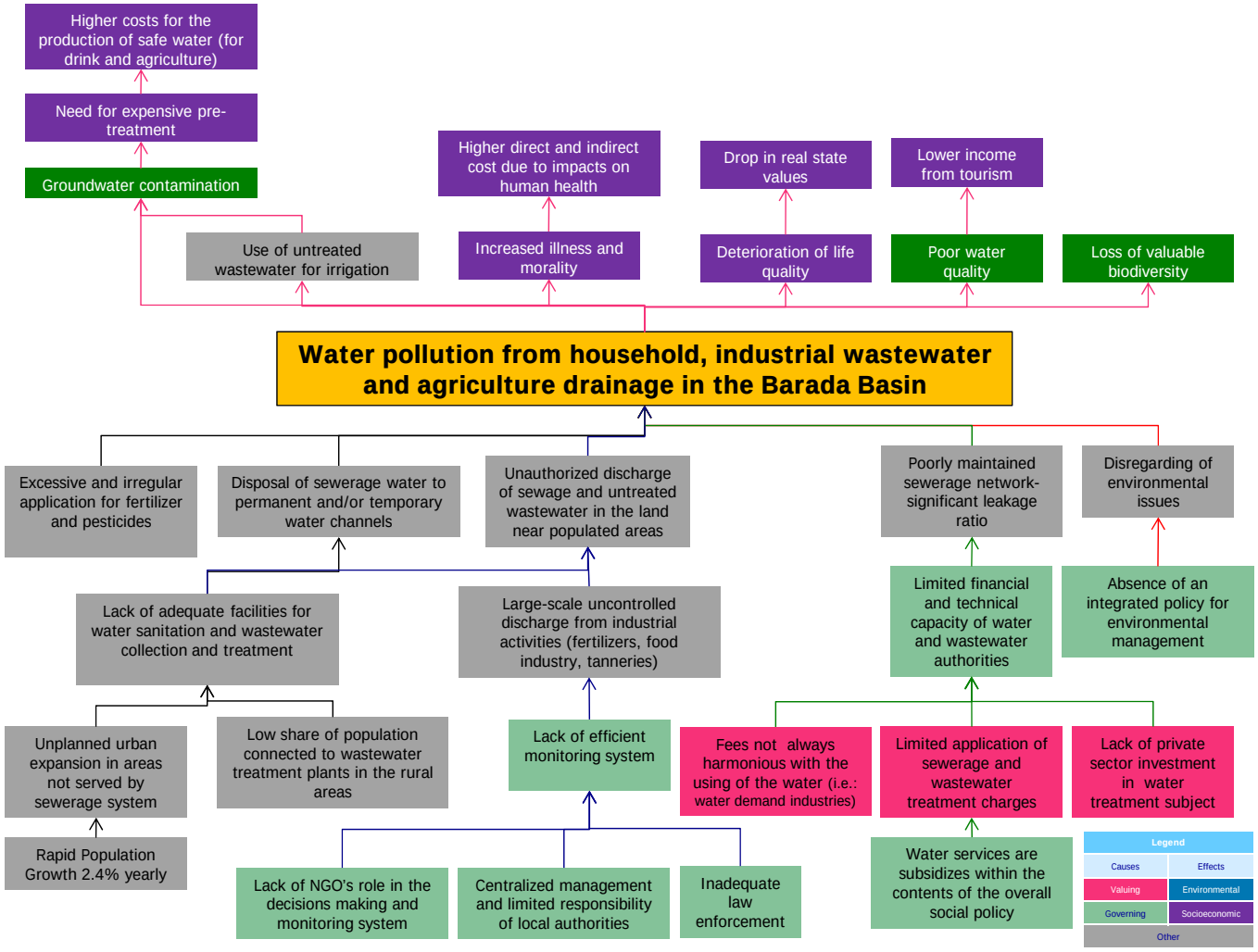


Figure 20: Causes and effects of water pollution in the Barada River Basin, as mapped by the workshop participants

2 List of Workshop Participants

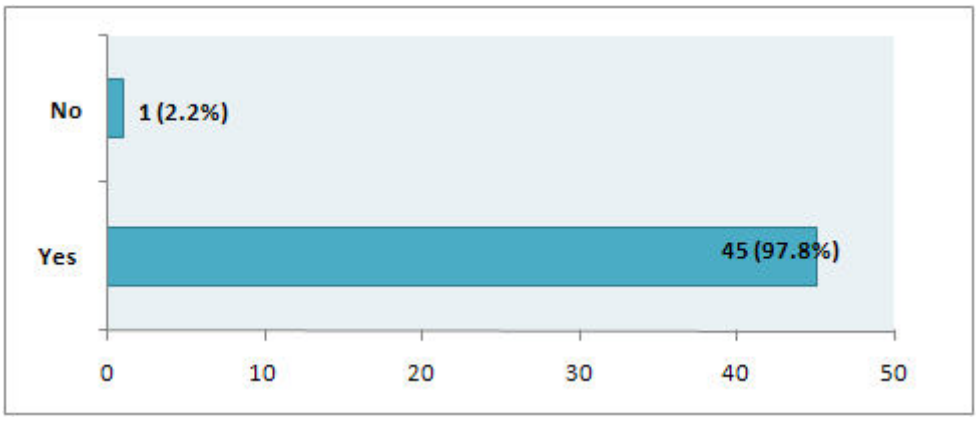
1) Dr. Nasser Nasser, Atomic Energy Commission of Syria
2) Hanan Masalkha, General Commission For Scientific Agricultural Research
3) Adel Marai, Syrian TV
4) Dr. Samir Safadi, Syrian Environment Society
5) Rani Daioub, General Company For Engineering Studies And Consulting
6) Watheq Rassol-Aga, Supreme Council of Sciences
7) Maan Daoud, General Commission For Scientific Agricultural Research
8) Ahmad Majar, General Commission For Scientific Agricultural Research
9) Kaian Joumaa, Press
10) Suliman Atia, Press
11) Shaheera Qaseea, League of Arab States
12) Michel Khaiat, Press
13) Amal Marouf, Press
14) Dr. Abd-Jabar Dahhak, Friends of Damascus Society
15) Tamim Al-Inklizi, Mayor of Al-Mleha municipality
16) Ahmad Ghazi, Industrialist
17) Eng. Laila Darra, Damascus Governorate, Directorate of Environment
18) Eng. Ferial Housaini, Damascus Governorate, Directorate of Environment
19) Assaad Dakhil, Water Resources Directorate in Damascus and Damascus Rural
20) Kassem Natouf, Water Resources Directorate in Damascus and Damascus Rural
21) Abdelhakeem Saad-Deen, Water Resources Directorate in Damascus and Damascus Rural
22) Nahida Fallouh, Water Resources Directorate in Damascus and Damascus Rural
23) Yassin Touma, Water Resources Directorate in Damascus and Damascus Rural
24) Ibrahim Yakhour, Institutional and Sector Modernisation Facility Project
25) Lian Catinis, Institutional and Sector Modernisation Facility Project
26) Ahmad Zlita, General Commission For Scientific Agricultural Research
27) Dr. Ramez Nasser, Atomic Energy Commission of Syria
28) AbdRahman Kassem, Atomic Energy Commission of Syria
29) Dr. Boulos Abo-Zakhem, Atomic Energy Commission of Syria
30) Iad Abo-Madi, Atomic Energy Commission of Syria
31) Rania Hafez, Atomic Energy Commission of Syria
32) Maissa Aawa, State Planning Commission
33) Instissar Mardini, Ministry of Utilities and Housing
34) Reem Abd-Rabbo, Ministry of Local Administration and Environment
35) Hanan Shawki, Ministry of Utilities and Housing
36) Jamal Jerad, Ministry of Utilities and Housing
37) MariamMashta, Ministry of Irrigation
38) Moukhtar Dana, Ministry of Irrigation
39) Souhair Khaiat, Ministry of Irrigation
40) Mahmoud Abdouni, Ministry of Irrigation
41) Imad Fattal, Ministry of Irrigation
42) Loutfi Nemer, Ministry of Irrigation
43) Youssef Toutou, Ministry of Irrigation
44) Reem Nasser-Alla, Ministry of Irrigation

45) Kinana Moustafa, Ministry of Irrigation
46) Taher Haj-Hassan, Ministry of Irrigation
47) , National Water Resource Commission
48) Ahmad Shehaddat, Ministry of Irrigation
49) , National Water Resource Commission
50) Maiada Koudmani, Ministry of Irrigation
51) , Water Quality Monitoring Directorate
52) Najeeb Hassoun, Ministry of Agriculture
53) , National Project for Transforming to Modern Irrigation
54) Hussein Alawad, Ministry of Agriculture
55) , National Project for Transforming to Modern Irrigation
56) Zouia Dagouz, Ministry of Tourism
57) Abeer Alnouss, Ministry of Tourism
58) Ahmad-Nizar Alwawi, Ministry of Finance
59) Ahmad Alhaj-Hassan,

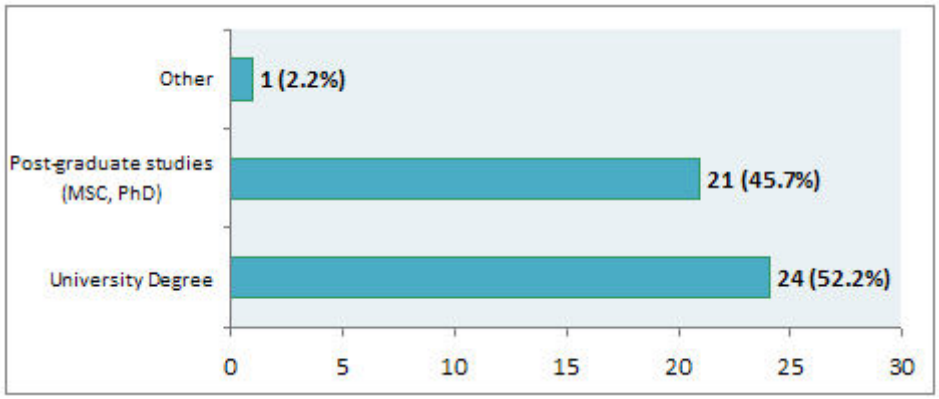
3 Workshop survey results

3.1 Respondents' background

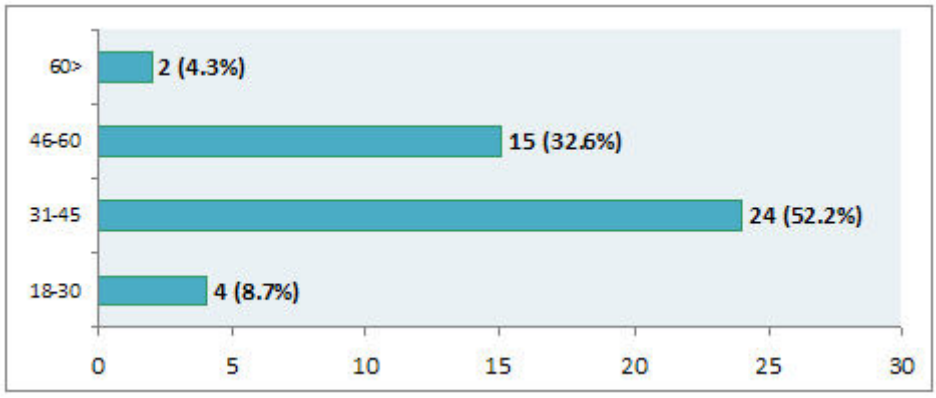
Permanent residents of the greater Damascus area



Educational Background

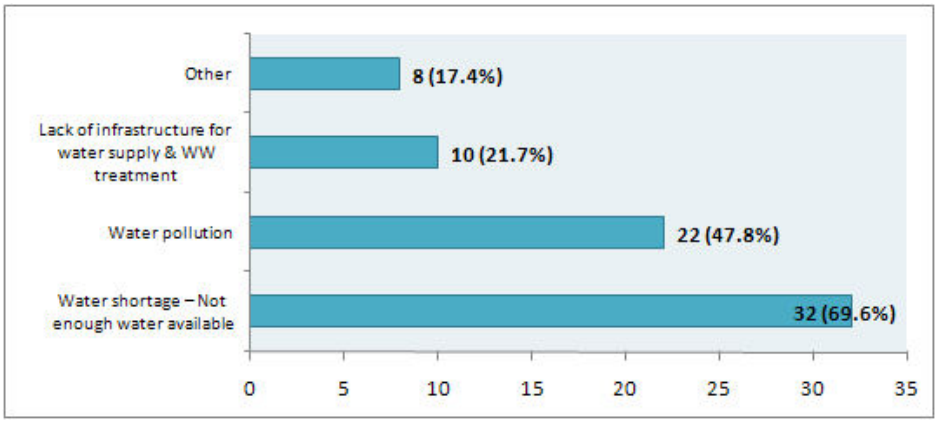


Age Group

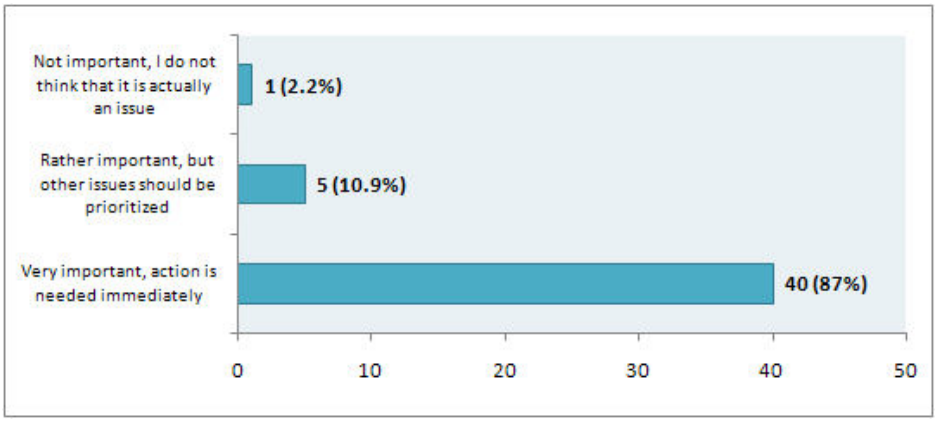


3.2 Perceptions on significant water management problems – Causes and effects to the pollution of the Barada River

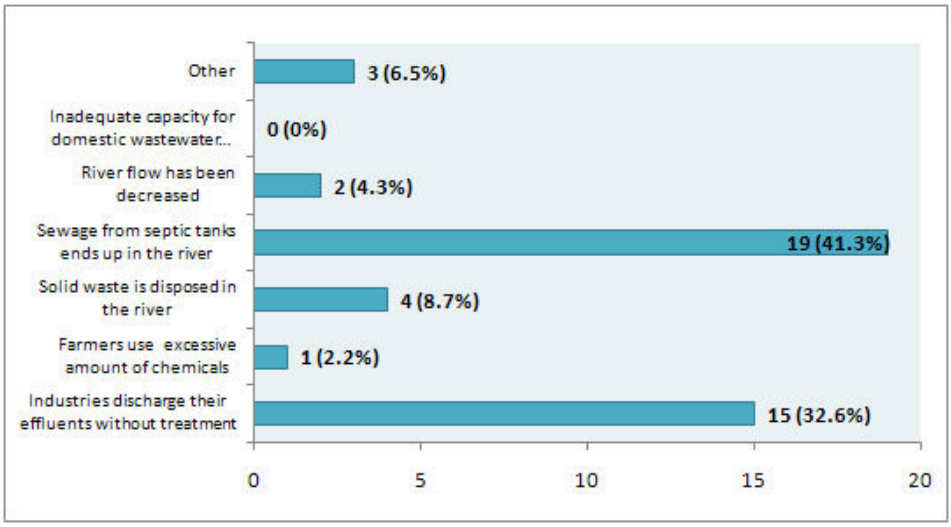
Which do you think is the most significant water-related problem currently faced in the Barada River Basin?



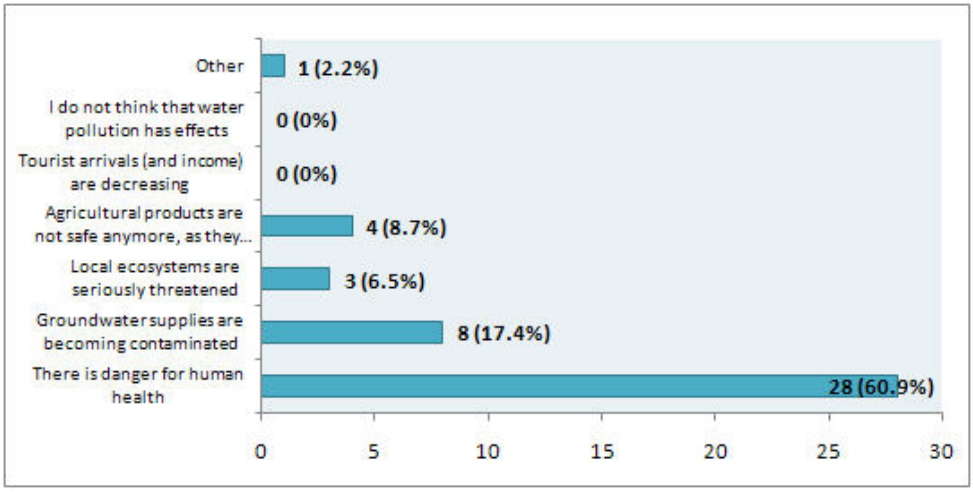
How significant do you think that water pollution is in your region?



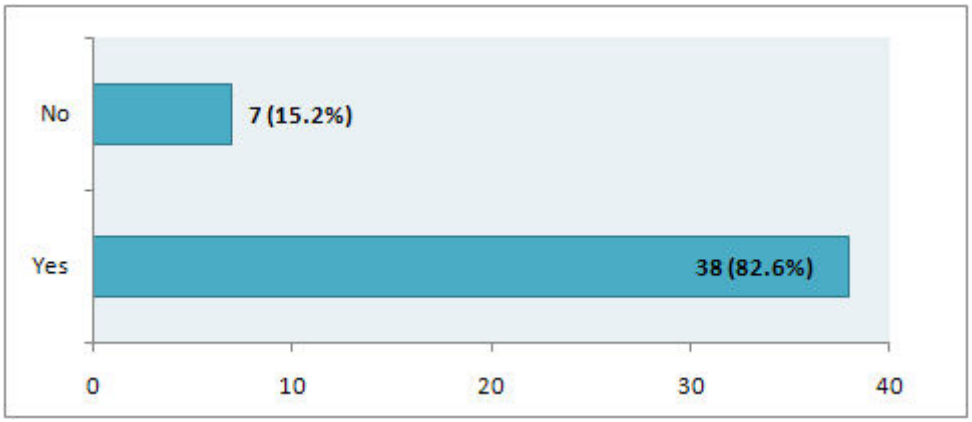
Which, according to your view, is the most important cause of water pollution in the Barada River? (only one answer possible)



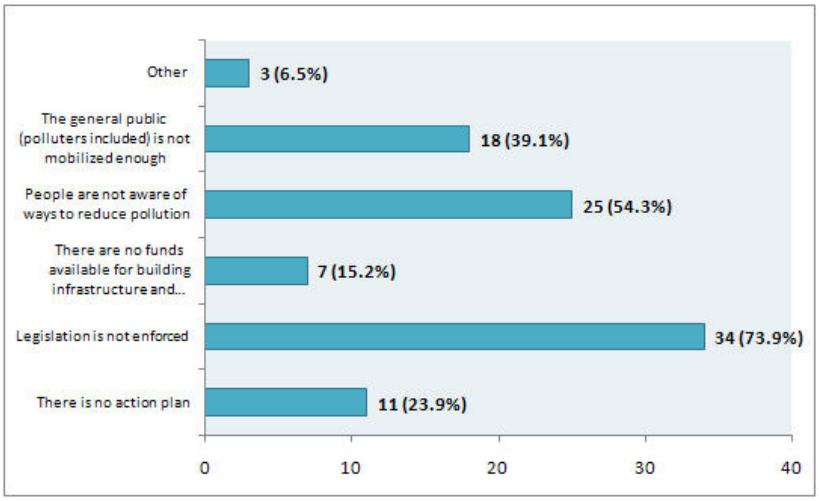
Which, according to your view, is the most important effect of water pollution



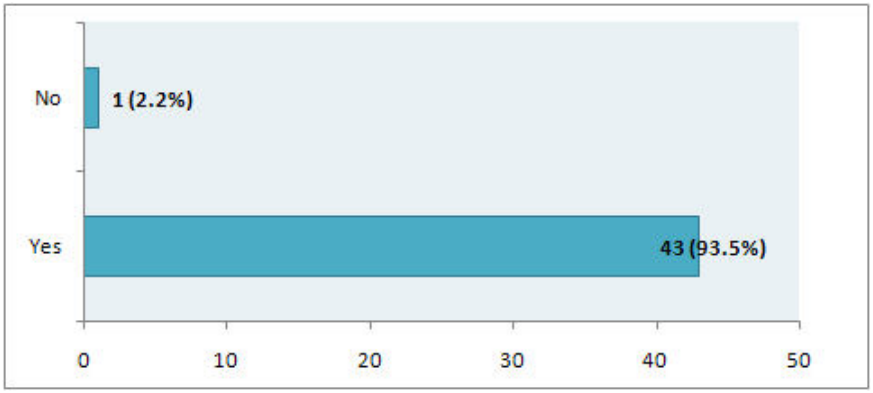
Does water pollution affect your daily activities?



Which, according to your view, are the underlying cause(s) of water pollution? (more than one answer possible)

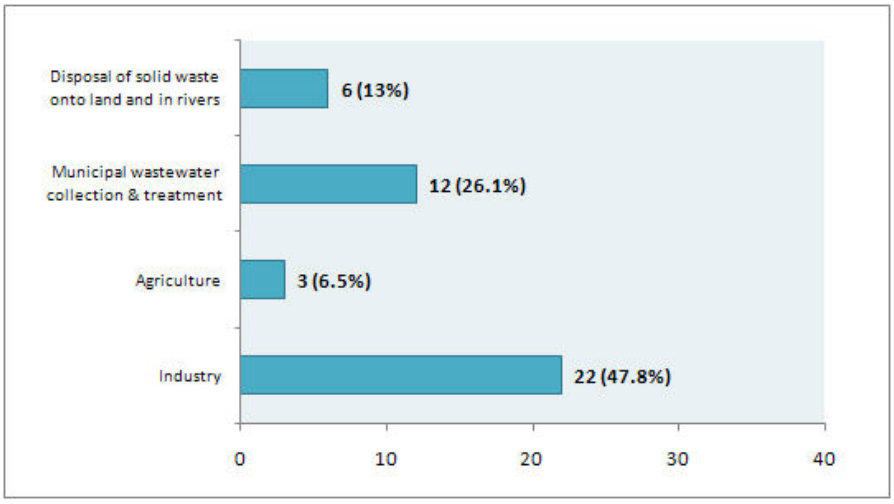


According to your personal view, are there administrative problems or constraints that should be overcome for effective solutions to be implemented?

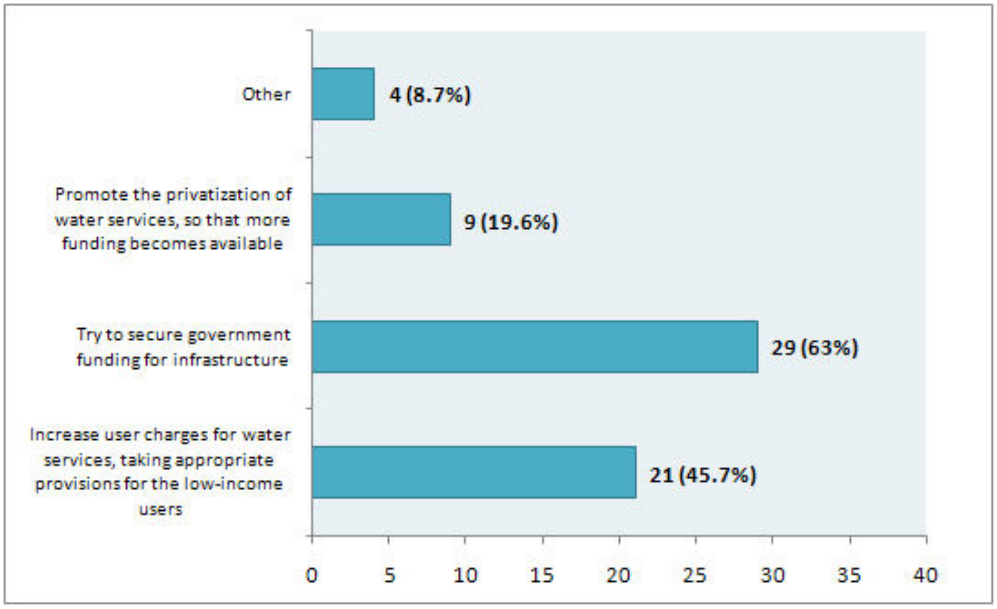


3.3 Prioritizing objectives & exploring alternatives for mitigating water pollution in the Barada River Basin

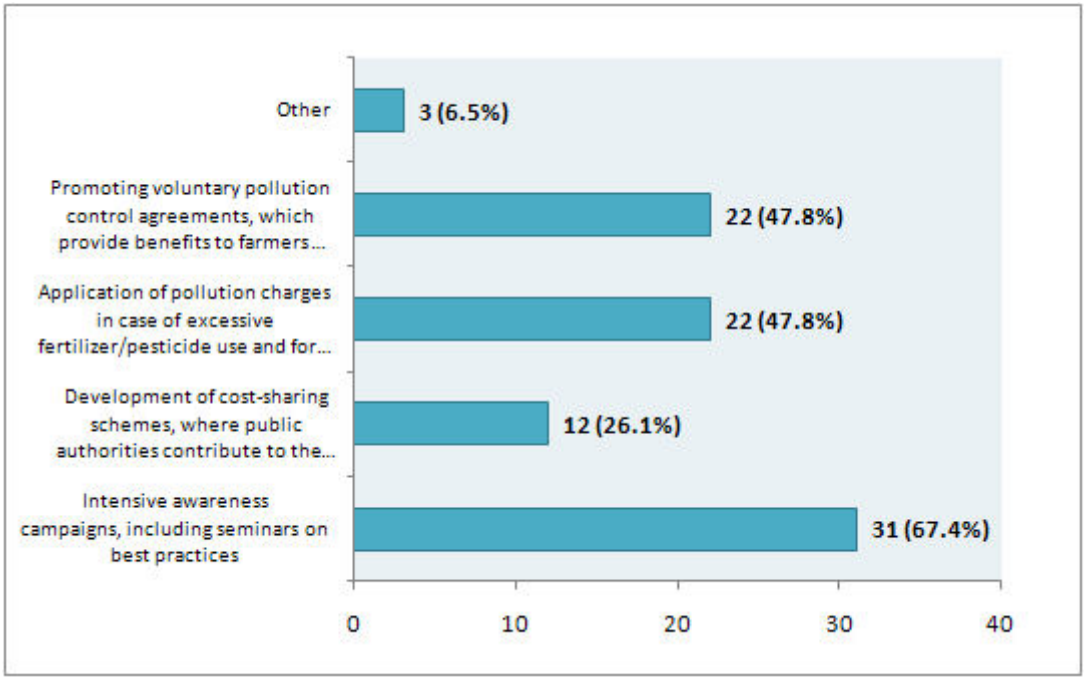
Which, according to your view, is the primary source of water pollution? (only one answer possible)



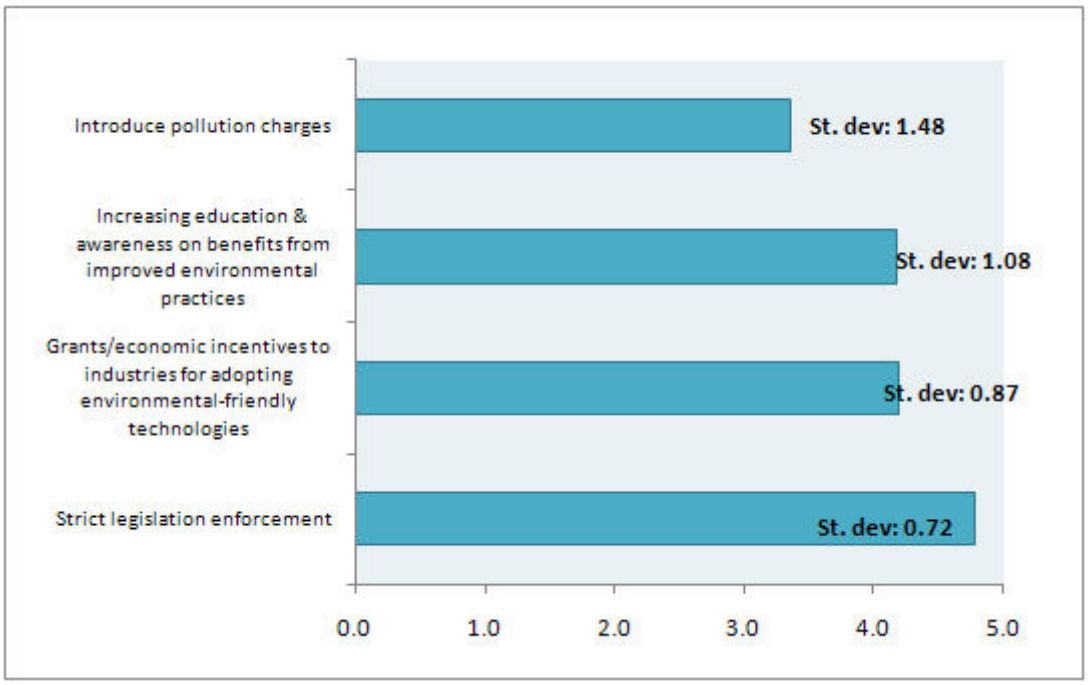
It can be claimed that water services cannot respond to the increasing need for new infrastructure, due to financial constraints. How do you think that this issue can be addressed? (more than one answer possible)



Pollution from agrochemicals is often attributed to lack of awareness of farmers on how to apply fertilizers and pesticides. Which of the following measures you think would be most likely to have a significant impact on the current agricultural practices? (more than one answer possible)



Industries, including small manufactories, are considered primary contributors to water pollution. Please rank the following measures according to the possible impact that they may have, using a scale from 1 (no contribution) to 5 (high contribution)



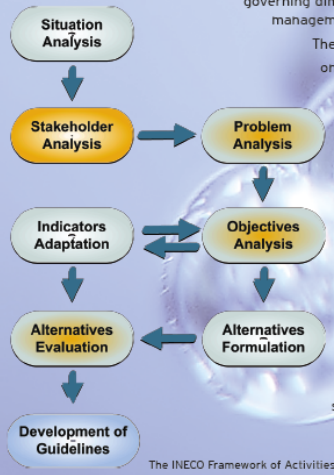
4 Event flier, programme and posters

4.1 Event flier (English version)

THE INECO PROJECT

INECO is a Coordination Action Project supported by the European Commission through the 6th Framework Programme, addressing the "Specific Measures in Support of International Cooperation (INCO Programme) - Mediterranean Partner Countries (MPC)" Priority. The INECO Consortium brings together 14 institutions from 10 Mediterranean Countries (Greece, France, Italy, Cyprus, Tunisia, Egypt, Lebanon, Syria, Algeria and Morocco), including public (6), private (7) and international organisations (1).

The goal of INECO is to introduce an interdisciplinary approach to water management building upon the integration of three major aspects: environment, economics and society. INECO will discuss shared problems in the decision-making process and the deficiencies of the present governance structures around the Mediterranean Basin. Research focuses on alternative institutional and economic instruments which can promote equity, economic efficiency and environmental sustainability in the sharing and governing dimensions of water resources management.



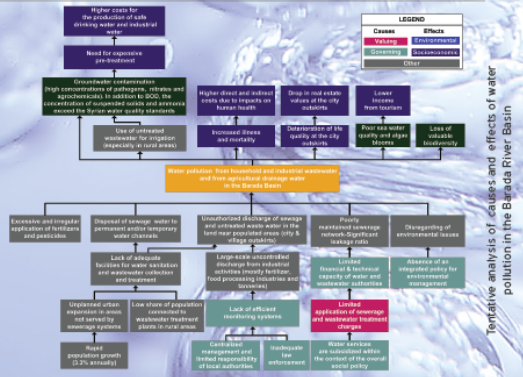
The INECO Framework of Activities

The Syria workshop is the second of the stakeholder workshops organised by INECO in Egypt, Syria, Lebanon, Cyprus, Tunisia, Algeria and Morocco. The workshops aim to develop a constructively engaged Integrated Water Resources Management process, and lay the foundations for reaching a common understanding on what the real problems are and how these could be addressed in a commonly agreed water resources management situation.

INECO IN SYRIA WATER POLLUTION IN THE BARADA RIVER BASIN

The area selected for the implementation of INECO in Syria is the Barada river basin, where Damascus is located. Historically, the Barada River was a vital environmental and socio-economic resource, sustaining the oasis of Ghouta, which contributed to the local economy and constituted a rich ecosystem, which was also considered a cultural heritage. However, in recent years, the Barada River ecosystems have collapsed, due to the high loads of industrial and domestic waste and wastewater discharge, which exceed the river's self purification capacity, and decrease of river flow, resulting from rainfall decrease and use of the Feige Spring for drinking water supply.

At present, the efforts undertaken in order to address the problem are incomplete, as environmental law applying is not strict enough, and due to legislative limitations, and lack of environmental awareness. Most industries discharge contaminants to the sewerage system or simply to land and rivers without treatment, free of charge and without penalties being enforced. In addition, the spatial dispersion of micro- and small-scale industries hinders the effective control over discharges. The current agricultural practices, which include excessive application of fertilizers and pesticides, overexploitation of water resources and application of inefficient irrigation methods have also



contributed to the exacerbation of water pollution in the area.
In order to address the problem, a feasible and integrated solution should be developed to mitigate environmental damage and prevent further deterioration in water quality. Considering current economic growth patterns and the emerging need for environmental protection, attempts should be made to develop an optimal policy, reflecting trade-offs between economic development and environmental protection in general, and water resources in particular.

THE SYRIA WORKSHOP OBJECTIVES

The workshop aims to strengthen the alliance between the INECO Research Team and Local Stakeholders in Syria by:

- Discussing on the focal water management problem experienced in the region;
- Promoting the development of a process where each contributor gains both a better understanding of the problem and insight on how other participants see the problem;
- Initiating the participatory involvement of stakeholders in determining, defining and evaluating alternative institutional and economic instruments towards problem mitigation.

The workshop will serve as a discussion forum on the problems and challenges faced by stakeholders. It will offer the opportunity for participants to share their experiences, knowledge, ideas, preferences, hopes, fears, opinions, and values.

4.2 Event flier (Arabic version)

الإدارة المتكاملة للموارد المائية IWRM:

لقد أصبحت الإدارة المتكاملة للموارد المائية نظرية ملحة بسبب الإسراع في تفسخها للحفاظ على الحق الإنساني للأجيال القادمة في الثروة المائية العذبة الطبيعية. وهذا يشمل المياه السطحية، المتوفرة مياه الأمطار والسيول والمياه الجوفية بالحقيقة. فلا بد من توفير وتلبية الاحتياجات الحقيقية في الزمان والمكان المناسبين.

إن ضعف الإدارة والتوزيع والصيانة وهدر قنوات الشبكات وعدم استخدام التقنيات الحديثة يتسبب من إمكانية الحصول الكافي على الماء. وعليه لا بد من تقليل دور الثروة المتجددة. وبالتالي فإن العوامل السابقة تشكل تحديات يواجه مستقبلنا، وعلينا أن نحدد أين نقف وإلى أين نسعى.

ومع التقييم والنقد الذي يستطيع أن نكون فاعلين في مجال الطلب على الماء. وعلينا أن نفعل دور الثروة بجميع مشتقاتها لتنقيتها وتعاملها واستعدادها للمياه لأنها مستخدم أساسي.

فلا بد إذا من تطبيق تشريعات خاصة وإعادة هيكلة بعض المؤسسات مستفيدين من الأدوات الاقتصادية والمؤسساتية التي يوفرها هذا التشريع من أجل الوصول إلى أهداف التنمية المستدامة للموارد المائية.

ماذا حوض يردى؟

يعتبر حوض وادي لوكوس حاليا من أجل دراسة السيناريو الذي تؤمن إدارة الشكاكلة للموارد المائية فيها الحوض كما هو معلوم ذو أهمية بالغة لمدينة دمشق وريفها.

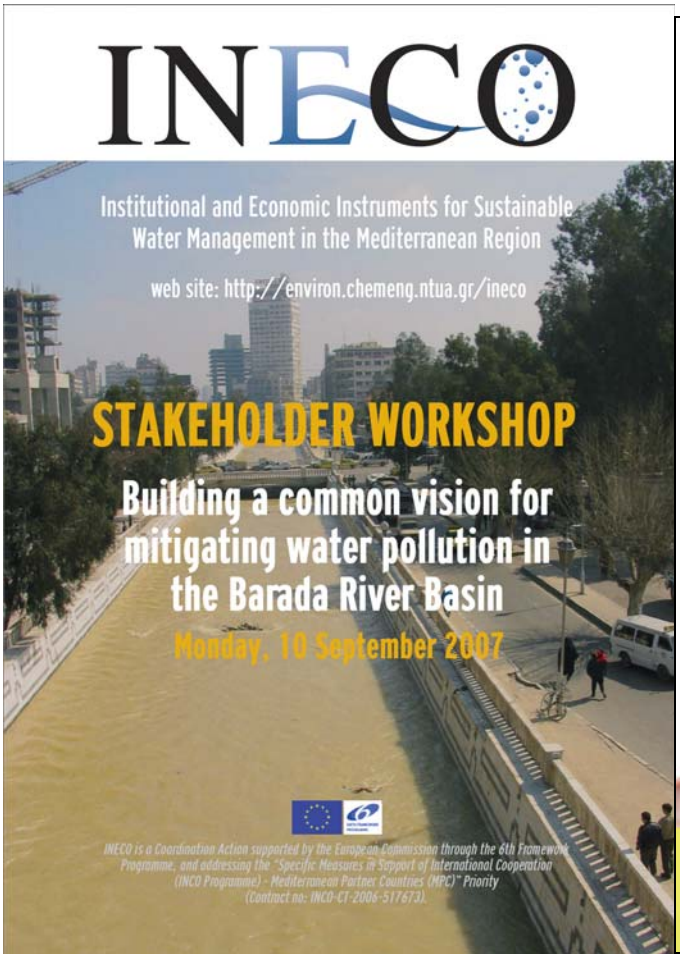
فهو يضم نشاط سكاني مركزي، وتنوع كبير في نوعية الاستخدام وبالتالي في نوعية المياه الناتجة عن هذا الاستخدام.

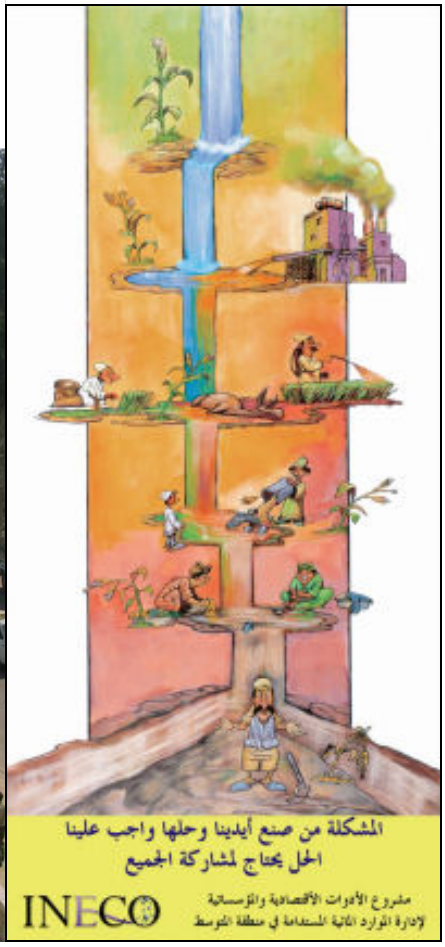
يتدفع الكثير من الصناعات حول هذا الحوض بمخلفاتها السائلة إلى المصرف الصحي أو إلى الأرض والأنهار، دون معالجة وحتى بدون أية فقاعات أو غرامات.

وأيضا نجد أن الممارسات الزراعية الحالية تتضمن استخدام واسع للأسمدة والمبيدات الحشرية، بالإضافة إلى استخدام أساليب ري ذات كفاءة منخفضة، ناهيك عن جودة مياه الري والعديد من المحاذير الأخرى.

فمن مياه الشرب إلى الري إلى الصناعة وإلى ما يسمى هذا الاستخدام المتنوع من نظم المصرف الصحي وطرق معالجة، بالإضافة إلى المشكلات والتجاوزات والمشاكل والحلول. كل هذه الأمور تستدعي النظر إليها من خلال مفهوم متكامل لإدارة هذه الموارد، وبحيث نتمكن من القيام بحل فاعل للمشاكل ويمكن العلاقة المتبادلة بين التطور الاقتصادي وحالة المياه وبالتالي الحفاظ على هذه الموارد للأجيال القادمة.

4.3 Event posters





INECO Lebanon Stakeholder Workshop

"Building a vision for mitigating water stress in the Damour River Basin"

Meshref, Damour

September 12th 2007

1 Workshop report

1.1 Introduction

The INECO Lebanon Stakeholder Workshop was held in the Meshref village, Damour River Basin on the 12th September 2007.

The stakeholders who attended the workshop came from different institutions :

- President & Members of Damour Municipality, Meshref Municipality as well as delegates from other municipalities of Damour watershed basin.
- Local community from Damour village, particularly farmers and owners of agricultural lands.
- Representatives from concerned ministries : Ministry of Energy & Water, Ministry of Environment, Ministry of Agriculture
- Representatives from Beirut & Mount Lebanon Water Office, Metn Water Office
- Representatives from NGOs, Experts in Water & Environment
- Representatives from Press & Media

All workshop materials were translated into Arabic language and were distributed to all stakeholders.

1.2 Event summary

The workshop started with the welcoming speeches of **Mr. Claude Tabbal** and **Dr. Fady Comeir**, and was followed by a presentation on **INECO** project, presented by **Dr. Dionysis Assimacopoulos**.

Opening the workshop debate and discussions, **Mr. Tabbal** exposed to the attendees the **Water Management Problems in Damour River Basin** with its detailed causes and effects, according to the research that **Conseil et Développement** had carried out in the region. A discussion was raised between the stakeholders over the problem, their causes and effects; then the participants exposed their opinions about the problems that the region was facing. **Dr. Assimacopoulos** made several interferences to explain and rationalize the debate. The comments of the stakeholders about the causes and effects of the **Damour River basin** were collected on "post-it notes" and exposed on a white board. (Attached copy of the post-it notes as collected by the stakeholders).

In the second part, **Ms Elina Manoli** made a condensed presentation on IWRM concepts and best practice examples.

This presentation was followed by a presentation by **Mr. Tabbal** on the objectives and alternative solutions related to the problem of **Damour River Basin**, as conceived by **Conseil et Développement**. The stakeholders agreed on the objectives in general and raised up additional solutions. Their comments were collected on post-it notes and exposed on a white board. (Attached copy of the post-it notes as collected by the stakeholders).

The stakeholders also filled a questionnaire that was distributed to them with the aim to map perceptions on water stress issues experienced in the Damour River Basin. The questionnaire was distributed in English and Arabic.

1.3 Discussion summary

The representative of *Beirut & Mount Lebanon Water Agency*, **Mr. Georges Al Kadi**, pointed out that there is a lot of serious problems caused by the wasting from the consumers of potable water, that the farmers are consuming large quantities of water of water; in addition to the uncontrolled important quantity of water consumed by farmers, and the *Ministry of Energy and Water* is currently working on a directive plan for the drinkable water.

Dr. Selim Sarraf, *Former Expert in Irrigation and Water Ressources at the FAO*, insisted on the construction of dams to collect river and rain water as a solution to prevent water shortage and water problems.

Farmers present at the workshop insisted on asking the government to secure enough water for agriculture irrigation, to treat the underground water and avoid environmental disasters, construct a dam in Damour region to secure water for the community and neighborhood.

For Ms Imane Abdel Aal, from the *Association of the Friends of Ibrahim Abdel Aal*, the problem of water is a political one and she commented that the local community of Damour should make a pressure on the government to solve their problems, and insisted with them to put the water issues projects on their political agenda.

Dr. Daoud Raad, from the *Ministry of Agriculture*, in turn insisted on implementing a global water management, and that the quantity of water in the country must be increased through the construction of dams to cope with the consumption of water which is seriously increasing in the country.

He also commented that the problem is the misusage of water, the non existence of an adequate water piping network, no sewage system, no dams. And that Damour water problem must be solved along with the solving of Safa river problems.

Mr. Khalil Zein, from the *Ministry of Environment*, insisted on adopting a global water management scheme that would include a series of parameters covering the technical, environmental and health, financial and institutional levels.

He also commented that the causes of non enforcement of laws are coming from political interferences on the one hand, and from financial issues because qualified people are not well paid in the Ministry. He mentioned that water is very rich in Chlore which can create health problems.

He also insisted on the fact that the recommendations raised from this project should be addressed to the upper decision makers to influence their decisions, and that the follow-up must be secured to reach our objectives.

Mr. Mahmoud Sraj, from the *Ministry of Energy and Water*, proposed that this basin should be exploited touristically in order to secure funds for water projects such as dams, etc.

Mr. Chkaiban, a cultivator and then farmer attributed the lack of sufficient water and quality of water in Damour to the continuous and excessive discharge done by the Beirut Water Agency from the Damour river and underground aquifers.

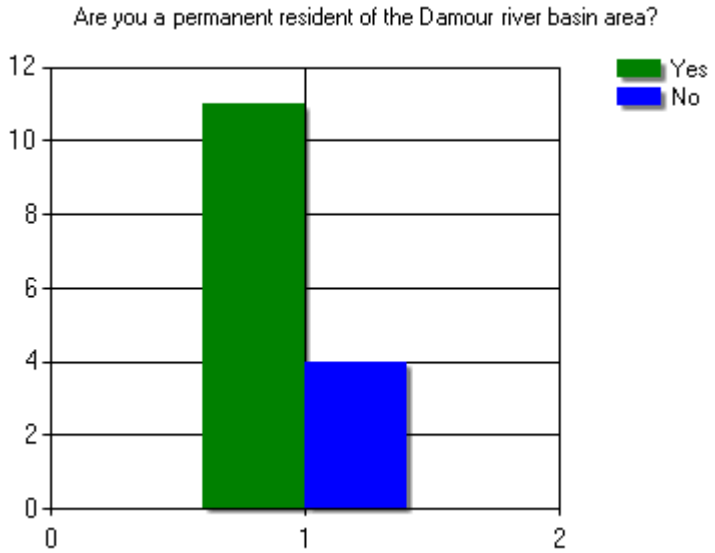
2 List of participants

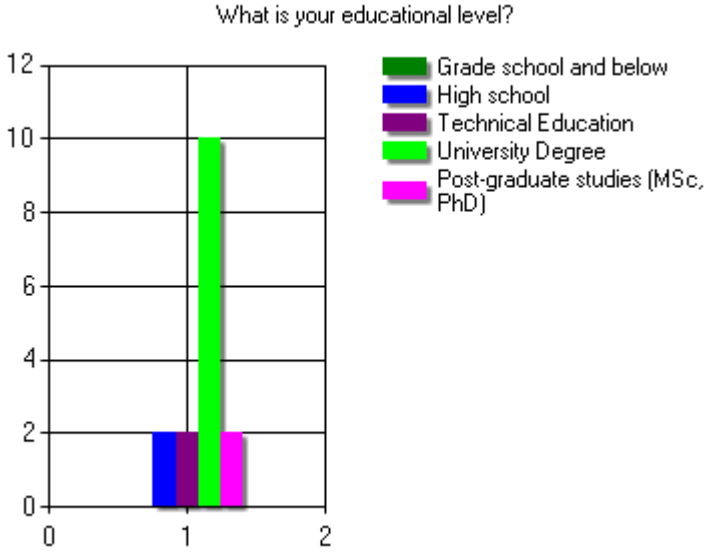
1) Dr. Fadi Comeir, GM of Ministry of Energy and Water , Ministry of Energy and Water, Administrative Management
2) Eng. Milad Mallah, Consultant Engineer, Research Center for Water, Energy & Environment - NDU, Follow up projects related Water, Energy & Environment
3) Dr. Daoud Raad, Head of Irrigation Dept - Professor, Ministry of Agriculture, Irrigation & Agronomy
4) Dr. Mohamed Abdulrazzak , Chief programme Planning and Technical Cooperation Divisions, UN - ESCWA, UN - Economic and Social Commission for western Asia - ESCWA
5) Mr. Youssef Aoun, President of Meshref Municipality, Meshref Municipality, President of Meshref Municipality
6) Me. Bachir Aoun, Lawyer, Representative of an NGO in Damour, Law Office
7) Eng. Salam Saad, Engineer, Barja Municipality, President of Berja Municipality
8) Mr. Nabil Semaha, Head of Dept, Beirut & Mount-Lebanon Water Authority,
9) Mr. Georges El Kadi, Head of Projects Dept, Beirut & Mount-Lebanon Water Authority,
10) Charbel Youssef Yammine, Member in Municipality, Meshref Municipality, Member in the Board of Meshref Municipality
11) Imane Abdel Aal, , Association of the Friends of Ibrahim Abdel Al, NGO - Water & Energy
12) Mr. Elie Aoun, , from the office of Deputy Elie Aoun, representing Deputy Elie Aoun
13) Mr. Ricardo khoury, Environmental Engineer, ELARD, Project Manager, Head of Department
14) Mr. Khalil Zein, Geologist, Ministry of Environment,
15) Ms Manal Moussallem, Project Manager, UNDP/Ministry of Environment, Early Recovery Coordinator
16) Ms Mayada Imad Bou-Ajram, Architect - Environment & Landscaping, Federation of Shouf Municipalities -Souwayjani, Architect of Landscaping & Environment
17) Ms Marlene Chahine, Architect - Landscaping, Baakline Municipality, Architect of Landscaping & Environment - Interior design
18) Ms Rima Kreidi, Architect - Landscaping, Baakline Municipality, Architect of Landscaping & Environment - Interior design
19) Mr. Michel Bou Mrad, Employee at Damour Municipality, Damour Municipality, Damour Municipality
20) Mr. Antoine Nasr, Damour Municipality Member, Damour Municipality, Member of the Board
21) Me. Charles Ghafari, President of Damour Municipality, Damour Municipality, Lawyer
22) Mr. Rachid Akl, Damour Municipality Member, Damour Municipality, Shipping Services
23) Mr. Nabih Amin EL Kazzi, Farmer - land owner, , Agriculture
24) Mr. Samir Aoun, Former Deputy , ,
25) Eng. Mahmoud Sraj, Head of Dept, Ministry of Energy and Water, Water distribution
26) Mr. Georges Khattar Aoun, Farmer , , Agriculture
27) Mr. Imad Zouein, Agriculture Engineer, , Agriculture
28) Mr. Tarek Daou, Medical Representative, Member of Bshetfine Municiaplity , Medical Representative at CCF

29) Mr. Fouad Chkaiban, Agronomist, , Farmer in Damour
30) Mr. Jamil Chkaiban, Farmer, , Farmer in Damour
31) Mr. Rachid Mikhael Nasr, Owner of Printing press, Nasr Printing Press, printing - Farmer in Damour
32) Mr. Georges Anis Fadel, Farmer & land owner, , Agriculture
33) Mr. Said Abou Diab, Jahlieh Municipality Member, Jahlieh Municipality, Committee of Agriculture, Environment & Water
34) Mr. Toufic El Matni, Manager of Damour Governmental School, Damour Governmental School,
35) Dr. Elie Abou Faysal, President of Damour Cultural Council, ,
36) Mr. Fadi El Boustani, Vice-President, Debbieh Municipality,
37) Mr. Bassam Kabalan, Unit Head - Economics & Management Studies, Industrial Research Institute, Research Studies
38) Dr. Elias Rizk, Professor, , teaching at NDU university -owner of agricultural project in Damour
39) Mr. Antoine Akl, Damour Mayor, , Farmer in Damour
40) Mr. Ma'moun Badih Abou Chakra, Secretary of Association of Industrialists in Shouf, Association of Industrialists in Shouf,
41) Dr. Salim Sarraf, Former FAO Irrigation & Water Ressources Officer, FAO, Irrigation
42) Mr. Amer Zein Elddine, Press, National Information Agency, Press
43) Mr. Alaa Abou Assi , Press, ANB & TV stations, Press

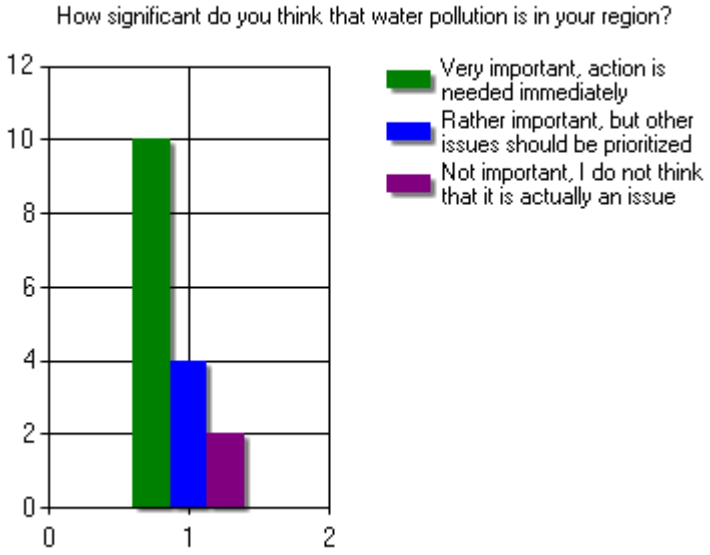
3 Workshop survey results

3.1 Respondents' background

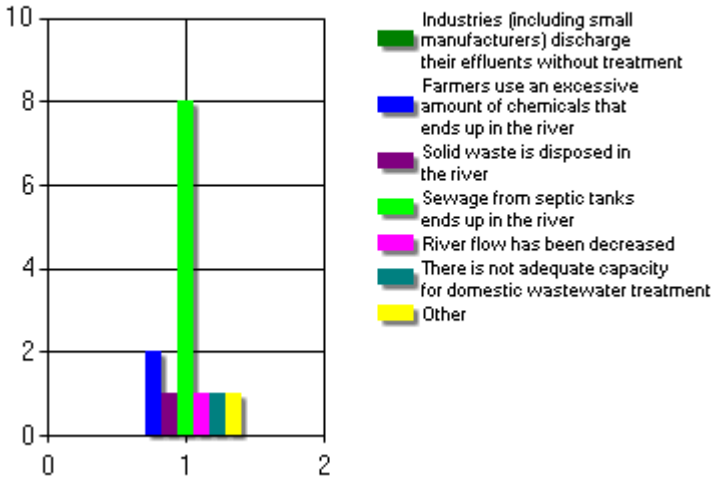




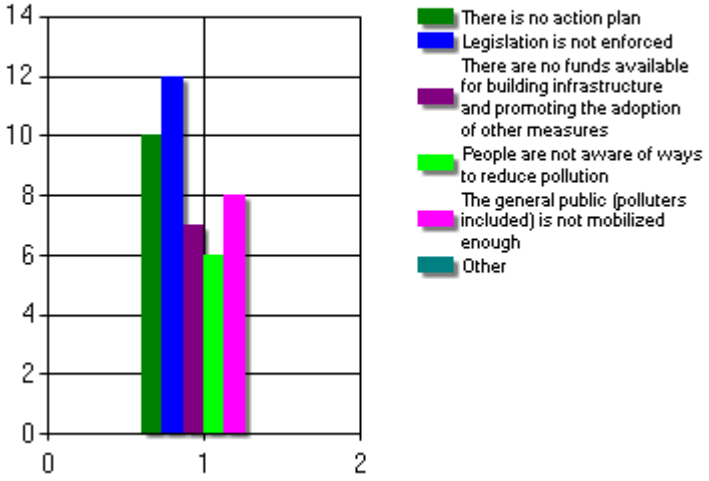
3.2 Perceptions on significant water management issues – Causes and effects to water stress in the Damour River Basin



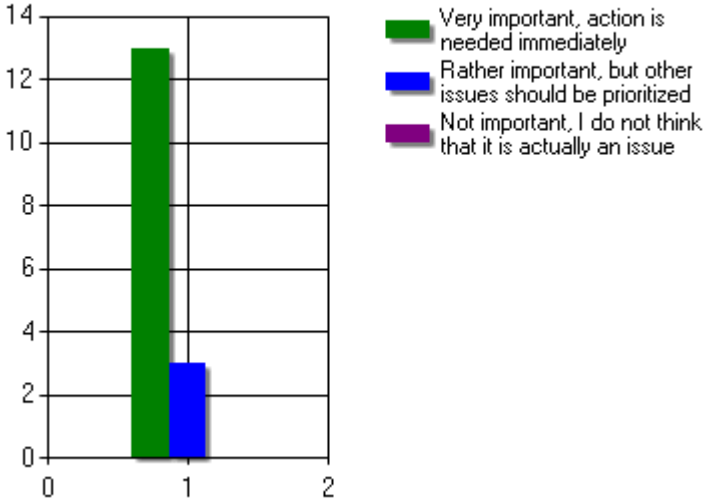
Which, according to your view, is the most important cause of water pollution in the Damour River?



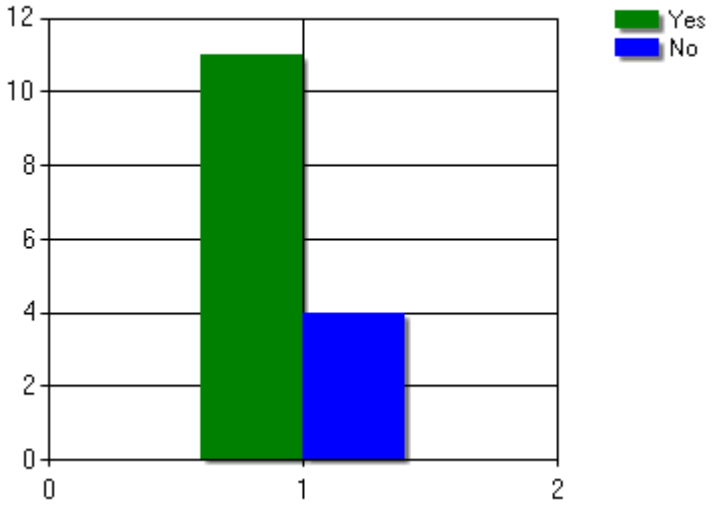
Which, according to your view, are the underlying cause(s) of water pollution?



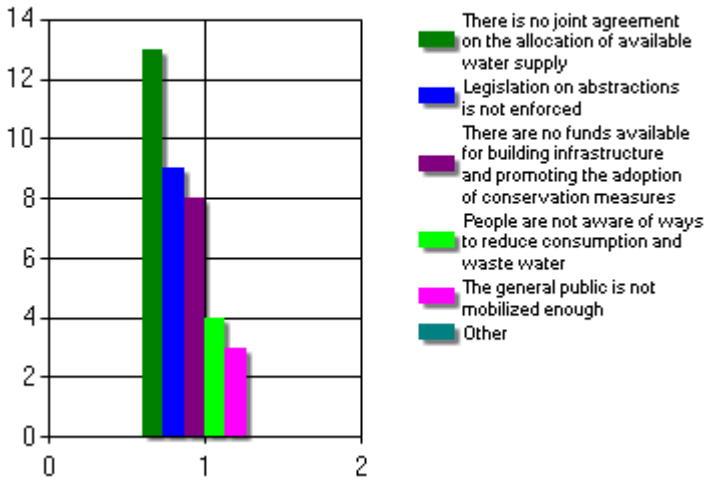
How significant do you think that water shortage is in your region?



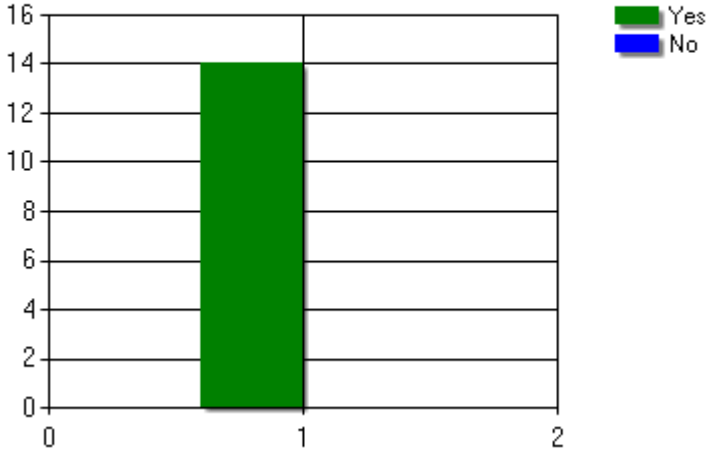
Have you experienced water shortage in your everyday life?



Which, according to your view, are the underlying cause(s) of water shortage?

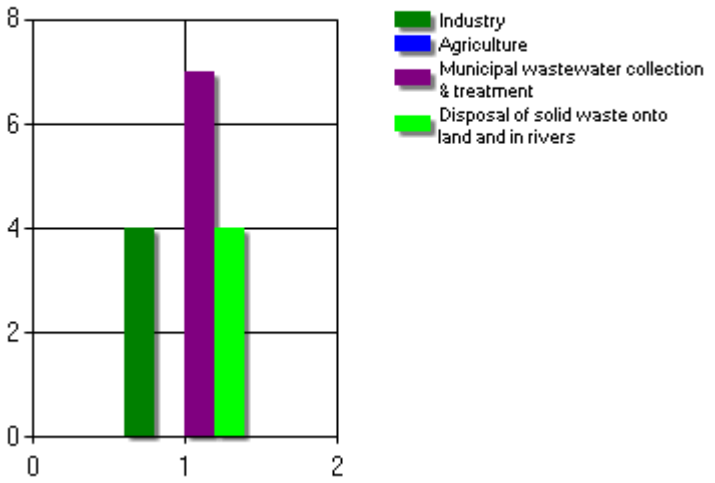


According to your personal view, are there administrative problems or constraints (for both water shortage and water pollution) that should be overcome for effective solutions to be implemented?

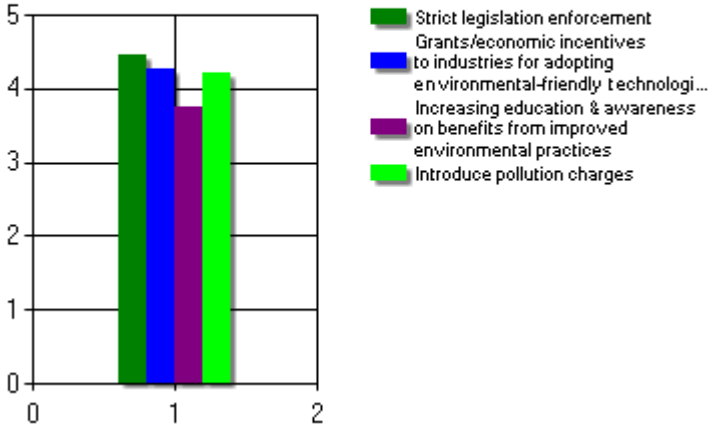


3.3 Prioritizing objectives and exploring alternatives

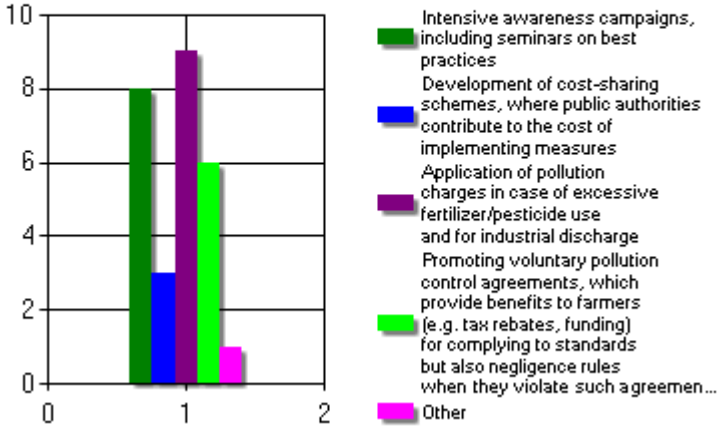
Which, according to your view, is the primary sector where action is needed immediately for mitigating water pollution?



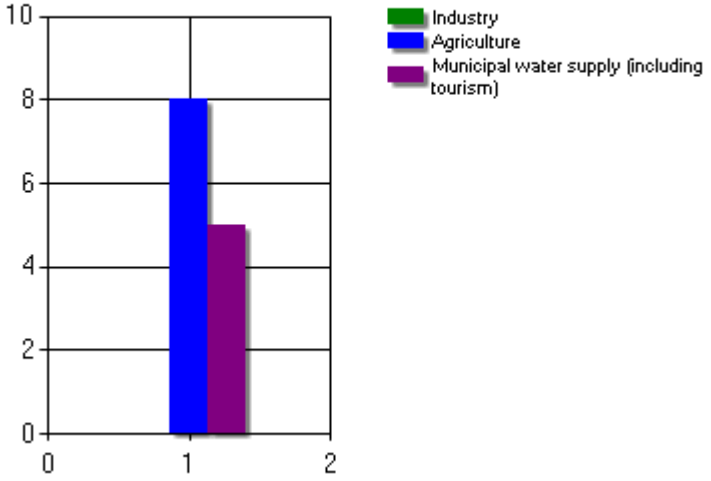
Industries, including small manufactories, are considered primary contributors to water pollution. Please rank the following measures according to the possible impact that they may have, using a scale from 1 (no contribution) to 5 (high contribution).(Average)



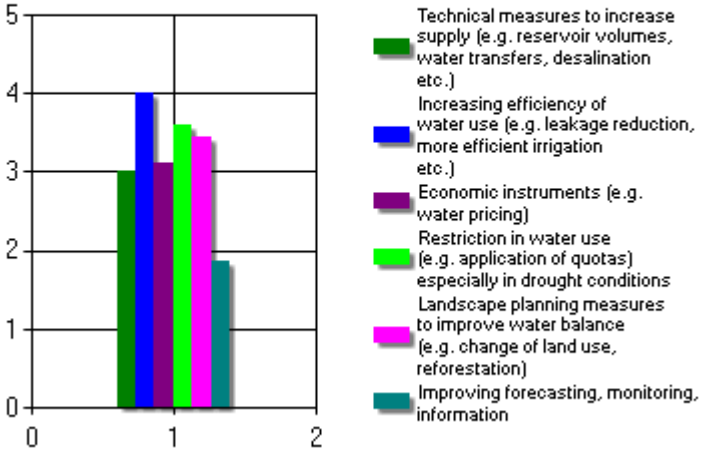
Pollution from agrochemicals is often attributed to lack of awareness of farmers on how to apply fertilizers and pesticides. Which of the following measures you think would be most likely to have a significant impact on the current agricultural practices? (more than one answer possible)



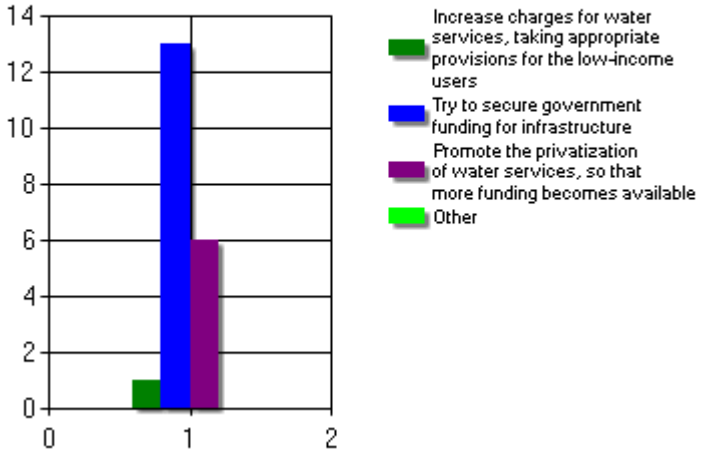
Which, according to your view, is the primary sector where action is needed immediately for mitigating water shortage?



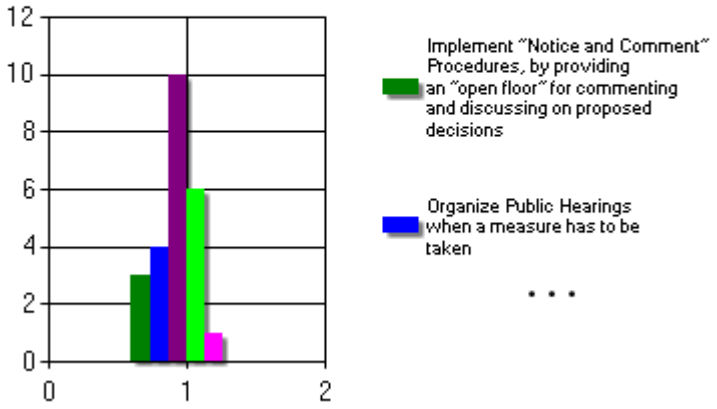
The following table lists a number of potential measures to address water shortage. Please rank the effectiveness of those measures using a scale from 1 (not effective) to 5 (most effective)(Average)



It can be claimed that water services cannot respond to the increasing need for new infrastructure, due to financial constraints. How do you think that this issue can be addressed?

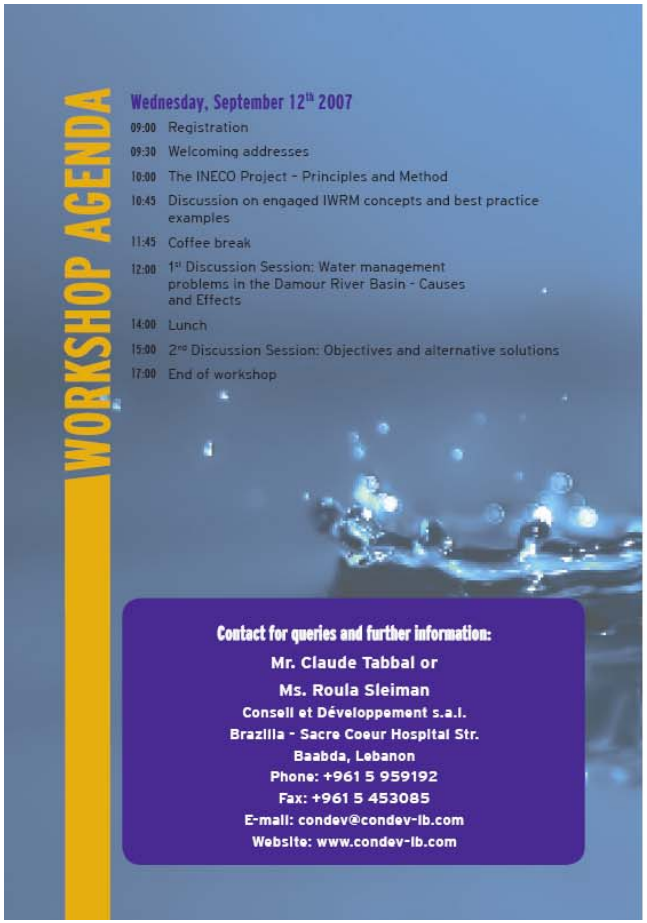


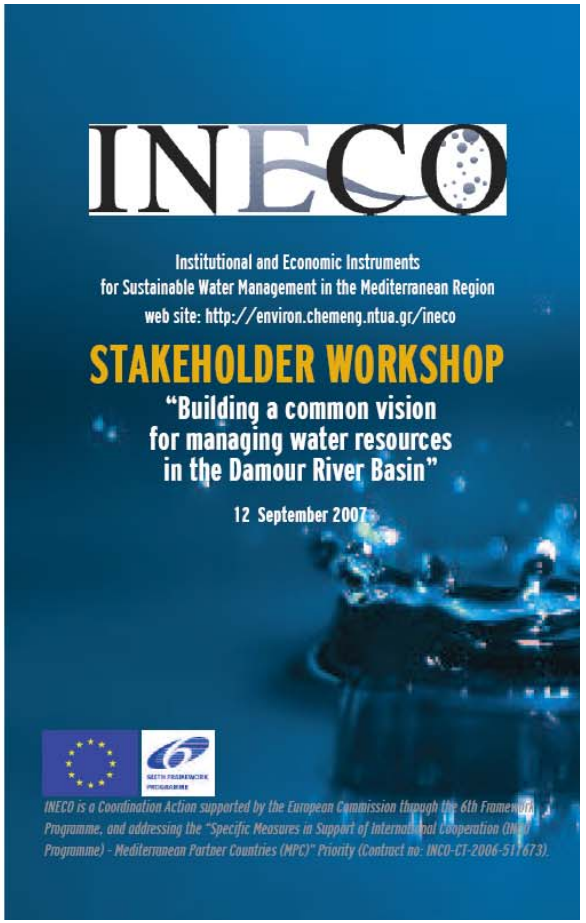
Public participation is currently considered the key principle of developing sound and successful water management policies, because it is thought of as the only way to ensure that the interests of all users are taken into account. How do you think that public participation can be implemented in the Damour River Basin?



4 Event fliers, programme and posters

4.1 Event flier (English version)





THE INECO PROJECT

INECO is a Coordination Action Project supported by the European Commission through the 6th Framework Programme, addressing the "Specific Measures in Support of International Cooperation (INCO Programme) - Mediterranean Partner Countries (MPC)" Priority. The INECO Consortium brings together 14 institutions from 10 Mediterranean Countries (Greece, France, Italy, Cyprus, Tunisia, Egypt, Lebanon, Syria, Algeria and Morocco), including public (6), private (7) and international organisations (1).

The goal of INECO is to introduce an interdisciplinary approach to water management building upon the integration of three major aspects: environment, economics and society. INECO will discuss shared problems in the decision-making process and the deficiencies of the present governance structures around the Mediterranean Basin. Research focuses on alternative institutional and economic instruments which can promote equity, economic efficiency and environmental sustainability in the sharing and governing dimensions of water resources management.

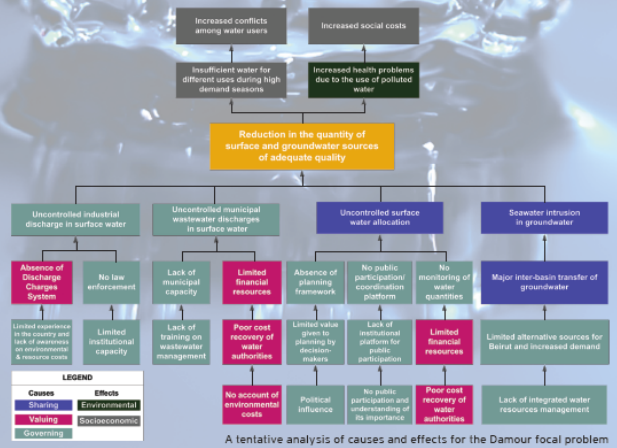
The INECO Project Framework

The Lebanon workshop is the third in a series of stakeholder workshops to be organised by INECO in Egypt, Syria, Lebanon, Cyprus, Tunisia, Algeria and Morocco. The workshops aim to develop a constructively engaged Integrated Water Resources Management process, and lay the foundations for reaching a common understanding on what the real problems are and how these could be addressed in a commonly agreed water resources management situation.

INECO IN LEBANON
THE DAMOUR RIVER BASIN

The area selected for the implementation of the INECO Project in Lebanon is the Damour River Basin. The Damour village is located 20 km to the south of Beirut, with a population of around 75.000 inhabitants. The Damour River is a vital socio-economic resource, used for drinking and irrigation water supply; over the past few years, conflicts have arisen between upstream and downstream users, whereas the quality of the river water has severely deteriorated due to the disposal of industrial and sewage waste. The Saadiyat area of the Damour village is not connected to a water supply network; private wells are extensively utilized to meet basic water needs. This fact, combined with the increased overexploitation of the Beirut Water Authority wells induces increased pressure on available groundwater resources. In the Damour River Basin, INECO will focus on the focal water management problem of the decrease in the total amount of surface and groundwater of adequate quality required for meeting the water needs of domestic, agricultural and industrial users.

The focal problem has several causes, such as the discharge of industrial and domestic wastewater in the river, uncontrolled surface water allocation, and seawater intrusion in groundwater as a result of overexploitation. Factors contributing to these issues are poor law enforcement, inadequate regulatory instruments, limited capacity of the competent authorities, insufficient financial resources combined with the lack of a clear planning framework and absence of a participation and coordination platform that would allow co-operative thinking and management of water resources.



A tentative analysis of causes and effects for the Damour focal problem

THE LEBANON WORKSHOP OBJECTIVES

The workshop aims to strengthen the alliance between the INECO Research Team and Local Stakeholders in Damour by:

- Discussing on the focal water management problem experienced in the region;
- Promoting the development of a process where each contributor gains both a better understanding of the problem and insight on how other participants see the problem;
- Initiating the participatory involvement of stakeholders in determining, defining and evaluating alternative institutional and economic instruments towards problem mitigation.

The workshop will serve as a discussion forum on the problems and challenges faced by stakeholders. It will offer the opportunity for participants to share their experiences, knowledge, ideas, preferences, hopes, fears, opinions, and values.

4.2 Event flier (Arabic version)

مشروع INECO

إن مشروع INECO هو مشروع عمل تعاوني مدعوم من المفوضية الأوروبية عبر برنامج العمل الإطاري السادس ويتطرق إلى أولوية "الإجراءات الخاصة لدعم التعاون الدولي (برنامج التعاون الدولي INCO)-دول الشراكة المتوسطية (MPC)". يجمع اتحاد INECO أربع عشرة مؤسسة من عشر دول متوسطية (اليونان، فرنسا، إيطاليا، قبرص، تونس، مصر، لبنان، سوريا، الجزائر والمغرب) بما في ذلك مؤسسات عامة (٦) وخاصة (٧) ومنظمات دولية (١).

يهدف مشروع INECO إلى إدخال مقاربة متعددة المواضيع لإدارة المياه مستنداً إلى دمج ثلاثة مظاهر: البيئة والاقتصاد والمجتمع. سيناقش مشروع INECO المشاكل المشتركة خلال عملية صنع القرار ونقاط العجز في هيكليات الإدارة الحالية في الدول المحيطة بحوض البحر المتوسط. تتركز الأبحاث حول الوسائل المؤسساتية والاقتصادية البديلة القادرة على تعزيز العدالة والفعالية الاقتصادية والقدرة على الحفاظ على التوازن البيئي ضمن أبعاد المشاطرة والتوجيه المتعلقة بإدارة موارد المياه.

إن ورشة العمل التي تقام في لبنان هي الثانية ضمن مجموعة سيتولى مشروع INECO تنظيمها للأطراف المعنية بالموضوع في كل من قبرص، تونس، مصر، لبنان، سوريا، الجزائر والمغرب. وتهدف ورش العمل هذه إلى تطوير عملية مشاركة بنّاءة باتجاه توزيع وإدارة مدمجين للموارد المائية ووضع أسس التوصل إلى تفاهم مشترك حول ماهية المشاكل الحقيقية وكيفية التطرق إليها عند مواجهة رغبة مشتركة في إدارة الموارد المائية.

مشروع INECO في لبنان
حوض نهر الدامور

تم اختيار منطقة حوض نهر الدامور لتطبيق مشروع INECO في لبنان. تقع قرية الدامور على بعد ٢٠ كيلومترا جنوب بيروت، ويبلغ عدد سكانها ٧٥ ألف نسمة. إن نهر الدامور مورد اجتماعي اقتصادي حيوي، وتُستخدم مياهه لتخزين مياهي الشفة والري. وقد نشأت في خلال السنوات الماضية نزاعات بين مستخدمي المياه في المناطق الواقعة في أعلى وأسفل النهر، في حين تدنت نوعية مياهه تدنياً ملحوظاً نظراً للسبل المستخدمة في التخلص من الفضلات الصناعية والمياه المبتذلة. إن منطقة السعديات التابعة لقرية الدامور ليست موصولة بشبكة للتزود بالمياه؛ ويتم استخدام الآبار الخاصة استخداماً مبالغاً فيه لتأمين الحاجات الأساسية من المياه. ويؤدي هذا الأمر، بالإضافة إلى المبالغة المتنامية في استغلال آبار مصلحة مياه بيروت، إلى زيادة الضغوط على موارد المياه الجوفية المتوفرة.

سيركز مشروع INECO في حوض نهر الدامور على المشكلة الأساسية في إدارة المياه المتعلقة بانخفاض الكمية الإجمالية للمياه السطحية والجوفية ذات النوعية المناسبة المطلوبة للإيفاء بحاجات الاستخدام المنزلية والزراعية والصناعية.

هناك مسببات عدة للمشكلة الأساسية، مثل تصريف مياه الصرف الصناعية والمنزلية في النهر، والتوزيع غير المنظم لكميات المياه السطحية، وتسرب مياه البحر إلى المياه الجوفية نتيجة المبالغة في استغلال الموارد. إن عدم التشدد في تطبيق القانون والافتقار إلى الوسائل التنظيمية الملائمة ومحدودية قدرات

مقاربة تحليلية لأسباب مشكلة حوض الدامور الأساسية ونتائجها.

السلطات المختصة والنقص في الموارد المالية بالإضافة إلى غياب إطار العمل التخطيطي الواضح وبرنامج المشاركة والتعاون الذي يتيح التفكير والإدارة التعاونيين في إدارة الموارد هي من العوامل المساهمة في المشكلة.

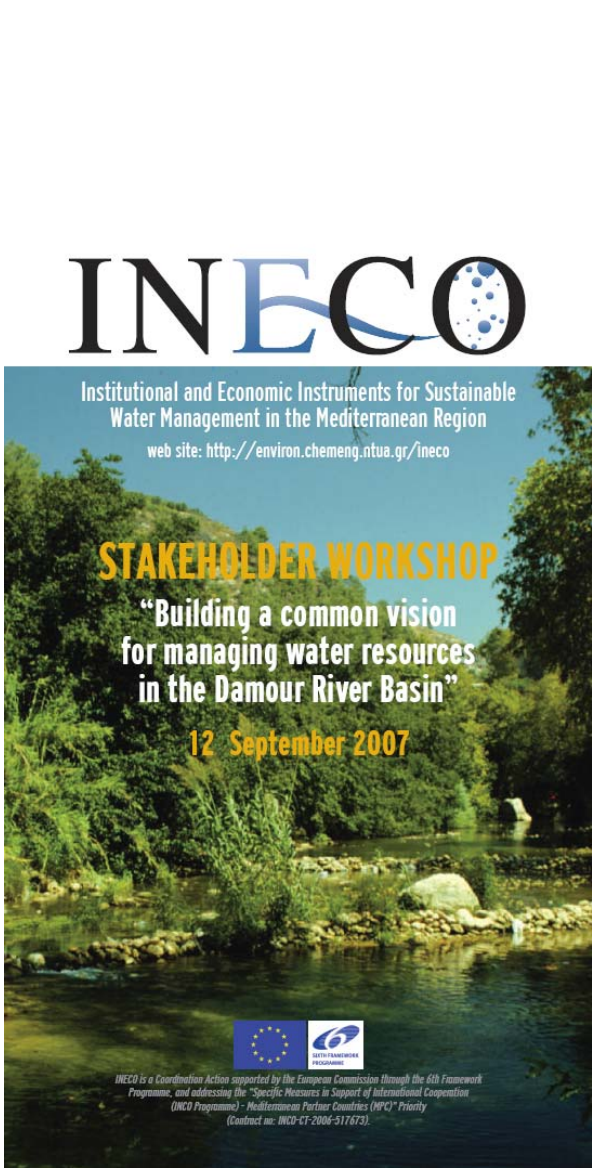
أهداف ورشة العمل المعقودة في لبنان

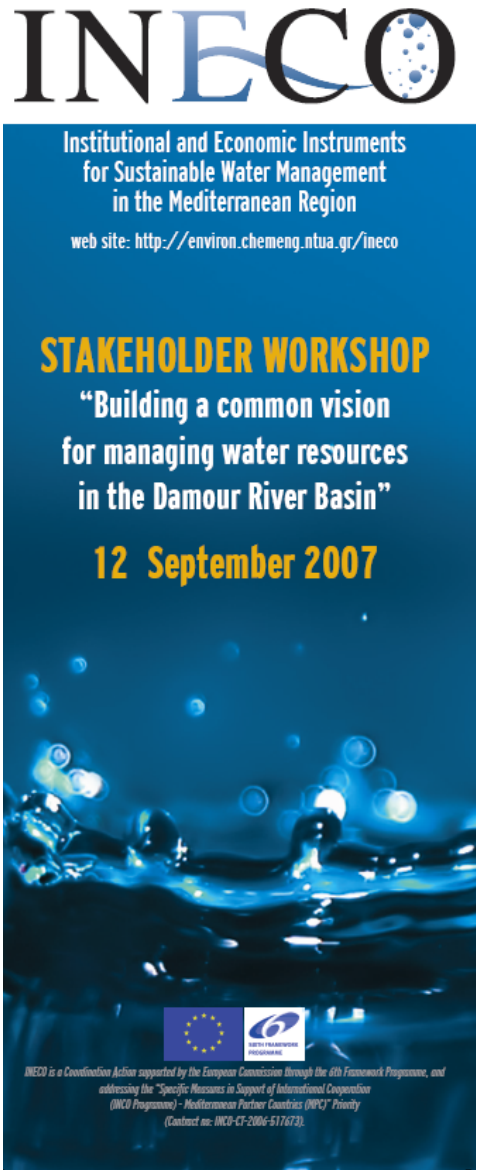
تهدف ورشة العمل هذه إلى تقوية الروابط بين فريق البحوث التابع لمشروع INECO والأطراف المعنيين المحليين في الدامور عبر التالي:

- مناقشة مشكلة إدارة المياه الأساسية التي تعانيها المنطقة؛
- تعزيز تطوير عملية يكتسب فيها كل من المساهمين فهماً أفضل وتبصراً حول رؤية باقي المشاركين للمشكلة؛
- تحفيز الأطراف المعنية على المشاركة في تحديد، وتعريف وتقدير الوسائل المؤسساتية والاقتصادية البديلة للتخفيف من حدة المشكلة.

سوف تكون ورشة العمل بمثابة منبر لمناقشة المشاكل والتحديات التي تواجهها الأطراف المعنية. وستتيح للمشاركين الفرصة لمشاركة تجاربهم ومعارفهم وأفكارهم وتوجهاتهم وآمالهم ومخاوفهم وآرائهم وقيمهم.

4.3 Event posters





INECO Cyprus
Stakeholder Workshop

"Building a common vision for managing groundwater resources in Cyprus"

Coral Beach Hotel, Pegeia (Paphos), Cyprus

26th -27th October 2007

1 Workshop Report

1.1 Introduction

1.1.1 Background

This document summarizes the discussions of the INECO Cyprus Stakeholders Workshop, held in Peyia, Cyprus. The Workshop was one of the three events organized by INECO during the period from the 25th to the 27th October 2007, as presented in the Figure below.

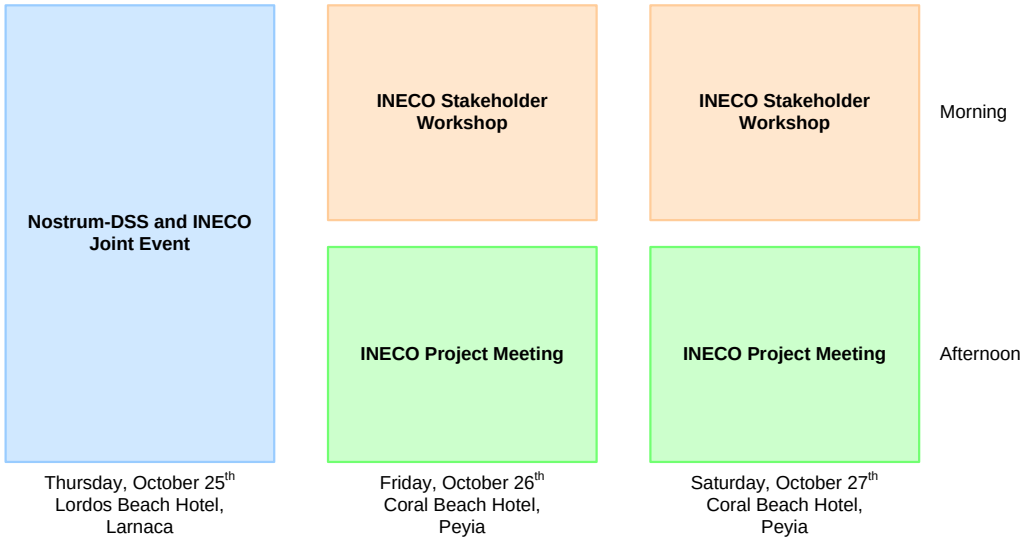


Figure 21: The implementation of the INECO Cyprus Events

The 1st event was co-organized with the Nostrum-DSS Project, on the 25th of October at the Lordos Beach Hotel in Larnaka. This joint dissemination event titled "IWRM through coordination, dissemination, and exploitation of research outcomes" invited a large number of researchers and other interested participants, including European Commission Representatives. It aimed at providing an opportunity to exchange scientific knowledge and project results on different topics in the domain of water resources management in the Mediterranean region. The main theme of the open session was oriented towards the discussion of problems and criteria for the coordination, dissemination and exploitation of EU-research outcomes relevant to the implementation of IWRM in the Mediterranean region.

The INECO Cyprus Stakeholder Workshop, held in the mornings of the 26th and 27th October 2007 in Peyia, Cyprus. The workshop was organized within the framework of WP 5 of INECO and aimed at strengthening the alliance between the INECO Project Team and Local Stakeholders, by providing a platform for constructively engaged dialogue among the parties concerned. The workshop focused on discussing with local stakeholders issues relevant to the focal water management problem of the Peyia Aquifer.

The INECO Annual Meeting complemented those two events; the meeting was held on the afternoons of the 26th and 27th of October, and aimed at evaluating the progress of the project, discussing upon issues and needs that emerged during its 1st year, and plan forthcoming project tasks.

1.1.2 Aim and scope of the INECO Cyprus Workshop

The Cyprus workshop, titled "Building a common vision for managing groundwater resources" was held at the Coral Beach Hotel in Pegeia, Paphos on the 26th and 27th October 2007. The workshop aimed at strengthening the alliance between the INECO Project Team and Local Stakeholders, by providing a platform for constructively engaged dialogue on how to develop and implement alternative options for addressing the current trend of overexploitation of the Pegeia aquifer.The workshop was attended by 48 persons, including 26 local stakeholders and 22 INECO partners' representatives.

This document provides a summary of discussions held during the Workshop. All relevant presentations and material are available from the corresponding section of the INECO web site (http://environ.chemeng.ntua.gr/ineco/Default.aspx?t=419).

1.2 Discussion Summary

1.2.1 Major outcomes

The major outcomes of the Stakeholder Workshop were the following:

- The workshop managed to gather people from Pegia around the same table for the first time. This had not been succeeded in the past, despite various efforts of the past 10 years.
- There are different positions among (at least) the local residents that participated in the workshop with regard to the causes and effects of aquifer depletion in the region, depending on their nationality (Cypriot or foreign). It should be noted that at present almost 50% of the people residing in Pegia are non-Cypriot.
- There is lack of information on the water issue of the area.
- Aeoliki Ltd. undertook the responsibility of preparing an information sharing book, including a short description of the Pegia Aquifer, characteristics and exploitation patterns. This will be available to all Pegia residents, with the aim to enhance information sharing among the interested parties, through a transparent and mutually beneficial way. The book will be circulated prior to the next Stakeholder Meeting, scheduled for November 2007.
- Subsequent stakeholder workshops will be organized on a regular basis, the next one being planned for November 2007.

1.2.2 Discussion Summary

Friday, October 26th 2007

Session I: Introduction

Mr. Christodoulos Artemis (Director of the Water Development Department – WDD) initiated the workshop through a welcoming address. He expressed the great interest of the WDD in the INECO project and in the two-day workshop of Pegia. As Mr. Artemis pointed out, public participation is a key element of the EU Water Framework Directive; all Member States are required to undertake public consultation activities for the development of River Basin Management Plans (Art. 14). In this regard, the INECO Cyprus workshop fits in with the work

undertaken by the WDD for the implementation of the WFD, and will support the effort for its successful implementation.

Subsequently, Prof. Dionysis Assimacopoulos (NTUA, INECO Project Coordinator) outlined the concepts and the framework of INECO activities; he presented the principles and the approach of the project, activities already undertaken in the other participating countries, and the frame and expected outcomes of the Cyprus workshop.

Session II: Groundwater Overexploitation and Depletion in Pegia

Dr. Ioannis Glekas initiated the next session by briefly outlining the workshop theme ("Groundwater overexploitation"), and its implications for the Pegia aquifer.

Then, Dr. Andreas Christodoulides (Water Development Department – WDD) gave a comprehensive overview of the problem experienced in the Pegia aquifer. He detailed the characteristics, the current condition of the aquifer, according to monitoring data collected by the WDD, and his perception on effects and causes of the problem and measures that could support more sustainable exploitation of the aquifer. He particularly pointed out that almost 25% of the total groundwater extraction corresponds to water supplied to the tourist industry, which is currently experiencing high growth rates.

The presentation initiated a discussion among the Pegia residents, local authority representatives, WDD officials and other project participants, moderated by Prof. E. Vlachos, Prof B. Barraque and Prof. D. Assimacopoulos, and supported by Dr. Glekas. The discussion focused on identifying perceptions and positions of the local stakeholders on groundwater depletion and its causes. Participants identified the following issues for discussion and elaboration:

- Building permits exceed the capacity to provide water in Pegia and will affect the depletion of the aquifer.
- The effect of the currently applied agricultural practices in the region (in terms of quantity required and nitrate concentrations) needs further analysis.
- There is need to change the cropping patterns in the region, which, at present are highly water intensive.
- The seasonal variation of water demand and its impact on the exploitation of the aquifer is an issue that requires further analysis.
- There is lack of awareness and education of local residents on water conservation.
- There is lack of information on water issues in the area.
- The quality of the water in the aquifer is not only affected by the current agricultural practices, but also from the lack of a sewerage system.
- There is need to take measures in order to reduce water losses in the distribution system (according to estimates, losses are presently equal to approximately 40%).

During the discussion session it became evident that there are different positions among (at least) the local residents with regard to the causes and effects of aquifer depletion in the region, depending on their nationality (Cypriot or foreign). It should be noted that at present almost 50% of the people residing in Pegia are non-Cypriot.

The first day of the workshop ended with a discussion on possible ways for proceeding with the process and keeping the interaction among the various stakeholders active.

Saturday, October 27th 2007

Session III: Discussions on objectives and alternative options

The second day of the workshop began with a presentation by Prof. Antonio Massarutto (IEFE, Bocconi University), who elaborated on economic instruments and institutional arrangements for groundwater management. He also presented examples and insight of policies adopted in other European countries and regions.

Subsequently, an open discussion was initiated among participants on the issues identified and discussed during the previous day. It became evident that the rapid urban development experienced in Pegia is an issue that causes a lot of concerns among residents. Furthermore, the overexploitation of the aquifer is at large attributed to this factor.

Next, the representative of the Agricultural Department of MANRE outlined the Department's activities and measures taken for preventing pollution and promoting water saving among farmers of the region. These include training of farmers on irrigation scheduling, application of water supply constraints in times of scarcity, monitoring of nitrate concentrations in groundwater, etc. Then, Mr. K. Spanos (WDD District Engineer) presented an overview of the current allocation of water resources in the Paphos District and background information on water issues in Pegia. He pointed out that current urban development rates in the wider community are significantly higher than those originally anticipated.

The discussion that followed focused on possible ways for providing a platform for enhanced, constructive and structured dialogue among all parties concerned. Prof. D. Assimacopoulos presented a proposal for the definition of objectives and for the definition of alternative options, which could lead to concrete results and joint decisions. Prof. E. Vlachos proposed the preparation of an information sharing book, available to all Pegia residents. Its aim will be to enhance information sharing among the interested parties, through a transparent and mutually beneficial way.

The last part of the workshop was dedicated to the opportunities offered by Art. 14 of the Water Framework Directive for enhancing public participation in the region and in Cyprus as a whole. Mr. Charis Omorphos (WDD) presented the current EU policy for the protection of groundwaters and the current situation in Cyprus.

Then Mr. Pantelides (Pegia Community Engineer) took the floor and presented according to his own data the situation regarding water supply and demand in the community, accounting also for the rapid urban development currently experienced in the region. He provided answers to the issues raised in the previous discussions regarding water availability, and the water saving measures currently applied and planned by the municipality. Finally, Mr. Christodoulos Artemis briefly outlined the public participation activities currently implemented by the WDD.

At the end of the workshop, it was decided to hold the next stakeholder meeting at the premises of the Pegia Municipality, in November 2007.

2 List of Participants

Local Stakeholders

1) Mr. George Chatziantoniou, Pegia Municipality (Deputy Council President)
2) Ms. Linda Leblanc, Pegia Council Member
3) Mr. Pantelis Pantelides, Pegia Municipality (Engineer)
4) Mr. Charis Kassioulis, Pegia Municipality (Engineer)
5) Mr. Denis O'Hare, Pegia Resident (Member of Pegia Environment Committee)
6) Mr. Chr. Karagiannides, Pegia Waterboard (Member of Pegia Council)
7) Mr. David Ball, Pegia Resident
8) Ms. Hazel Frances Hall, Pegia Resident
9) Mr. John Knowles, Pegia Resident
10) Ms. Andri Harpa, Pegia Resident
11) Ms. Maria Neofytou, Pegia Resident
12) Mr. Stelios Savvides, Pegia Resident
13) Mr. George Frangoulides, Pegia Resident
14) Mr. Anastasis Nikolaou, Pegia Resident
15) Mr. Theodosis Stasis, Pegia Resident
16) Ms. Maro Savvidou, Pegia Resident
17) Mr. Takis Ioannou, Pegia Resident
18) Mr. Andreas Chatziantoniou, Pegia Resident
19) Mr. Neofytos Pantelides, Pegia Resident
20) Mr. Kyriakos Spanos, Water Development Department, MANRE
21) Mr. Sotiris Paschalides, Water Development Department, MANRE
22) Mr. Kyriakos Pittakas, Water Development Department, MANRE
23) Mr. Andreas Kazantzis, Agricultural Department, MANRE
24) Dr. Andreas Christodoulides, Water Development Department, MANRE
25) Ms. Natassa Neokleous, Water Development Department, MANRE
26) Mr. George Papados, Agricultural Department, MANRE

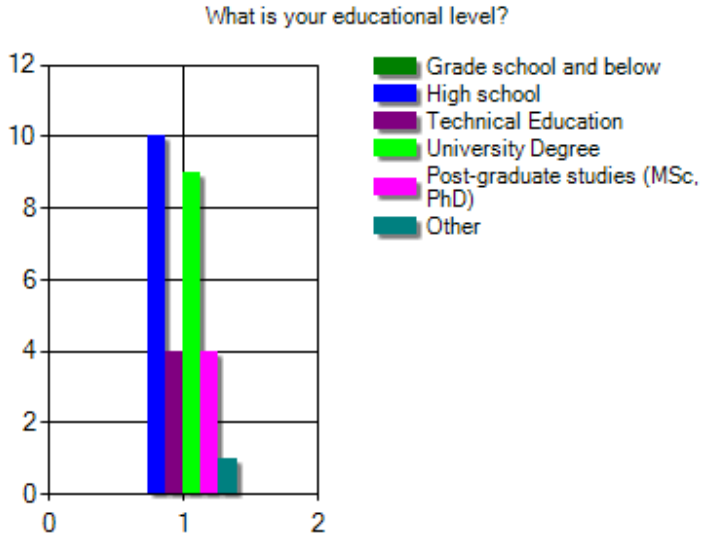
INECO Project Partners & EC Representatives

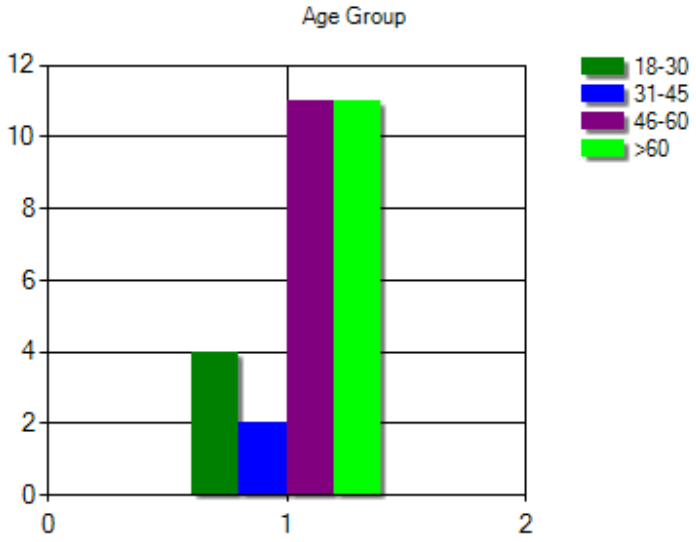
27) Ms. Marialuisa Tamborra (EC Scientific Officer)
28) Prof. Dionysis Assimacopoulos (NTUA, Project Coordinator)
29) Ms. Eleni Manoli (NTUA)
30) Dr. Jean-Marc Berland (IOW)
31) Prof. Antonio Massarutto (IEFE)
32) Mr. Christodoulos Artemis (WDD)
33) Mr. Charis Omorphos (WDD)
34) Dr. Ioannis Glekas (Aeoliki)
35) Dr. Demetris Glekas (Aeoliki)
36) Mr. Ahmed Bouzid (CITET)
37) Mr. Foued El Ayni (CITET)
38) Mr. Ridha Boulabiar (ONAS)

39) Dr. Fathy El Gamal (WMRI)
40) Prof. Magdy Abou Rayan (IC)
41) Prof. Ahmed Mansour (IC)
42) Dr. Rehan Monir (IC)
43) Mr. Claude Tabbal (C&D)
44) Mr. Malek Haddad (SIC)
45) Mr. Abdoullah Bouchedja (ABHCSM)
46) Mr. Abderrahmane Affia (ISKANE)
47) Prof. Evan Vlachos (Colorado State University)
48) Prof. Bernard Barraqué (CNRS-LATTS)

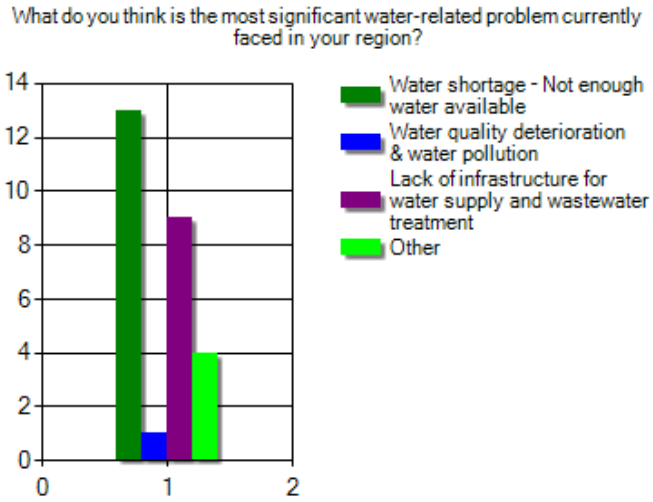
3 Web and workshop survey results

3.1 Respondents' profile

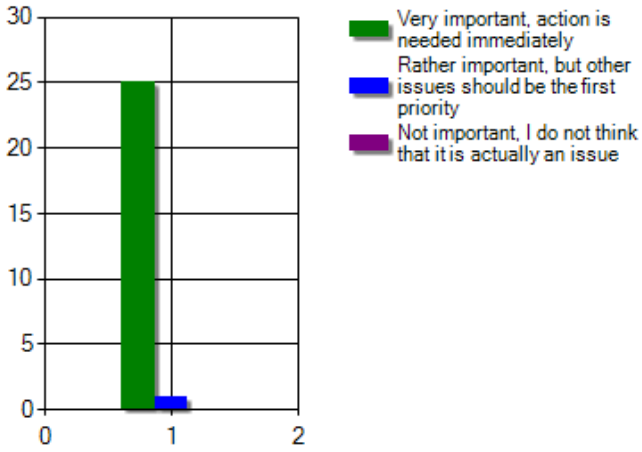




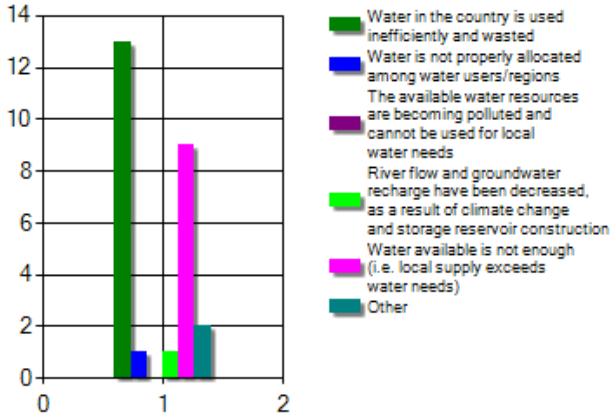
3.2 Perceptions on significant water management issues – Causes and effects to groundwater depletion in Pegeia and Cyprus



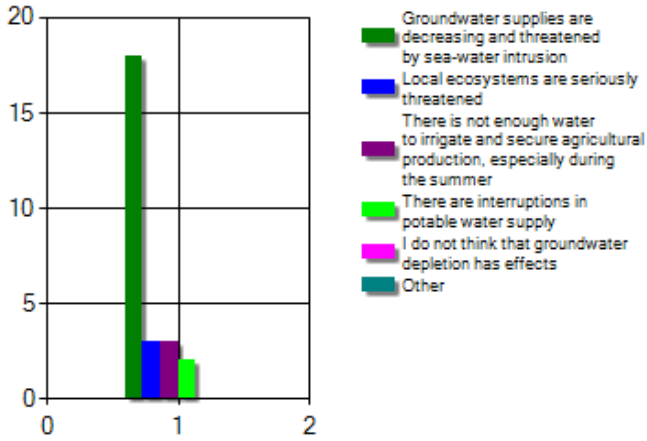
How significant do you think that groundwater depletion is in Cyprus?



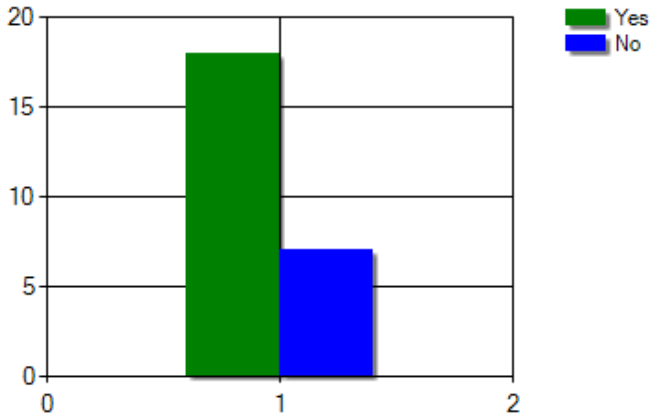
Which, according to your view, is the most important cause of groundwater depletion in your region? (only one answer possible)



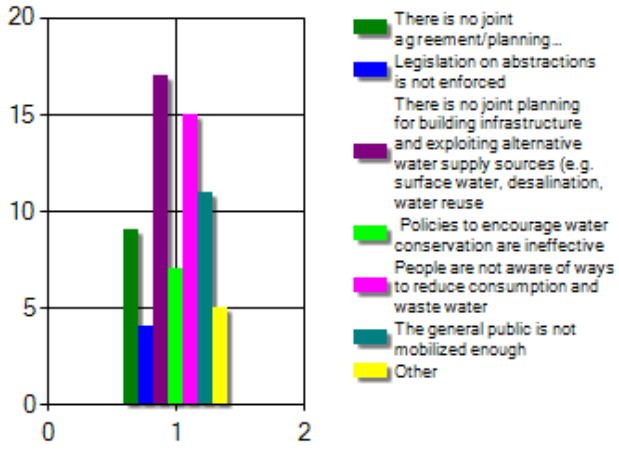
Which, according to your view, is the most important effect of groundwater depletion in your region? (only one answer possible)

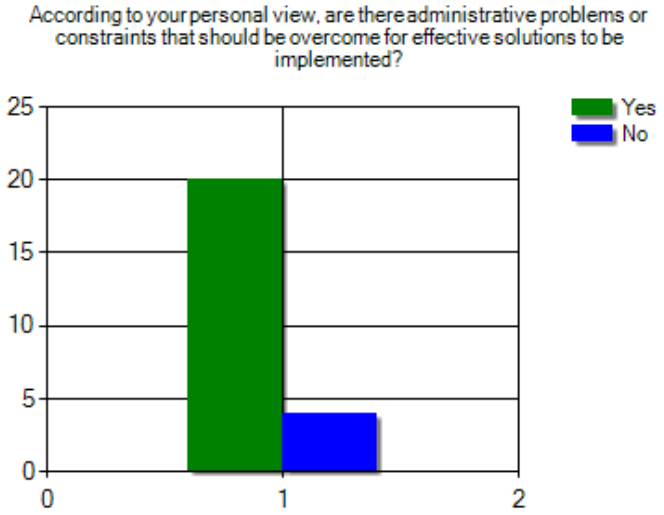


Have you had any personal experience(s) associated with the depletion of groundwater in your everyday life (e.g. drying up of boreholes, supply interruption, need to purchase water from private water dealers etc.)

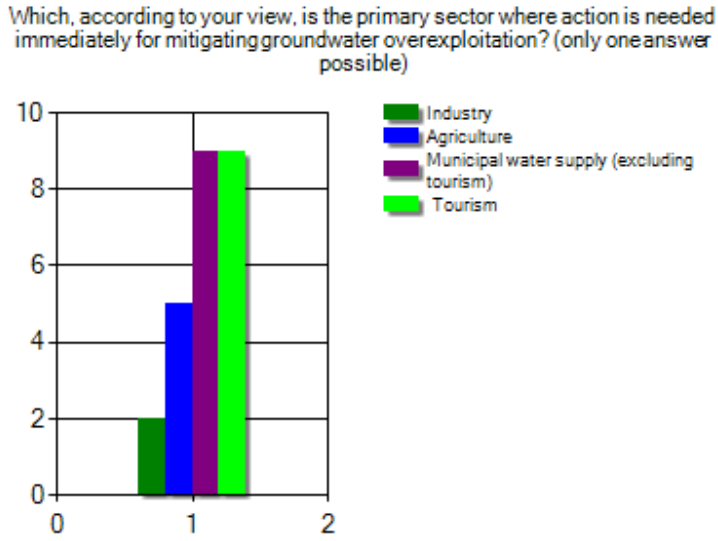


Which, according to your view, are the underlying cause(s) of groundwater depletion? (more than one answer possible)

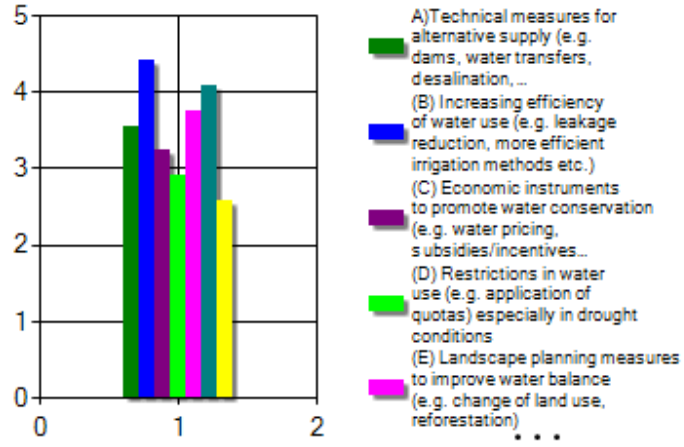




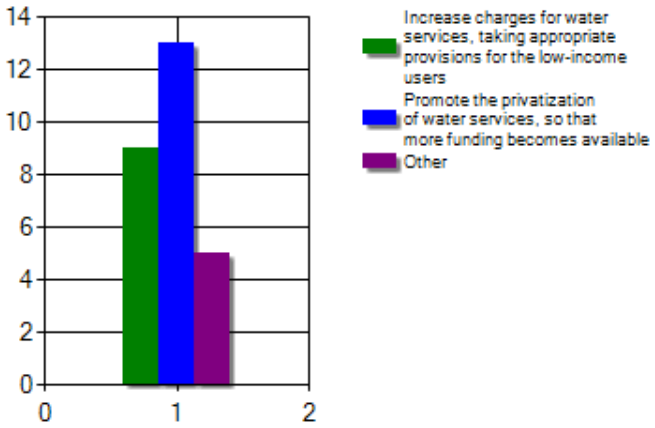
3.3 Prioritizing objectives & Exploring alternative options mitigating groundwater overexploitation



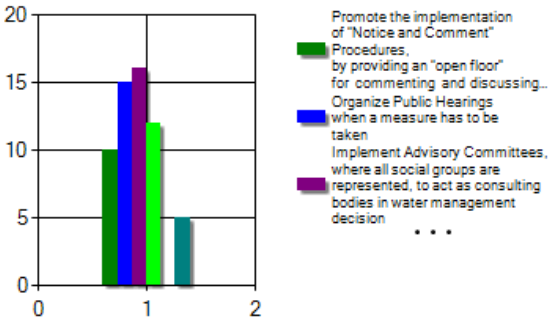
The following table lists a number of potential measures to address groundwater overexploitation. Pleaserank the effectiveness ofthose measures using a scale from 1 (not effective) to 5 (most effective)(Average)



It can be claimed that water services cannot respond to the increasing need for new infrastructure, due to financial constraints. How do you think that this issue can be addressed? (more than one answer possible)



Public participation is currently considered the key principle of developing sound and successful water management policies, because it is thought of as the only way to ensure that the interests of all users are taken into account. How do you think that public participation can be implemented in Cyprus? (more than one answer possible)



4 Event flier, programme and posters

4.1 Event flier and programme (English version)

THE INECO PROJECT

INECO is a Coordination Action Project supported by the European Commission through the 6th Framework Programme, addressing the "Specific Measures in Support of International Cooperation (INCO Programme) - Mediterranean Partner Countries (MPC)" Priority. The INECO Consortium brings together 14 institutions from 10 Mediterranean Countries (Greece, France, Italy, Cyprus, Tunisia, Egypt, Lebanon, Syria, Algeria and Morocco), including public (6), private (7) and international organisations (1). The goal of INECO is to introduce an interdisciplinary approach to water management building upon the integration of three major aspects: environment, economics and society. INECO will discuss shared problems in the decision-making process and the deficiencies of the present governance structures around the Mediterranean Basin. Research focuses on alternative institutional and economic instruments which can promote equity, economic efficiency and environmental sustainability in the sharing and governing dimensions of water resources management.

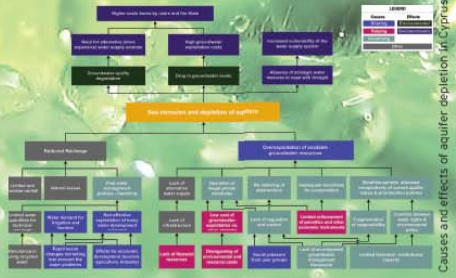
The INECO Framework of Activities

The Cyprus workshop is the fourth of the stakeholder workshops organised by INECO in Egypt, Syria, Lebanon, Cyprus, Tunisia, Algeria and Morocco. The workshops aim to develop a constructively engaged Integrated Water Resources Management process, and lay the foundations for reaching a common understanding on what the real problems are and how these could be addressed in a commonly agreed water resources management situation.

INECO IN CYPRUS - GROUNDWATER OVEREXPLOITATION

In Cyprus, INECO will discuss on the focal water management problem of depletion and sea water intrusion in groundwater. During the past few decades, the heavy groundwater over-pumping, a practice adopted in order to cope with an increasing demand for domestic and irrigation purposes or to mitigate drought effects, has resulted in the depletion of almost all inland aquifers. Seawater intrusion is also a major problem in many coastal aquifers (13 out of 19 groundwater bodies, i.e. 68%, are at risk from over-pumping).

The overexploitation of groundwater resources can be mainly attributed to the lack of coordination in the existing groundwater management framework, which, in turn, leads to ineffective and conflicting decision making processes, social pressures from user groups during the process of borehole permit issuing, and in the non-strict enforcement of penalties and sanctions. The present inequality between agricultural users supplied by public infrastructure and those solely depending on private boreholes encourages further overexploitation and mismanagement of aquifers, especially when an increase in public water supply tariffs is introduced. The current problem is exacerbated by the reduced natural recharge of many riverbed aquifers, due to the construction of large hydraulic schemes and dams, which did not adequately consider downstream impacts. Furthermore, the strong involvement of public authorities in the construction and management of infrastructure impacted on the level of involvement of farmers in the development and management of irrigation schemes, and fostered their adherence to traditional, water-intensive cropping patterns and groundwater extraction.



Causes and effects of aquifer depletion in Cyprus

THE CYPRUS WORKSHOP OBJECTIVES

The workshop aims to strengthen the alliance between the INECO Research Team and Local Stakeholders in Cyprus by:

- Discussing on the focal water management problem experienced in the region;
- Promoting the development of a process where each contributor gains both a better understanding of the problem and insight on how other participants see the problem;
- Initiating the participatory involvement of stakeholders in determining, defining and evaluating alternative institutional and economic instruments towards problem mitigation.

The workshop will serve as a discussion forum on the problems and challenges faced by stakeholders. It will offer the opportunity for participants to share their experiences, knowledge, ideas, preferences, hopes, fears, opinions, and values.

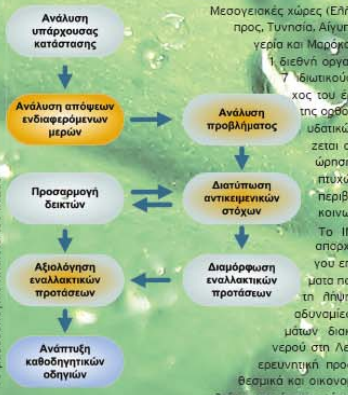
4.2 Event flier and programme (Greek version)

ΤΟ ΕΡΓΟ INECO

Το INECO είναι ένα πρόγραμμα «Συντονιστικής Δράσης» χρηματοδοτούμενο από την Ευρωπαϊκή Επιτροπή στα πλαίσια του 6ου Πλαισίου, μέσω του προγράμματος «Ειδικά μέτρα στήριξης της διεθνούς συνεργασίας - Μεσογειακές χώρες (INCO-MPC)».

Το έργο υλοποιείται από μία ομάδα 14 φορέων από 10 Μεσογειακές χώρες (Ελλάδα, Γαλλία, Ιταλία, Κύπρος, Τυνησία, Αίγυπτος, Λίβανος, Συρία, Αλγερία και Μαρόκο), η οποία περιλαμβάνει 1 διεθνή οργανισμό, 6 δημόσιους και 7 ιδιωτικούς φορείς. Βασικός στόχος του έργου είναι η προώθηση της ορθολογικής διαχείρισης των υδατικών πόρων, που θα βασίζεται στην ολοκληρωμένη θεώρηση των τριών θεμελιωδών πτυχών της αειφορικότητας: περιβάλλον, οικονομική και κοινωνική ανάπτυξη.

Το μεθοδολογικό πλαίσιο του INECO



Το INECO αποσκοπεί στην απορρή ενός γόνιμου διαλόγου επάνω στα κοινά προβλήματα που αντιμετωπίζονται κατά τη λήψη αποφάσεων και στις αδυναμίες των σημερινών συστημάτων διακυβέρνησης του τομέα νερού στη Λεκάνη της Μεσογείου. Η ερευνητική προσπάθεια εντοπίζεται σε θεσμικά και οικονομικά διαχειριστικά εργαλεία, τα οποία μπορούν να προωθήσουν την κοινωνική ισότητα, την οικονομική αποδοτικότητα και την περιβαλλοντική αειφορία στη διαχείριση των υδατικών πόρων.

Η διημερίδα της Κύπρου είναι η 4η μίας σειράς συναντήσεων που διοργανώνει το έργο στην Αίγυπτο, τη Συρία, το Λίβανο, την Κύπρο, την Τυνησία, την Αλγερία και το Μαρόκο. Οι συναντήσεις αυτές αποσκοπούν στη:

- Διαμόρφωση του πλαισίου για μία εποικοδομητική συνεργασία όλων των ενδιαφερόμενων μερών προς την Ολοκληρωμένη Διαχείριση Υδατικών Πόρων, και
- Θεμελίωση κατάλληλων διαδικασιών με στόχο τη συνδιαμόρφωση κοινής αντίληψης για τα προβλήματα διαχείρισης νερού και για το πώς αυτά μπορούν να αντιμετωπιστούν με τη συναίνεση όλων των ενδιαφερόμενων μερών και των εμπλεκόμενων φορέων.

ΤΟ INECO ΣΤΗΝ ΚΥΠΡΟ - ΥΠΕΡΕΚΜΕΤΑΛΛΕΥΣΗ ΥΠΟΓΕΙΩΝ ΥΔΑΤΩΝ

Το INECO στην Κύπρο θα εστιάσει στο πρόβλημα της υπερεκμετάλλευσης και υφαλμύρυνσης του υπόγειου υδροφόρου ορίζοντα. Η χρήση υπόγειων νερών, συχνά σε βαθμό μεγαλύτερο από το φυσικό ρυθμό επαναπλήρωσης, υιοθετήθηκε κατά τις τελευταίες δεκαετίες ως η ευκολότερη μέθοδος για την κάλυψη της αυξανόμενης ζήτησης νερού στον οικιακό, τουριστικό και αγροτικό τομέα, ιδιαίτερα σε περιόδους ξηρασίας. Σήμερα, παρατηρείται πτώση της στάθμης και υφαλμύρυνση πολλών υπόγειων υδροφορέων, με αποτέλεσμα τα 13 από τα 19 υπόγεια υδάτινα σώματα της χώρας να βρίσκονται σε κίνδυνο λόγω της συνεχιζόμενης υπερεκμετάλλευσης.

Η υπερεκμετάλλευση των υπόγειων υδάτων αποδίδεται κυρίως στην έλλειψη συντονισμού στην αντιμετώπιση του προβλήματος, που οδηγεί σε αναποτελεσματικές, και πολλές φορές αντιφατικές αποφάσεις, σε πιέσεις που ασκούνται από ορισμένες κοινωνικές ομάδες κατά τη διαδικασία αδειοδότησης νέων γεωτρήσεων και στη μη συστηρή επιβολή των προβλεπόμενων από τη νομοθεσία ποινών και προστίμων. Επιπλέον, η διαφορά που υπάρχει ανάμεσα στο κόστος νερού που επωμίζονται οι αγρότες που εξυπηρετούνται από τα Κυβερνητικά Υδατικά Έργα (ΚΥΕ) και στο αρκετά χαμηλότερο κόστος παροχής νερού από ιδιωτικές γεωτρήσεις, ενθαρρύνει την υπερεκμετάλλευση, ιδιαίτερα όταν η τιμή διάθεσης νερού από τα ΚΥΕ αυξάνεται. Τα τελευταία χρόνια το πρόβλημα έχει επιδεινωθεί εξαιτίας και της μείωσης του φυσικού ρυθμού επαναπλήρωσης πολλών υπόγειων υδροφορέων λόγω της ανάντι κατασκευής φραγμάτων. Ταυτόχρονα, η μεγάλη εμπλοκή δημόσιων φορέων όχι μόνο στην κατασκευή αλλά και στη λειτουργία των αρδευτικών δικτύων είχε αρνητική επίδραση στο βαθμό συμμετοχής των αγροτών στην ανάπτυξη και διαχείριση υποδομών και ευνόησε την προσκόλληση σε παραδοσιακές, υδροβόρες καλλιέργειες.

Αίτια και επιπτώσεις της εξάντλησης των υπογείων υδάτων στην Κύπρο

ΟΙ ΣΤΟΧΟΙ ΤΗΣ ΔΙΗΜΕΡΙΔΑΣ

Η διημερίδα αποσκοπεί στην εδραίωση της συνεργασίας μεταξύ του INECO και ενδιαφερόμενων μερών στην Κύπρο, στοχεύοντας:

- Σε εκτενή συζήτηση με όλα τα ενδιαφερόμενα μέρη για την υπερεκμετάλλευση των υπόγειων υδάτων και τις ευρύτερες περιβαλλοντικές και κοινωνικοοικονομικές της επιπτώσεις.
- Στην ανάπτυξη γόνιμου διαλόγου όπου όλοι οι συμμετέχοντες αποκτούν καλύτερη αντίληψη του προβλήματος και των επιπτώσεών του, αλλά και του τρόπου με τον οποίο άλλα ενδιαφερόμενα μέρη αντιλαμβάνονται το πρόβλημα και τις επιπτώσεις του.
- Στη δρομολόγηση μίας συμμετοχικής διαδικασίας λήψης αποφάσεων, όπου όλα τα ενδιαφερόμενα μέρη έχουν ενεργό ρόλο στον προσδιορισμό και την αξιολόγηση θεσμικών, διοικητικών και οικονομικών εργαλείων για την αντιμετώπιση του προβλήματος.

Η διημερίδα θα λειτουργήσει ως πλατφόρμα διαλόγου για τα προβλήματα και τις προκλήσεις που αντιμετωπίζουν τα ενδιαφερόμενα μέρη, και θα προσφέρει στους συμμετέχοντες τη δυνατότητα να εκφράσουν τις εμπειρίες, γνώσεις, ιδέες, προτιμήσεις, ανησυχίες και απόψεις τους για την υπερεκμετάλλευση των υπόγειων υδάτων στην Κύπρο.

4.3 Event posters

INECO Tunisia Stakeholder Workshop

"Building a common vision for managing groundwater resources in Tunisia"

Kheops Hotel, Nabeul, Tunisia
Thursday, December 6th 2007

1 Workshop report

1.1 Introduction

The INECO Tunisia workshop was held on December 6th and 7th 2007, in Nabeul, Tunisia. The event was organized by CITET, with the support of the Governor of Nabeul and the International Network of Basin Organizations. The event was the fifth in a series of stakeholder workshops organised by INECO in Lebanon, Syria, Egypt, Cyprus, Tunisia, Algeria and Morocco. The main objectives of the event were to develop a process towards constructively engaged Integrated Water Resources Management, and lay the foundations for reaching a common understanding on what the real problems are and how these could be addressed in a commonly agreed water resources management situation.

The workshop brought together 49 participants including 3 general directors, the first delegate of Nabeul governorate, the delegate of Nabeul, 23 technicians from the Ministry of Agriculture and hydraulic resources, the Ministry of Environment and Sustainable Development and the National Union of Agriculture and Fishing, 11 Agriculture Development Groups and 4 farmers from the Nabeul Governorate, and 4 Media representatives.

1.2 Event summary

1.2.1 Morning session

The morning of the workshop was chaired by Mr. Hédi Belhadj, Director at the General Direction of Dams and Hydraulic water works in the Ministry of Agriculture and Water Resources. Mr. Ridha Boulabiar, Director of ONAS (National Sanitation Utility) of the Ministry of Environment and Sustainable Development acted as rapporteur.

The first session involved welcoming addresses and a presentation on the INECO Project, its main goals, objectives and methodology.

During the **Opening session** Mr Sami Belaid, the General Director of CITET (Tunis International centre for Environmental technologies) welcomed the first delegate, the delegate of Nabeul, the General Director of water resources, the General Director of the Agricultural Department of Nabeul, Prof. Dionysis Assimacopoulos of NTUA and Coordinator of INECO project, Dr. Jean-Marc Berland from the International Office for water and all the participants. Mr. Samir Belaid addressed also his thanks to the Governor of Nabeul for his acceptability to put this event under his auspices. The General Director of CITET in his opening speech stressed the importance of organising this workshop in the governorate of Nabeul for the second time. The event brought together all partners and water users in the framework of the implementation of the INECO project, with the aim to exchange ideas on a major and an important problem: the over exploitation of groundwater resources in the Cap-Bon region. He mentioned that water scarcity in Tunisia is becoming more and more severe, as a result of population growth rising living standards, and accelerated urbanization, which pose a threat on the sustainability of water abstractions and the sustaining of agricultural activities. The escalating urban water demand has led to an increased utilization of fresh water for domestic purposes and the production of larger wastewater volumes estimated at 220 millions cubic meters of treated waste water where only 20% of this volume is reused actually in agriculture. However and is spite of the considerable effort of the government through a national strategy which has played a prominent and determinant role in water resources mobilization, farmers continue to over exploit phreatic water tables specially in the north east of Tunisia with an average of 106% and up to 160% in Haouaria of

Nabeul governorate. This has resulted in the experienced focal problem of groundwater depletion and salinisation in the Cap Bon region. Mr. Samir Belaid underlined that the main goal of the meeting is to discuss the problem, exchange ideas about the causes and the effects of the problem and study the objectives. Then the General Director of CITET gave the floor to Mr. Khaled Atig, the first delegate of Nabeul governorate to open the workshop on behalf of the governor of Nabeul. Mr. Atig focused his speech on the importance of water resources management issue and on the government efforts for water mobilization, conservation, and sustainable management in Tunisia and especially in Nabeul Governorate. He addressed his thanks to the Ministry of Environment and Sustainable Development and to Tunis International Centre for Environmental Technologies for organizing the event in Nabeul and wished all success for its proceedings.

Following the above opening speeches, Mr. Ahmed Bouzid, consultant at CITET for the INECO project, presented the workshop program for the first day.

The **introductory presentation** by Prof. Assimacopoulos outlined the concepts and the framework of INECO activities; he presented the principles and the approach of the project, activities already undertaken in the other participating countries, and the frame and expected outcomes of the Tunisia workshop. It further discussed the water management challenges of the 21st century, focusing particularly on those experienced in the MENA region and the institutional challenges that are related with sustainable water management.

The **2nd Session** was devoted to overview presentations concerning water management in Tunisia. Firstly, the broader framework was presented by the General Director of Water resources of the Ministry of Agriculture and Water Resources. The presentation was very important and summarized all issues, events and progress realized in the water sector, including overviews of the:

- Geographical, social and climatic context;
- State of water resources, in terms of water availability, demand and projections for 2030, major problems faced in water management, sanitation issues, such as treatment plants, access to sanitation and volumes of treated and reused wastewater.
- Current institutional context and the progress achieved within the framework of pursuing IWRM and adequate water provision and sanitation coverage.
- Issues related to policies, programs and key projects under execution, current investments and financing;
- Present situation, needs and challenges, and future plans.

Then, Mr. Moncef Rekaya, Director of water resources in the regional Agriculture Department of Nabeul (CRDA) presented current trends with regard to the exploitation of phreatic water tables and techniques of artificial recharge in the Cap-bon region. Mr. Rekaya focused on the following:

- Shallow and deep water tables and corresponding extractions rates.
- Water quality deterioration and sea water intrusion phenomena, due to the overexploitation of un Derground water resources.
- Programs and projects of artificial recharge with treated wastewater and surface water.

Then, Mr. Bouzid Ahmed, General Engineer, consultant at CITET on the INECO Project, introduced the activities of the project in Tunisia, its objectives, its components, what has been realized and what will be the future activities. Then he presented the focal problem which was chosen by the local stakeholders and recommended by INECO consortium during the interim meeting held in Athens in

February 2007. Te problem was presented in the form of a tree, its roots representing the causes and its branches the effects.

Mr Bouzid mentioned that overexploitation of underground water resources is mainly attributed to the operation of illegal boreholes, mostly drilled by farmers for irrigation purposes. There is a pressing need to rationalize groundwater resources management and agricultural water use, by fostering the application of water efficient irrigation methods and incentives towards less water incentive cropping patterns. Furthermore, the use of alternative water supply sources, such as treated waste water is still limited due to quality restrictions, adopted standards, soil types, choice of crops, land use patterns, farmers willingness to accept and pay and prevailing public perceptions. In spite of the pertinent governmental subsidies, awareness campaigns and economic incentives aimed at promoting water conservation and waste water reuse, have not yet managed to adequately address the concern of end-users.

1.2.2 Discussion summary

Following this presentation, a discussion took place along 2 hours; 8 participants spoke and commented on causes and effects. The main comments were the following:

- The increasing water demand, coupled with the degradation of groundwater bodies both in terms of quantity and quality, constitute major challenges at all levels of decision-making and policy implementation.
- Overexploitation of groundwater is partly due to the easy access to the resource, as abstractions are free of charge and uncontrolled.
- Wasteful water use in irrigated agriculture stems mostly from: (a) lack of technical capacity of farmers, (b) weak valorization of water in irrigated agriculture, (c) limited demand for surface water, due to its high charge (d) limited farmer awareness on improved irrigation practices.
- Institutional and legislative measures are not adequate for addressing the issue. Participation of end-users in the formulation of water management policies should be pursued.
- Effective solutions to the problem can foster an increase of cultivated areas, mitigation of water shortage and loss of agricultural income and contribute to addressing desertification problems, already experienced in some parts of the country.

All the above comments and proposals were taken into consideration to adjust some of the causes and the effects of the preliminary problem tree.

1.3 Afternoon session

The afternoon workshop session on “Objectives and Alternatives” was chaired by Mr. Moncef Rekaya: Director of water resources at the regional department of Agriculture of Nabeul (CRDA). Mr. Habib Chaieb, Deputy Director at the General Direction of Water Resources of the Ministry of Agriculture and Hydraulic Resources acted as rapporteur.

A first presentation on the definition of objectives and possible options was made by Mr. Ahmed Bouzid, consultant at CITET/ INECO project. The objectives were presented as the opposite of causes, summarized as follows:

- Developing new approaches for better underground water valorization and reinforcing water saving techniques.
- Use of less water-incentive cropping patterns
- Improvement of institutional and legislative measures.

- Reinforcement of treated waste water reuse research programs.
- Reinforcement of awareness campaigns.

The main alternatives were identified as follows.

- Establishment of technical criteria for recharging the aquifers with treated waste water.
- Improvement of treated waste water quality through supplementary treatments (tertiary, infiltration percolation procedures) which will alleviate the public acceptance attitude
- Rational surface water management
- Unification of irrigation water tariffs
- Continuation of water resources mobilization
- Reinforcement of soil and water conservation works.
- Improvement and maintenance of the actual infrastructures.
- Concentration on the actual irrigated schemes and avoid the establishment of new perimeters.
- Monitoring ground water extractions (install meters on the wells and boreholes)
- Sharing management of aquifers. Bring scientific results near agricultural development groups (GDA).
- Preoccupy much more of piloting irrigations and water valorization on the economic level.
- Reinforce the institutional aspects of GDA's.

At the end of this presentation, it was decided to discuss and comment the above objectives and alternatives during future meeting with the local stakeholders.

Next, Dr. Jean-Marc Berland made a key note speech on Institutional and Economic Instruments for sustainable groundwater management. The presentation addressed the following issues:

- The silent revolution of groundwater and exploitation patterns
- Policy directions related to groundwater management in arid and semi-arid countries.
- The valuing, governing and sharing dimensions of groundwater management;
- Overexploitation, outputs and impacts, and traditional solutions.
- Introduction of some case studies in Spain, Italy and Germany.
- Approaches related to groundwater, supply and demand management, compensation and reinforcement of the institutional environment.
- Other issues such as: knowledge investment, the political and the social situation, local groups organization system, participatory approaches etc.

The last presentation of the 1st day was made by Prof. Assimacopoulos, complementary to the previous key note speech. The presentation involved a preliminary identification of objectives, a summary of management options and instruments for sustainable water management, focusing on the regulatory approach vs. user group incentives. It further summarized some key considerations with regard to a change of cropping patterns.

At the end of the first day the dedicated workshop survey was distributed to all stakeholders present.

1.4 Field trip

The second day of the workshop included a field trip to three management and research stations for the artificial recharge of water tables with treated waste water and surface water in the Nabeul Governorate. The following stations were visited:

- Bou-Argoub Station:

- Established in 2005
- Area = 8 hectares
- Infiltration basins with surface water = 19
- Cost = 340.000 Tunisian Dinars (TD).

- Oued Souihil station:
  - Established in1985
  - Infiltration basins with treated waste water =12
  - Cost = 45000 Tunisian Dinars (TD).
- Korba Station:
  - Established in 2006
  - 3 infiltration basins: 50 x 30 m with tertiary treated waste water.
  - 1200 m of delivering pipeline of 250mm diameter
  - 300m3 circular reservoir semi-buried
  - 3 technical locals: 4 x 5 m
  - 1 pumping station.
  - 15 piezometers for recharge control.
  - Total cost = 643 500 Tunisian Dinars.

2 List of participants

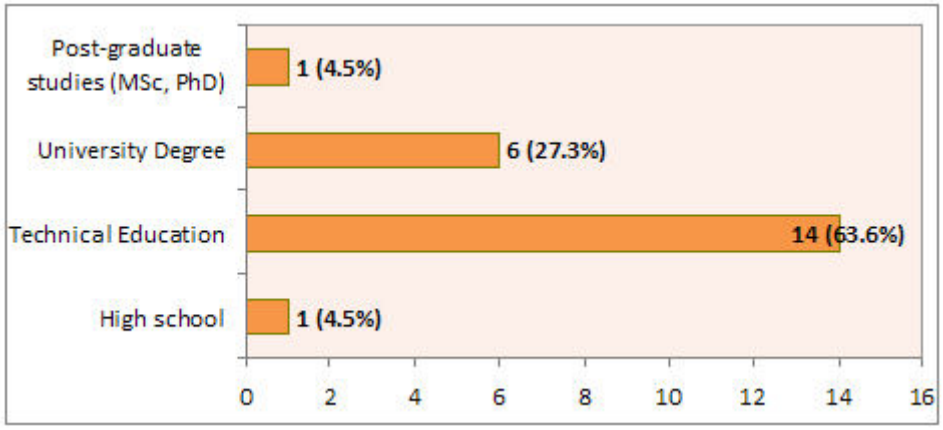
1) Hamdi Salah, DG ACTA, Chef service
2) Gabsi Samir, CRDA Nabeul, Chef Service
3) Chergui Tarek, CRDA Nabeul, Bureau suivi
4) Zohra Dada, GDA ben Argoub, Directeur Technique
5) Mohamed Aled, //, //
6) Belgacem Belgacem, CRDA Nabeul, Chef Division RPS
7) Mohamed Toukabri, Agence TAP, Journaliste
8) Nabli Salah, GDA Diar El Hajjaj, Directeur
9) Mejdoub Nermine, Premier Ministère, Sous Directeur
10) Souilem Mongi, CRDA Nabeul, Chef d'arrondissement EPI
11) Lassoued Kouthai, CRDA Nabeul, Chef de division Etudes
12) Berland Jean Marc, OIEAU, Chef de projet
13) Souilem Hakim, GDA Korba, Ingénieur
14) Lemelli imid,, Agriculteur
15) Brinis Besma, GDA tabarka, Directeur Technique
16) Hamza Mekki, DGRE, Directeur Général
17) Rached ben Zagna, Presse le temps,
18) Bouasaila Mohamed, INRAP Nabeul,
19) Miniaoui Abderraouf, CRDA, Chef département hydraulique
20) Batnini Mohamed, GDA, Directeur Techniques
21) Mrabet Slim, ONAS DR Nabeul, Chef division Epuration
22) Bouziri Chokri, VTAP, Bureau Central
23) Belgacem Ben Taleb, COSAG Grombalia, Président

24) Jlassi Fouad, CRDA, Chef d'arrondissement ressources en eau
25) Dionosys Assimacopoulos, NTVA/INECO, Regional coordinator
26) Ridha Boulabiar, ONAS, Directeur
27) Mabrouk Mohsen, ONAS, Directeur regional
28) Chaieb Habib, DGRE, Sous Directeur
29) Saidi Nourhène, University de Monastir, Thésard (étudiante)
30) Braiek Hichem, GDA, Directeur
31) Ahmed Bouzid, CITET, Consultant
32) Samir bel Aid, Citet, Directeur Général
33) Faouzi Hammouda, Citet, Directeur
34) Ghéraini Hatem, GDA/MBZ, Directeur Technique
35) Soussi Moncef, CRDA, Chef CGDA
36) Rhouma Touhami, GDA Zaouit Djdidi, Secrétaire Général
37) Belhaj Hédi, DG/ BGTH, Directeur
38) Mhamdi Med, I.N. Météorologie, Chef station de Nabeul
39) Chaouch Med, GDA ZT. Djedidi, Directeur Technique
40) Riahi Hatem, GDA Beni Khalled, Directeur Technique
41) Foued El Aini, Citet, Direction Labo
42) Moncef Rekaya, CRDA Nabeul, Directeur
43) Salem Affa, Gouvernorat de Nabeul, Chef de service
44) Abdallah rabhi, CRDA Nabeul, Directeur General
45) Khaled Atig, Gouvernorat de Nabeul, 1er delegué
46) Rachid Khanfir, DG/RE, Directeur

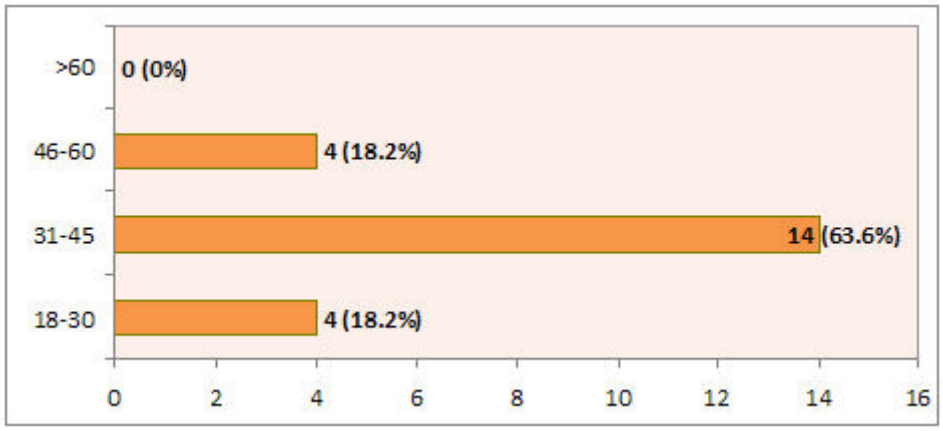
3 Workshop survey results

3.1 Respondents' profile

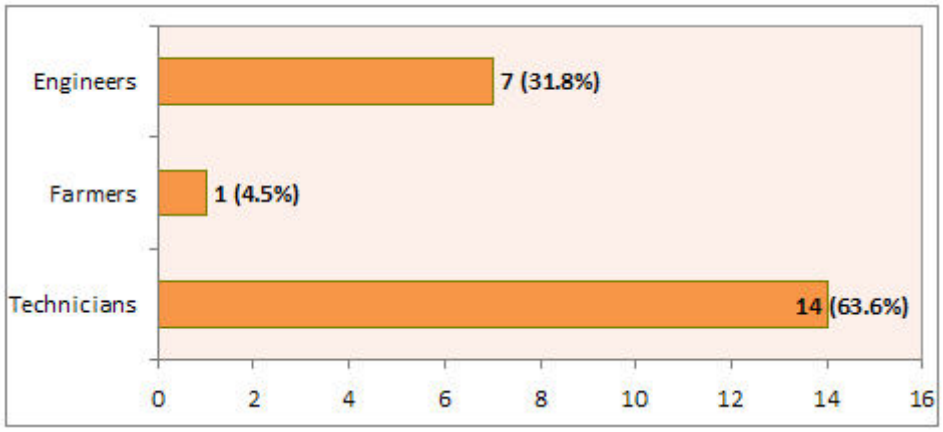
Educational Background



Age Group

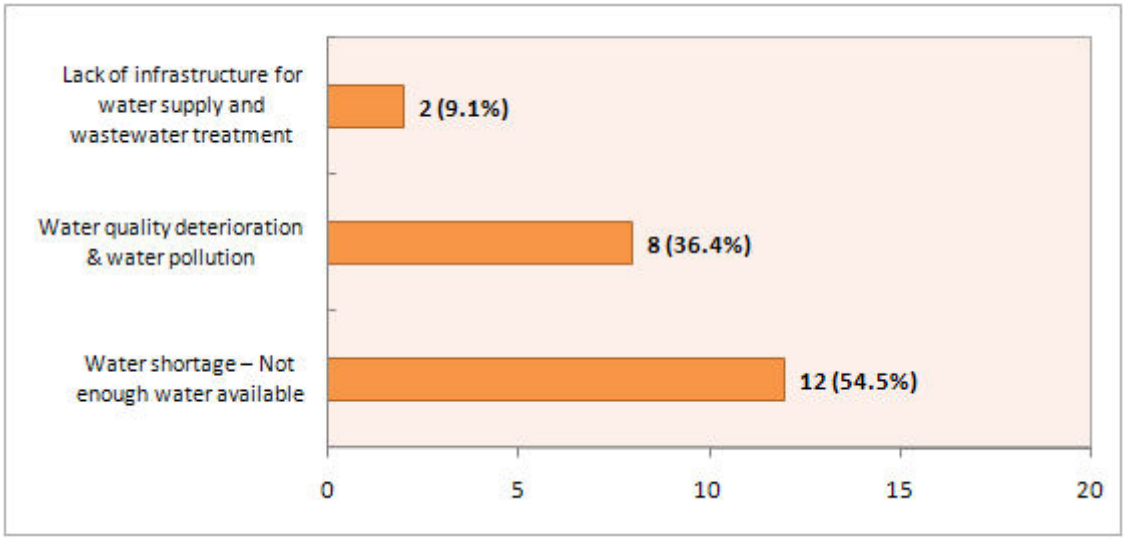


Profession

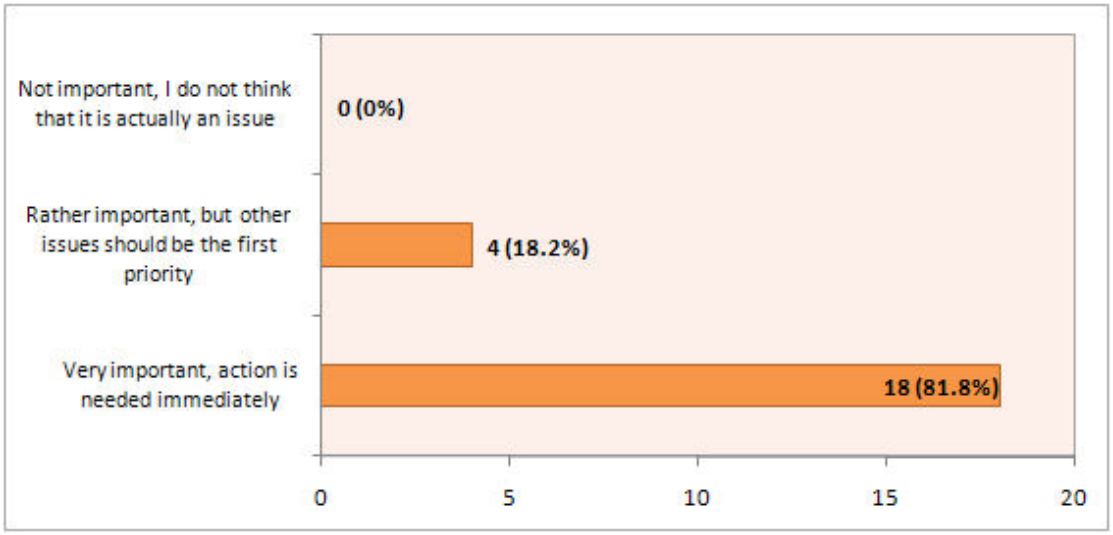


3.2 Perceptions on significant water management issues – Causes and effects to groundwater overexploitation in Tunisia

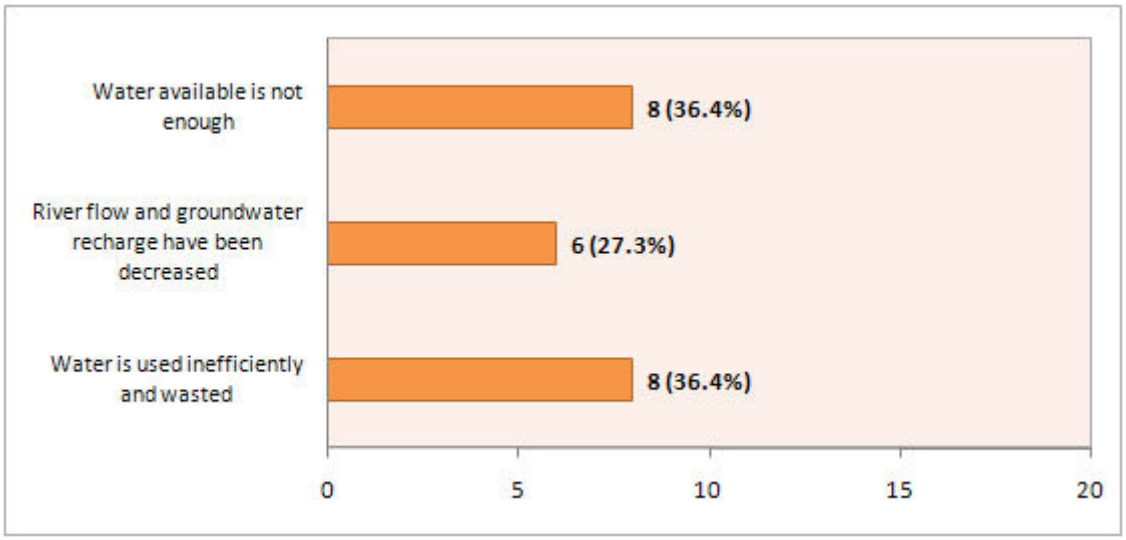
Which do you think is the most significant water-related problem currently faced in your region?



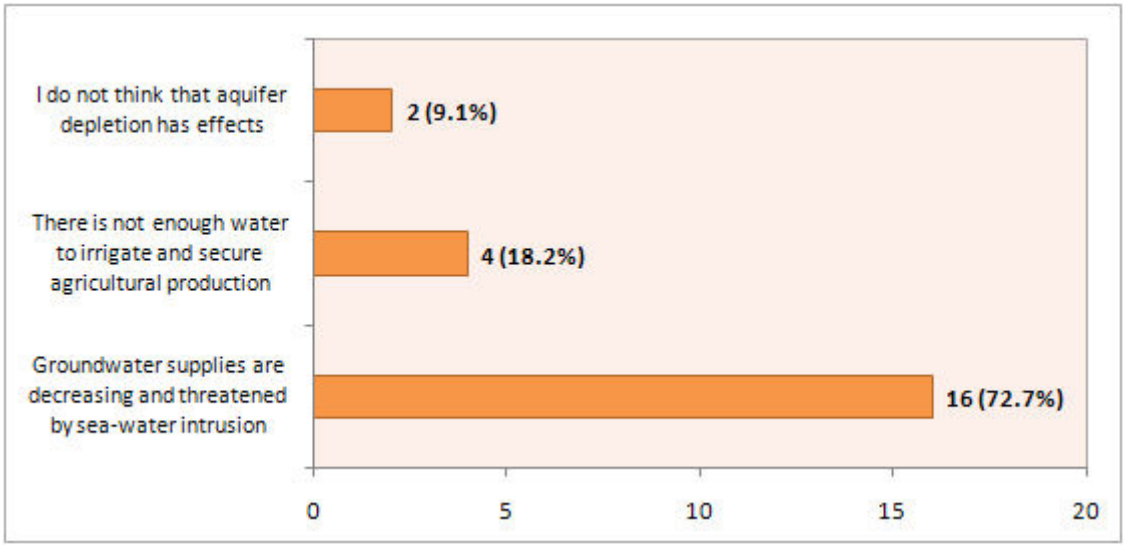
How significant do you think that aquifer depletion is your region?



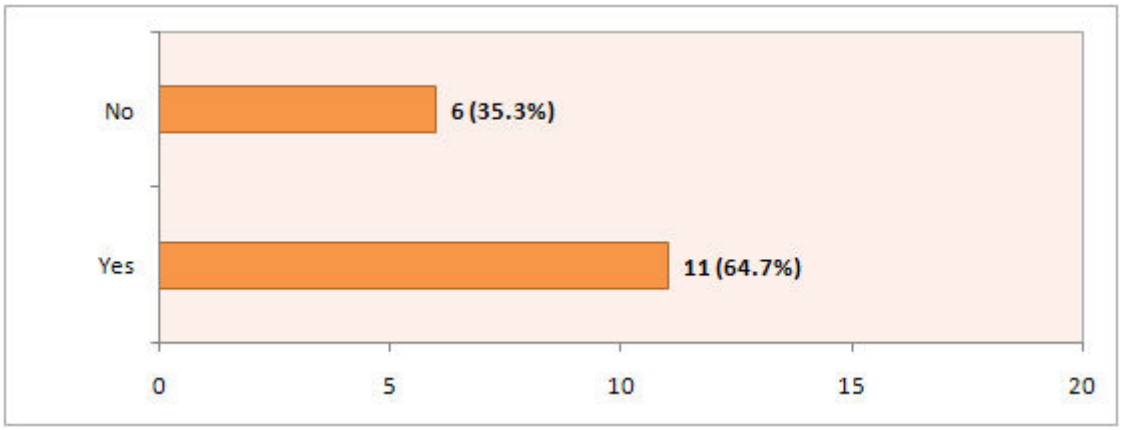
Which, according to your view, is the most important cause of aquifer depletion in your region?



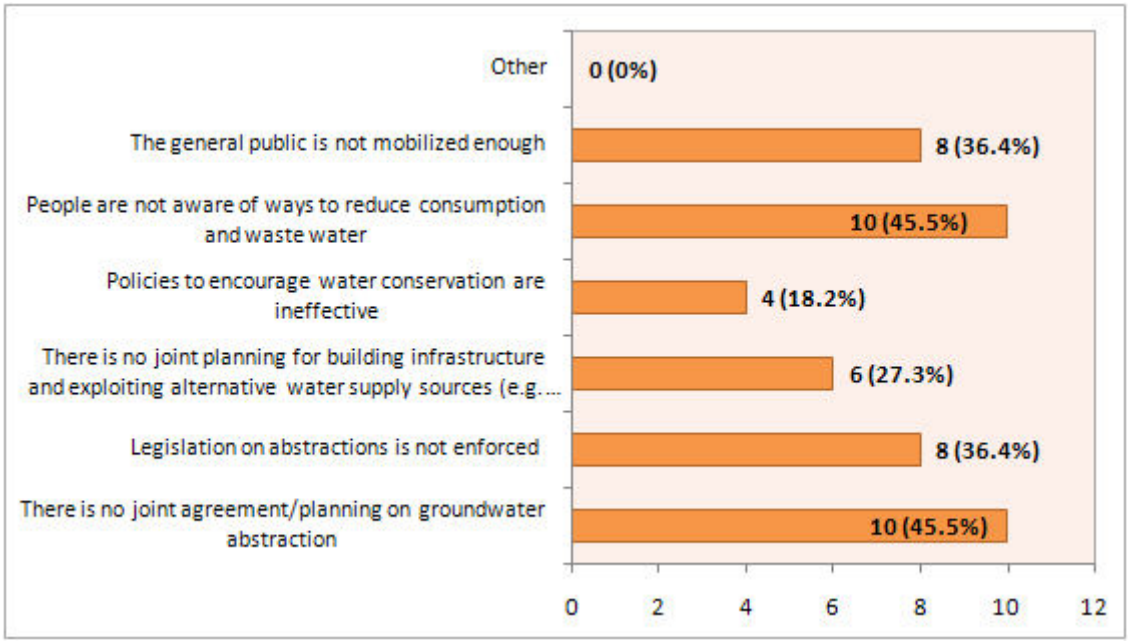
Which, according to your view, is the most important effect of aquifer depletion in the region?



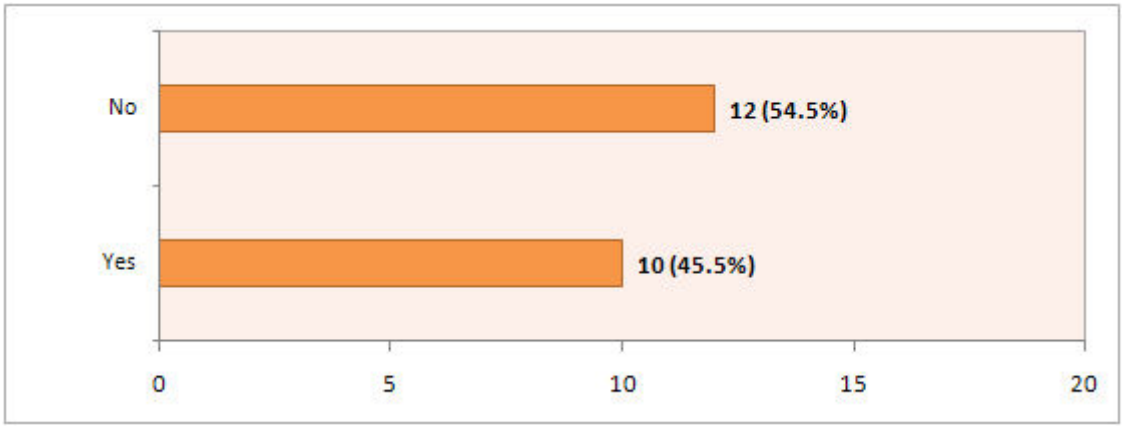
Have you had any personal experience(s) associated with the depletion of groundwater in your everyday life?



Which, according to your view, are the underlying cause(s) of aquifer depletion? (more than one answer possible)

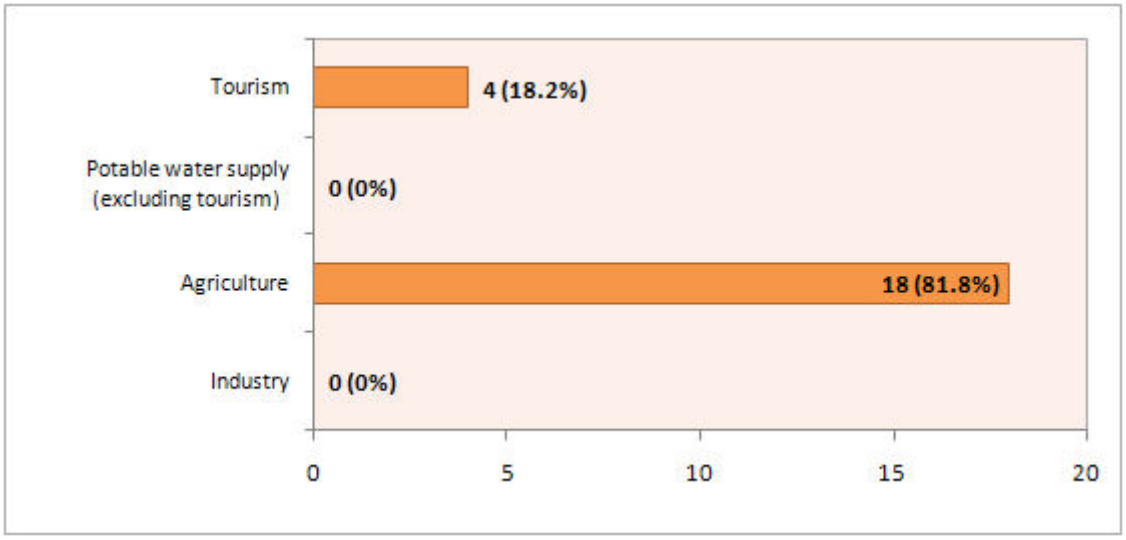


According to your personal view, are there administrative problems or constraints that should be overcome for effective solutions to be implemented?

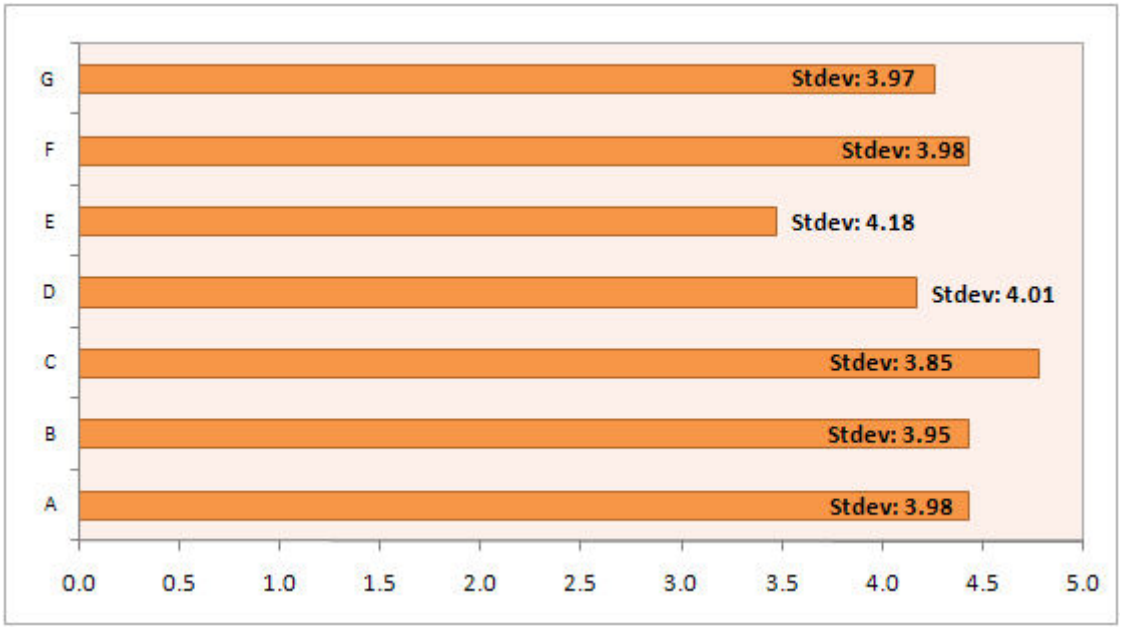


3.3 Prioritizing objectives & Exploring alternative options for mitigating groundwater depletion in Tunisia

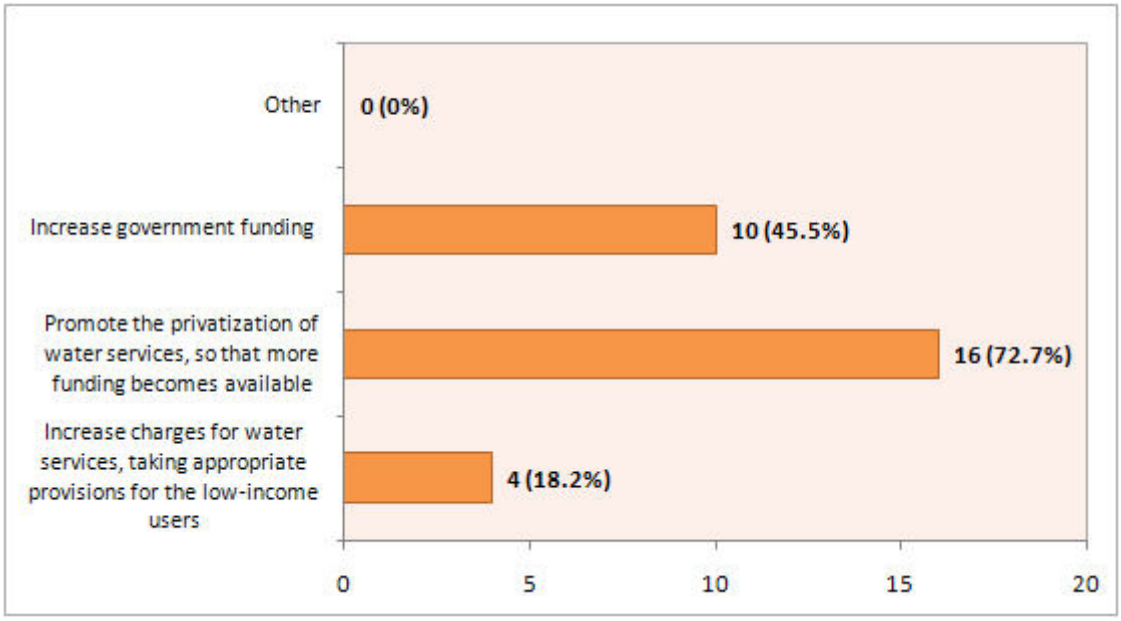
Which, according to your view, is the primary sector where action is needed immediately for mitigating groundwater overexploitation?



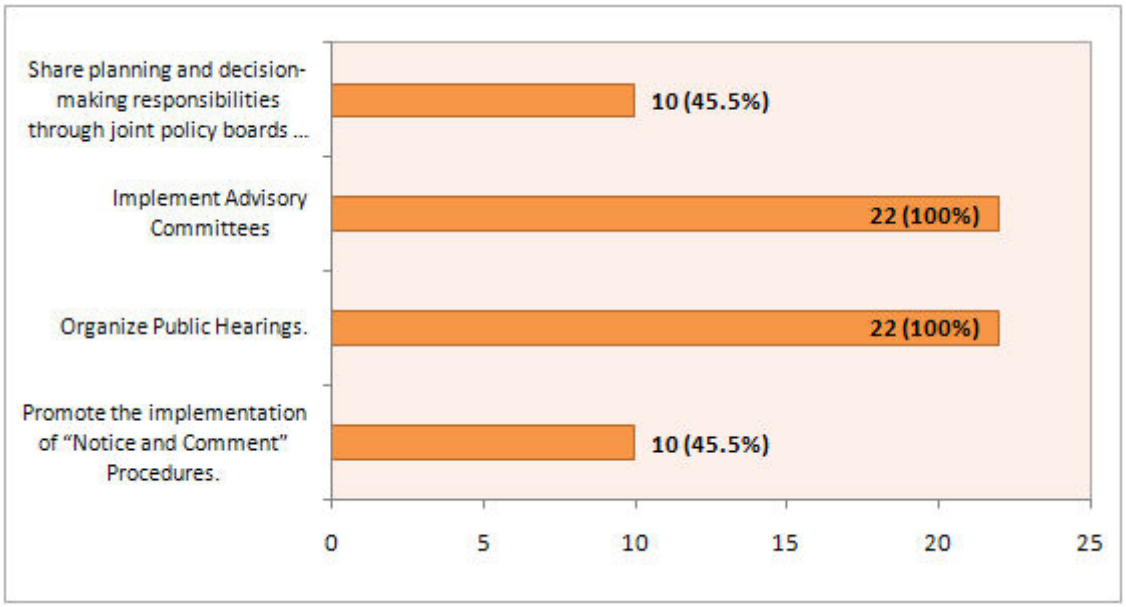
Option ranking: *Please rank the following options according to their effectiveness in addressing the problem, using a scale from 1 to 5 (1: least effective; 5: most effective):*
Option A: Technical measures to enhance supply from alternative sources
Option B: Measures to increase efficiency in water 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



It can be claimed that water services cannot respond to the increasing need for new infrastructure, due to financial constraints. How do you think that this issue can be addressed? (more than one answer possible)



Public participation is currently considered the key principle of developing sound and successful water management policies, because it is thought of as the only way to ensure that the interests of all users are taken into account. How do you think that public participation can be implemented in the region and in Tunisia as a whole? (more than one answer possible)



4 Event fliers, programme and posters

4.1 Event flier and programme (English version)

WORKSHOP AGENDA

6 December 2007

09:00 Registration

Session 1: Introduction - The INECO Approach

09:30 Welcoming addresses

10:00 The INECO Project - Principles and Approach, *Prof. Dionysis Assimacopoulos, INECO Coordinator, National Technical University of Athens*

10:30 Coffee Break

Session 2: Water Management in Tunisia & Groundwater exploitation patterns

10:45 Water Resources Management in Tunisia, *Dr. Rachid Khanfir, DG RE*

11:00 The focal water management problem of groundwater overexploitation - Recharge of water tables in the Governorate of Nabeul, *Dr. Moncef Requaya, CRDA of Nabeul*

11:15 Groundwater overexploitation - An analysis of causes and effects, *Mr. Ahmed Bouzid, CITET*

Session 3: Building of the problem tree through a participatory approach

11:30 Group Work Session: Separation into small groups for analysing causes and effects to groundwater overexploitation and reporting towards the audience

13:00 Lunch Break

14:30 Building the problem tree by the workshop moderator

Session 4: Discussion on objectives and alternatives

15:00 Institutional and Economic Instruments for Groundwater Management, *Dr. Jean-Marc Berland, International Office for Water*

15:30 Coffee Break

15:45 Building the objective tree - Discussion on alternative solutions and implications

16:30 Completion of assessment questionnaires - Experiences and Narratives

17:00 End of Workshop

Contact for queries and further information:
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The INECO Consortium

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Prof. Dionysis Assimacopoulos - *e-mail:* assim@chemeng.ntua.gr

French Water Information Center, International Office for Water, France
Dr. Jean-Marc Berland - *e-mail:* jm.berland@oieau.fr

International Network of Basin Organisations
Mr. Jean-Francois Donzier - *e-mail:* jf.donzier@wanadoo.fr

Istituto di Economia e Politica dell' Energia e dell' Ambiente,
Universita Commerciale Luigi Bocconi, Italy
Prof. Antonio Massarutto - *e-mail:* antonio.massarutto@uniud.it

Aeoliki Ltd, Cyprus / Dr. Dimitris Glekas - *e-mail:* aioliki@cytanet.com.cy

Water Development Department, Ministry of Agriculture, Natural Resources and the Environment, Cyprus
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Water Management Research Institute, National Water Research Center,
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Central Administration for Soil, Water and Environment,
Ministry of Agriculture and Land Reclamation, Egypt
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Mr. Khatim Kherraz - *e-mail:* kherraz@abhcsm.dz

ISKANE Ingénierie, Morocco
Dr. Abderrahmane Affia - *e-mail:* iskane@casanet.net.ma

INECO

Institutional and Economic Instruments
for Sustainable Water Management in the Mediterranean Region
web site: http://environ.chemeng.ntua.gr/ineco

STAKEHOLDER WORKSHOP

"Building a common vision for managing groundwater resources in Tunisia"

THURSDAY 6th December 2007

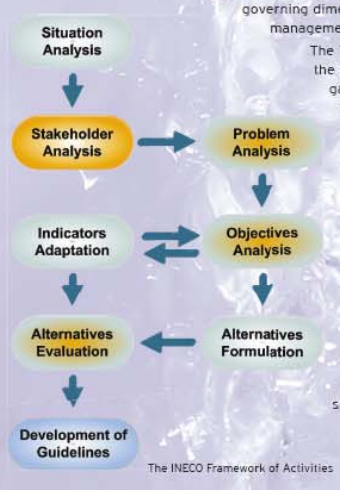
SIXTH FRAMEWORK PROGRAMME

INECO Coordination Action supported by the European Commission through the 6th Framework Programme, and addressing the "Specific Measures in Support of International Cooperation (INCO Programme) - Mediterranean Partner Countries (MPC)" Priority (Contract no: INCO-CT-2004-517673).

THE INECO PROJECT

INECO is a Coordination Action Project supported by the European Commission through the 6th Framework Programme, addressing the "Specific Measures in Support of International Cooperation (INCO Programme) - Mediterranean Partner Countries (MPC)" Priority. The INECO Consortium brings together 14 institutions from 10 Mediterranean Countries (Greece, France, Italy, Cyprus, Tunisia, Egypt, Lebanon, Syria, Algeria and Morocco), including public (6), private (7) and international organisations (1).

The goal of INECO is to introduce an interdisciplinary approach to water management building upon the integration of three major aspects: environment, economics and society. INECO will discuss shared problems in the decision-making process and the deficiencies of the present governance structures around the Mediterranean Basin. Research focuses on alternative institutional and economic instruments which can promote equity, economic efficiency and environmental sustainability in the sharing and governing dimensions of water resources management.



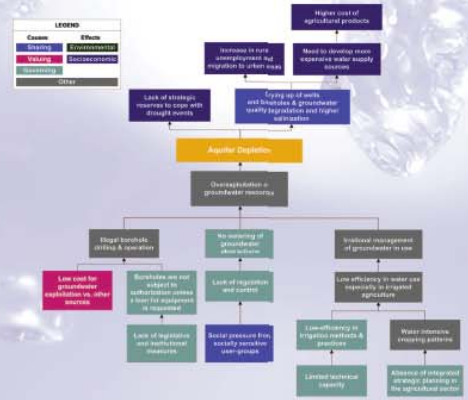
The INECO Framework of Activities

The Tunisia workshop is one of the stakeholder workshops organised by INECO in Egypt, Syria, Lebanon, Cyprus, Tunisia, Algeria and Morocco. The workshops aim to develop a constructively engaged Integrated Water Resources Management process, and lay the foundations for reaching a common understanding on what the real problems are and how these could be addressed in a commonly agreed water resources management situation.

INECO IN TUNISIA - GROUNDWATER OVEREXPLOITATION

Water scarcity in Tunisia is becoming more and more severe, as a result of population growth, rising living standards, and accelerated urbanization which pose a threat on the sustainability of water abstractions and the sustaining of agricultural activities. The escalating urban water demand has led to increased utilization of fresh water for domestic purposes and to the production of larger wastewater volumes. In spite of the considerable effort for water resources mobilization, a strategy which has played a prominent and determinant role in the mitigation of socio-economic impacts of the last 15-year droughts, farmers continue to overexploit phreatic water tables. This has resulted in the current focal problem of groundwater depletion and salinisation. At present, 71 out of 273 water tables are overexploited at a rate of 146%, whereas groundwater represents more than 52% of the country's total renewable water resources.

The overexploitation of groundwater resources is mainly attributed to the operation of illegal boreholes, mostly drilled by farmers for irrigation purposes. There is a pressing need to rationalize groundwater resources management and agricultural water use, by fostering the application of water-efficient irrigation methods and offer incentives towards less water-intensive cropping



Causes and effects of aquifer depletion in Tunisia

patterns. Furthermore, the use of alternative water supply sources, such as treated wastewater, is still limited due to quality restrictions, adopted standards, soil types, choice of crops, land use patterns, farmers' willingness to accept and pay and prevailing public perceptions. In spite of the pertinent governmental subsidies, awareness campaigns and economic incentives aimed at promoting water conservation and wastewater reuse have not yet managed to adequately address the concerns of end-users.

THE TUNISIA WORKSHOP OBJECTIVES

The workshop aims to strengthen the alliance between the INECO Research Team and Local Stakeholders in Tunisia by:

- Discussing on the focal water management problem experienced in the region;
- Promoting the development of a process where each contributor gains a better understanding of the problem and insight on how other participants see the problem;
- Initiating the participatory involvement of stakeholders in determining, defining and evaluating alternative institutional and economic instruments towards problem mitigation.

The workshop will serve as a discussion forum on the problems and challenges faced by stakeholders. It will offer the opportunity for participants to share their experiences, knowledge, ideas, preferences, hopes, fears, opinions, and values.

4.2 Event flier and programme (French version)

ORDRE DU JOUR DE L' ATELIER

6 Décembre 2007

09:00 Inscription

Session 1: Introduction du projet INECO

09:30 Allocutions d'accueil

10:00 Le projet INECO: Principes et Approches
Prof. D. Assimacopoulos Coordinateur du Projet Université Polytechnique Nationale d'Athènes

10:30 Pause café

Session 2: Gestion des Ressources en Eau en Tunisie et modèles d'exploitation des ressources souterraines

10:45 Gestion des ressources en eau en Tunisie, *Dr. Rachid Khanfir, DGRE*

11:00 Techniques de Recharge des Nappes Souterraines dans le Gouvernorat de Nabeul , *Dr. Moncef Requaya, CRDA de Nabeul*

11:15 Surexploitation des Ressources en eau souterraines - Analyse des causes et effets, *Mr. Ahmed Bouzid, CITET*

Session 3: Construction de l'arbre du problème à travers une approche participative

11:30 Travail de groupes: Séparation en petits groupes pour l'analyse des causes et effets de la surexploitation des ressources souterraines et rapporting envers l'audience

13:00 Déjeuner

14:30 Construction de l'arbre du problème par le modérateur.

Session 4 : Discussion sur les objectifs et les alternatives.

15:00 Les instruments institutionnels et économiques pour la gestion des ressources en eau souterraines, *Dr. J.M. Berland, Office International de l'Eau*

15:30 Pause café

15:45 Construction de l'arbre des objectifs - Discussion sur les solutions alternatives et les implications.

17:00 Clôture de l'atelier

Pour plus d'informations, contacter :
Mr Ahmed Bouzid
CITET : CENTRE INTERNATIONAL DES TECHNOLOGIES DE L'ENVIRONNEMENT DE TUNIS
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Tél : 00216 71 206 482, Fax : 0021671206642
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L' INECO Consortium

School of Chemical Engineering, National Technical University of Athens, Greece
Prof. Dionysis Assimacopoulos - *e-mail:* assim@chemeng.ntua.gr

French Water Information Center, International Office for Water, France
Dr. Jean-Marc Berland - *e-mail:* jm.berland@oieau.fr

International Network of Basin Organisations
Mr. Jean-Francois Donzier - *e-mail:* jf.donzier@wanadoo.fr

Istituto di Economia e Politica dell' Energia e dell' Ambiente,
Universita Commerciale Luigi Bocconi, Italy
Prof. Antonio Massarutto - *e-mail:* antonio.massarutto@uniud.it

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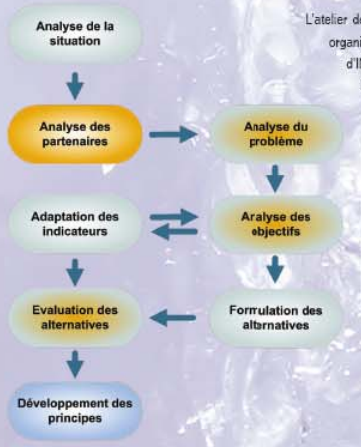
LE PROJET INECO

INECO est une action de coordination du projet soutenu par la Commission Européenne à travers le 6ème Programme Cadre, adressant "Mesures spécifiques à l'appui de la coopération internationale (programme INCO) – Priorité des pays partenaires méditerranéens (MPC)". Le Consortium INECO regroupe 14 institutions de 10 pays méditerranéens (Espagne, Grèce, France, Italie, Chypre, Tunisie, Égypte, le Liban, la Syrie, l'Algérie et le Maroc), y compris organismes publics (6) et organismes privés (7) et internationaux (1). L'objectif de INECO est d'introduire une approche interdisciplinaire de la gestion de l'eau en s'appuyant sur l'intégration des trois aspects principaux: l'environnement, l'économie et la société. INECO discutera les problèmes communs dans le processus décisionnel et les déficiences de la structure de gouvernance actuelle dans le bassin méditerranéen. La recherche porte sur les divers instruments économiques et institutionnels qui peuvent promouvoir l'équité, l'efficacité économique et la durabilité environnementale dans le partage et la gouvernance de la gestion des ressources en eau.

L'atelier de la Tunisie est l'un des ateliers organisés par les parties prenantes d'INECO en Égypte, en Syrie,le Liban, Chypre, la Tunisie, l'Algérie et le Maroc. Les ateliers visent à développer un esprit constructif engagé pour la gestion intégrée des ressources en eau, et de jeter les bases pour parvenir à une compréhension commune de ce que sont les vrais problèmes et la manière dont ils pourraient être traités dans un commun accord.

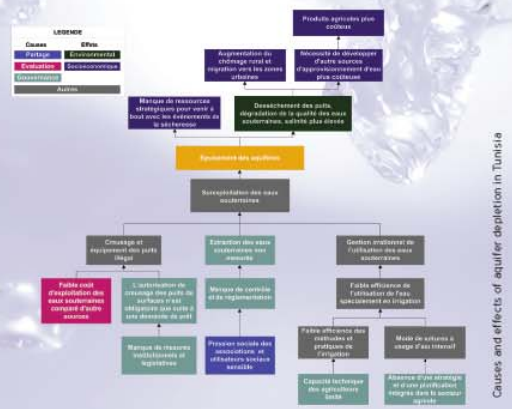


The INECO Framework of Activities

INECO EN TUNISIE, la surexploitation des eaux souterraines

La rareté de l'eau en Tunisie est en train de devenir de plus en plus grave, en raison de la croissance démographique, la hausse du niveau de vie, l'urbanisation accélérée qui font peser une menace sur la durabilité des prélèvements d'eau et le maintien des activités agricoles. L'escalade de la demande d'eau en milieu urbain a conduit à une utilisation accrue de l'eau douce à des fins domestiques et à la production de grandes quantités d'eaux usées. Malgré les efforts considérables pour mobiliser les ressources en eau, la stratégie nationale qui a joué un rôle déterminant dans l'atténuation des impacts socio-économiques des 15 dernières années de sécheresse, les agriculteurs continuent à surexploiter les nappes phréatiques. Ce qui a abouti au problème de l'épuisement des eaux souterraines et de la salinisation. À l'heure actuelle, 71 des 273 nappes phréatiques sont surexploitées à un taux de 146%, tandis que les eaux souterraines représentent plus de 52% du total des ressources en eau renouvelables.

La surexploitation des ressources en eaux souterraines est principalement imputable à l'exploitation illégale des forages, pour la plupart creusés par les agriculteurs à des fins d'irrigation. Il est urgent de rationaliser la gestion des ressources en eaux souterraines et de l'utilisation de l'eau agricole, en encourageant l'application des techniques d'irrigation efficaces et offrir des incitations vers des



Causes and effects of aquifer depletion in Tunisie

modes de cultures moin intensives. En outre, l'utilisation d'autres sources d'approvisionnement en eau, telles que les eaux usées traitées qui est encore limité en raison des restrictions et la qualité de ces eaux, les normes adoptées, les types de sol, le choix des cultures, les modes d'utilisation des terres, l'acceptation des agriculteurs et l'opinion publique. Malgré la pertinence des subventions gouvernementales, les campagnes de sensibilisation et les incitations économiques visant à promouvoir la conservation de l'eau et la réutilisation des eaux usées, n'ont pas encore réussi à répondre de manière adéquate aux préoccupations des utilisateurs finals.

Les Objectifs de l'atelier

L'atelier vise à renforcer l'alliance entre l'équipe de recherche d'INECO et les intervenants locaux en Tunisie par:

- Débattre le problème focal de gestion de l'eau rencontré dans la région;
- Promouvoir le développement d'un processus où les gains de chaque contribuant à une meilleure compréhension du problème et un aperçu sur la façon dont les autres participants voir le problème;
- Initier la participation des parties prenantes dans la détermination, la définition et l'évaluation d'autres instruments économiques et institutionnelles en vue de l'atténuation du problème.

L'atelier servira de forum de discussion sur les problèmes et les difficultés rencontrées par les parties prenantes. Il offrira aux participants l'occasion de partager leurs expériences, leurs connaissances d'idées, les préférences, les espoirs, les craintes, les opinions et les valeurs.

4.3 Event posters

INECO Algeria
Stakeholder Workshop
"Protecting the Seybouse waters from pollution"
Annaba, Algeria
Saturday, January 19th 2008

1 Workshop report

1.1 Introduction

The Algeria Stakeholder Workshop aimed to promote discussion on the pollution of the Oued (River) Seybouse. The meeting brought together about 60 participants, including stakeholders from the entire river basin area (Annaba, Guelma, Tarf and Souk Ahras), from the Departmental Directions of Water (DHW), the Directions of Agricultural Utilities (DSA), the Directions for Environment and Health, the National Agency for Water Resources (ANRH), the National Office for Irrigation and Drainage (ONID), the National Office for Sewage (ONA), the Chambers of Commerce and Industry, Chambers of Agriculture, locally elected officials, national gendarmerie, academics, industrialists and journalists.

The debate was moderated by the General Director of the Water Basin Agency (ABH) and four experts:

- Prof. Dionysis Assimacopoulos, Professor at the National Technical University of Athens (INECO Project coordinator);
- Prof. Bernard Barraque: Head of research at the CNRS, France
- Dr. Jean Marc Berland: Project Manager at the International Office for Water
- Prof. Hocine Bendjoudi, from the University Paris IV, France

This document presents a summary overview of the event, and details its major outcomes. Further information on the event can be obtained from the INECO web site, at http://environ.chemeng.ntua.gr.

1.2 Event overview

The workshop was initiated with a presentation on the INECO project, its objectives and methodology. Then, an introduction was made to the discussion topics, through a brief presentation of the current status of the Oued Seybouse and the causes to the significant deterioration of water quality currently experienced in the region. The discussion that followed was based on:

- A problem tree, analyzing the possible causes to water pollution. Causes already identified comprise institutional and regulatory restrictions, problems with law enforcement, insufficiency of financial resources and lack of awareness among the general public and industrial users. Participants provided further information and insight to the problem, according to their experience, judgment and perceptions.
- An objective tree, defining ways and steps towards problem mitigation.
- Suggestions on possible options.

The workshop was complemented with a brief overview of the workshops held in other countries involved in the project: Egypt, Lebanon, Tunisia, Syria, and Cyprus. Similar problems tend to emerge from the studied cases; a synthesis of findings in the form of a comparative analysis might be interesting.

1.3 Discussion outcomes

Following the above presentation, a discussion was initiated among the participants. The main conclusions drawn from the debate were related to **shortcomings** and **suggestions**, and are summarized below.

1.3.1 Identified shortcomings

Shortcomings identified by participants were related to:

- Technical issues, where there is lack of knowledge on:
  - The sources of water pollution and the regular monitoring of water quality and pollution evolution. Actions undertaken by technical institutions should not be restricted to the management of specific incidents/events.
  - Pollution hotspots, as the monitoring network is not dense enough.
  - Specific characteristics of pollution sources.
- Economic and financial issues, where there is lack of knowledge on:
  - The real status of the different funds available, and especially their use for environmental purposes.
  - The actual financial support offered to industries for the installation of wastewater treatment units in relation also to their own investing capacity.
  - What are the actual financial supports for the cleaning up required by industrialists (estimated costs for the treatment units), and what are their investing capacities in this field.
- Law enforcement, and especially to the operation of the water police, which is still inadequately equipped and protected.
- Efforts to raise awareness among water users and especially industrialists and farmers, on practices that can lead to an increase of production but also to a decrease of pollution. It was pointed out that the pollution of resources can evolve to an insurmountable obstacle to production, especially in the agricultural sector.

1.3.2 Suggestions

Participants suggested the following:

- Acceleration of data acquisition for the basin, according to the programme given to the Basin Agency or the ANRH, with contribution from the University, but on the basis of a contract and clear payments.
- Strengthening of awareness programmes and actions towards manufacturers and farmers, but also towards the locally elected officials.
- Enhanced coordination between the different departments in charge of monitoring and control: Water Resources, Health, Environment, Industry and Agriculture.
- Acquisition of mobile laboratories, able to undertake random, but also regular inspections.
- Increased efforts to implement laws on water pollution, particularly with regard to the obligations of polluting industries to provide information on loads and quality of discharges, and to the prohibition of discharging industrial waste in the sewerage system without prior advanced treatment.

- Enhancement of the economic and financial knowledge, particularly with regard to the possibility of using special funds from the Ministries of Water Resources and of Environment. Possibly, financial incentives for installing wastewater treatment plants can be provided through inter-ministerial coordination and be in the form of contracts with specific industrial branches.
- Building of capacity of the water police, possibly through the establishment of a main department, in charge of monitoring environmental violations and through coordination with the different security bodies.

2 List of workshop participants[1]

1) ASSIMACOPOULOS Dionysis, PROJET INECO . Université d' Athenes, Professeur. Coordonnateur du projet INECO
2) BARRAQUEJean Michel, Projet INECO., Directeur de recherches. CNRS
3) BERLAND Jean Marc, Projet INECO. OIEau, Office international de l' Eau. France
4) KHERRAZ Khatim, Projet INECO. Agence de Bassin CSM, Directeur Général
5) BOUCHEDJA Abdallah, Agence de Bassin CSM , Chef de département etudes
6) ASSAS Rafik, Agence de Bassin CSM , Chef de département informatique
7) BENMOSTEFA Yasmine, Agence de Bassin CSM , Documentaliste
8) FERRAH Abdennacer, Agence de Bassin CSM , Chef de délégation Annaba
9) CHERCHAR Mounia, ABH ANNABA, INGENIEUR
10) HERBO Feriel, AKHER SAA, JOURNALISTE
11) BAHRI Kamel, ANBT, INGENIEUR
12) RAMDANI Abbdelaziz, ANRH ANNABA, CHEF D'ANTENNE
13) ZENATI Hocine, ANRH CONSTANTINE, DIRECTEUR REGIONAL/HYDROGEOLOGUE
14) KHERICI Belkacem, APC CHIHANI, UNIVERSITAIRE
15) BOUCHEMELLA Abdellah, APC EL BOUNI, VICE PRESIDENT
16) DAHAK Mourad, ARCELOR METTAL, DEPARTEMENT ENVIRONNEMENT
17) MOULOUD Makhlouf, BET INTEGRAL TIDDIS, DIRECTEUR/ INGENIEUR EN CHEF
18) DEPACHTERE Michel, CAPEF (ALGERIE), GERANT
19) OSMANE Abdelhak, CELLULE DE PROTECTION ENVIRONNEMENT, GENDARMERIE
20) MERINE Abdelkader, CELLULE DE PROTECTION ENVIRONNEMENT, GENDARMERIE
21) CHEMAKH Fateh, CELLULE DE PROTECTION ENVIRONNEMENT, GENDARMERIE
22) HASNI Abdelmalek, CHAMBRE DE COMMERCE , TS

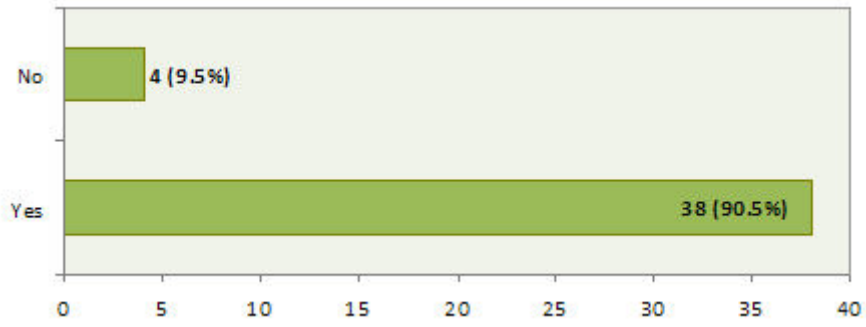
[1] Abbreviations:
DHW: Direction de l' Hydraulique de Wilaya
DMI: Direction des Mines et de l' Industrie
DSA: Direction des Services Agricoles (wilaya)
APC: Assemblée Populaire Communale : Municipality
MRE: Ministère des ressources en Eau
ONA: Office National d' Assainissement
ONID: Office National d' Irrigation et de drainage

23) AFIANE Abdelhalim, COMMUNE DE BOUCHEGOUF, INGENIEUR
24) ATMANI Sebti, DHW ANNABA, MASTER EN HYDRAULIQUE
25) BEKHOUCHE Nadjib, DHW EL TAREF, DIRECTEUR
26) KARA ALI Salah, DHW GUELMA, DIRECTEUR
27) BOUMAZA Mourad, DIRECTION DE LA SANTE ANNABA, DIRECTEUR
28) CHAOUI Fateh, DIRECTION DE L'ENVIRONNEMENT ANNABA, INGENIEUR
29) MENINA Moussa, DMI EL TAREF, INGENIEUR
30) LAYACHI Narimane, DSA ANNABA, INGENIEUR
31) AOUADI Laid, DSA EL TAREF, DIRECTEUR
32) MEZIANI Larbi, DSA GUELMA, DIRECTEUR
33) GUESMIA Nabila, L'EST REPUBLICAIN, JOURNALISTE
34) HAMMOUCHE Hassina, MRE/DAPE, CHEF DE BUREAU
35) KABAR Samir, ONA ANNABA, INGENIEUR
36) MEHRI Hakima, ONA ANNABA, INGENIEUR
37) LAHOUASNIA Nabila, ONA ANNABA, INGENIEUR
38) KEBIECHE Abdelhak, ONID/DRC, MAGESTER EN HYDRO-AGRICOLE
39) AOUNALLAH Ouafia, UNIVERSITE ANNABA, DOCTORANTE
40) OUNISSI Makhlouf, UNIVERSITE ANNABA, CHERCHEUR
41) HARIDI Ahcène, UNIVERSITE ANNABA, ENSEIGNANT/CHERCHEUR
42) FREHI Hocine, UNIVERSITE ANNABA, ENSEIGNANT/CHERCHEUR
43) DJABRI Larbi, UNIVERSITE ANNABA, PROFESSEUR
44) DJERIBI Ryad, UNIVERSITE ANNABA, DOCTEUR D'ETAT BIOTECHNOLOGIE
45) AFFOUN Samia, UNIVERSITE DE CONSTANTINE, THEORIE EN DOCTORAT
46) MEBARKI Azzeddine, UNIVERSITE DE CONSTANTINE, ENSEIGNANT/CHERCHEUR
47) BENDJOUDI Hocine, UNIVERSITE DE PARIS 6°, ENSEIGNANT
48) YALLS Amina, UNIVERSITE GUELMA, ETUDIANTE
49) ZENATI Nourreddine, UNIVERSITE SOUK AHRAS , ENSEIGNANT
50) MAZOUZI Fatima Zohra,UNMASC,RESPONSABLE

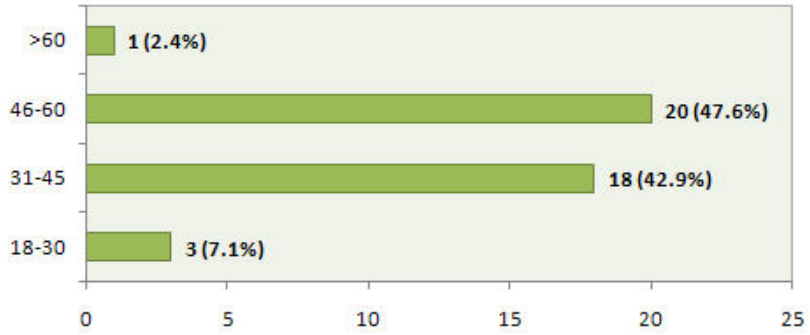
3 Workshop survey results

3.1 Respondents' profile

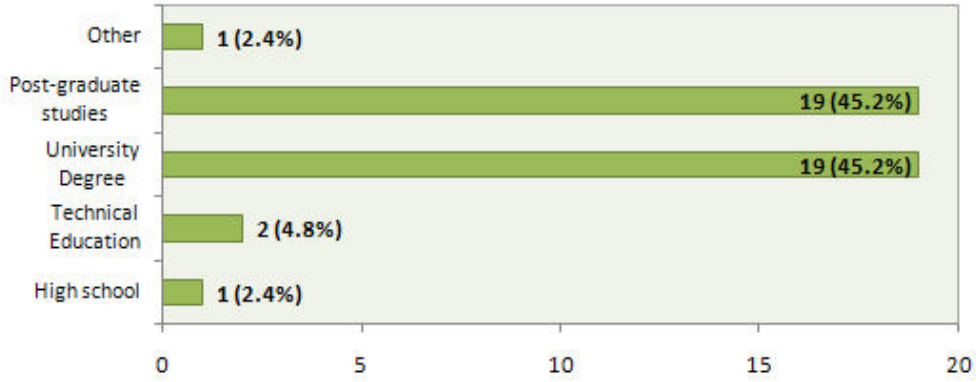
Permanent residents of the Seybouse River Basin region



Age Group

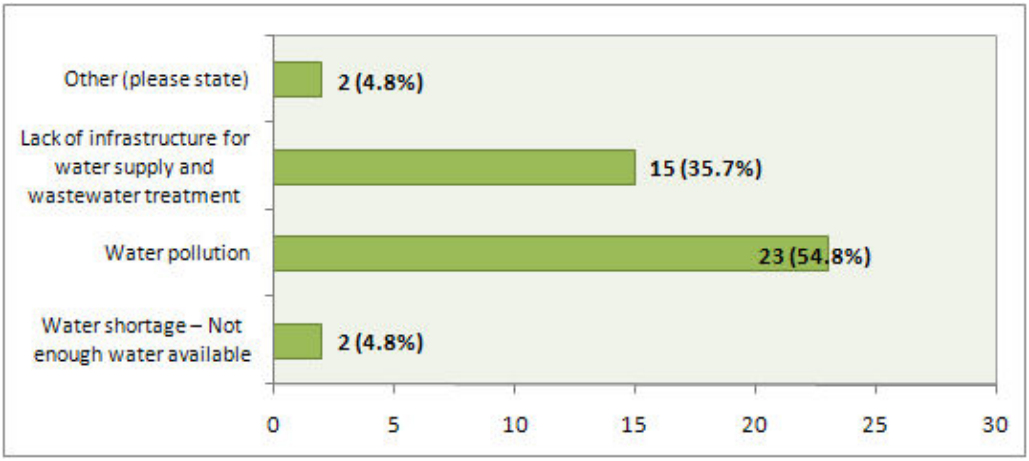


Educational Background



3.2 Perceptions on significant water management issues – Causes and effects to water pollution in the Seybouse

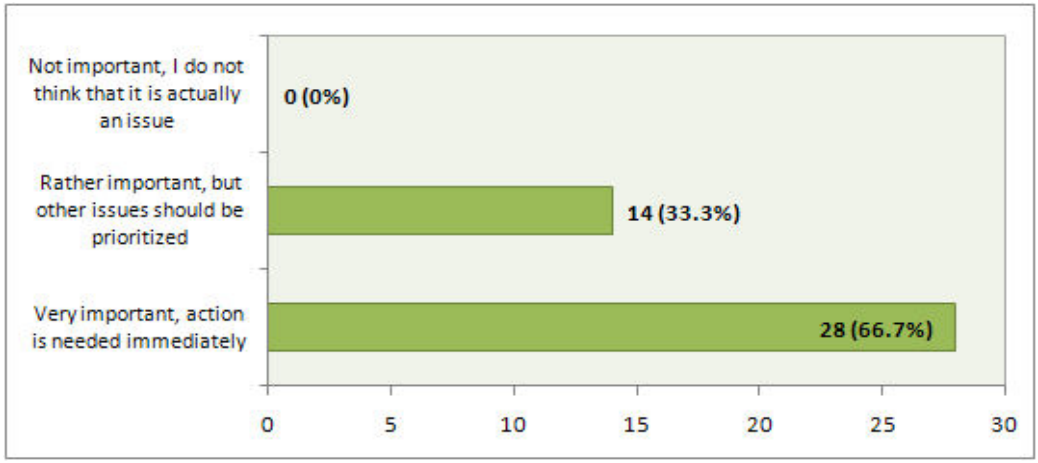
Which do you think is the most significant water-related problem currently faced in the Seybouse River Basin?



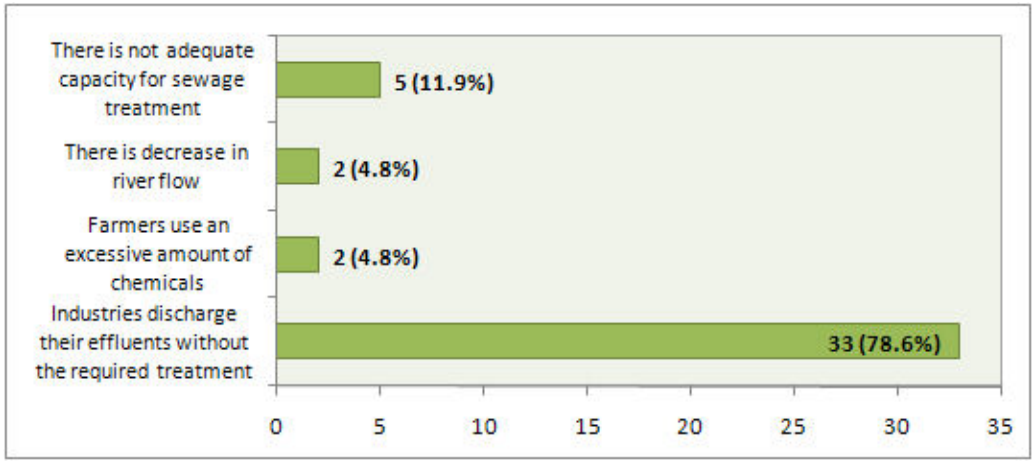
Other answers

1. Institutions not having the financial, human and regulatory conditions to control pollution.
2. The maintenance works of the Oued Seybouse.
3. There is problem of in the valuing and rationalizing dimension (rational use)-of resource management. Effective cost and its impact.

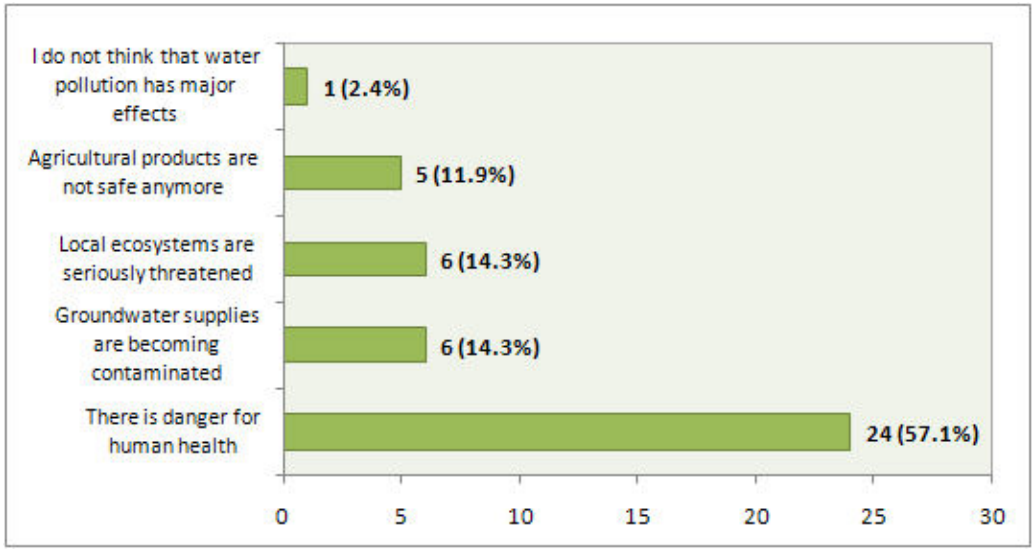
How much significant do you think that water pollution is in the Seybouse River Basin?



Which, according to your view, is the most important cause of water pollution in the Seybouse River Basin? (only one answer possible)



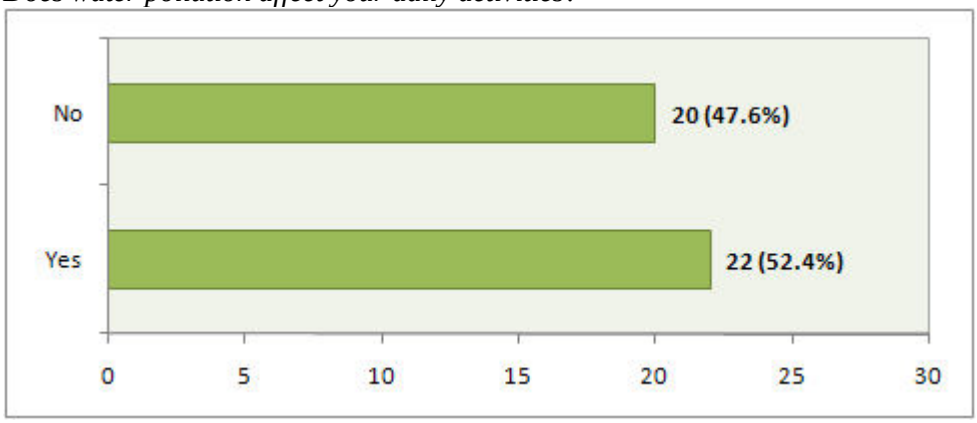
Which, according to your view, is the most important effect of water pollution in the region? (only one answer possible)



Other answers

1. The fauna living in the Oued is seriously threatened.

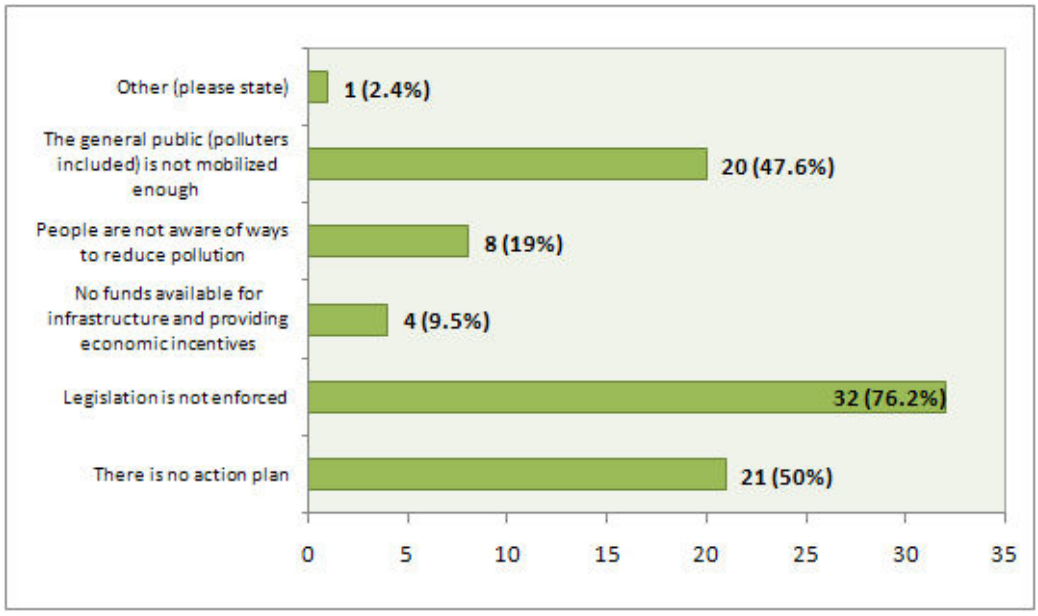
Does water pollution affect your daily activities?



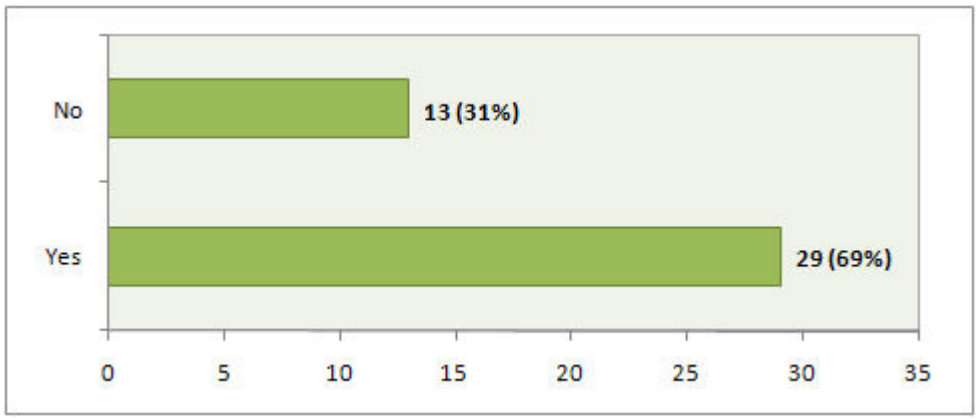
Examples quoted by participants

1. Health risk.
2. When operating our hydrometric unit we proceed by making a gauging.
3. The water quality of the river is conveyed to all areas; it is currently difficult to find unpolluted areas.
4. In the context of fighting water borne diseases.
5. Using water in our daily life is one significant reason to affect our daily activities.
6. Using and consuming natural products or food, arises a continuous risk.
7. Odour nuisance means danger for groundwater contamination.
8. Scientific research programme on water quality in the region of Soukahras.
9. Hydrocarbon waste released in the sewage system, the motor oil.
10. We can save water by prohibiting irrigation water abstractions from Oued Seybouse.
11. Additional expenditures for control and monitoring of the resource.
12. Nauseous, dirtiness, the river banks are unreachable.
13. Poor quality of drinking water.
14. Indirectly on the professional level, the impact of pollution complicates the operation of water purification plants.

Which, according to your view, are the underlying cause(s) of water pollution? (more than one answer possible)



According to your personal view, are there administrative problems or constraints that should be overcome for effective solutions to be implemented?

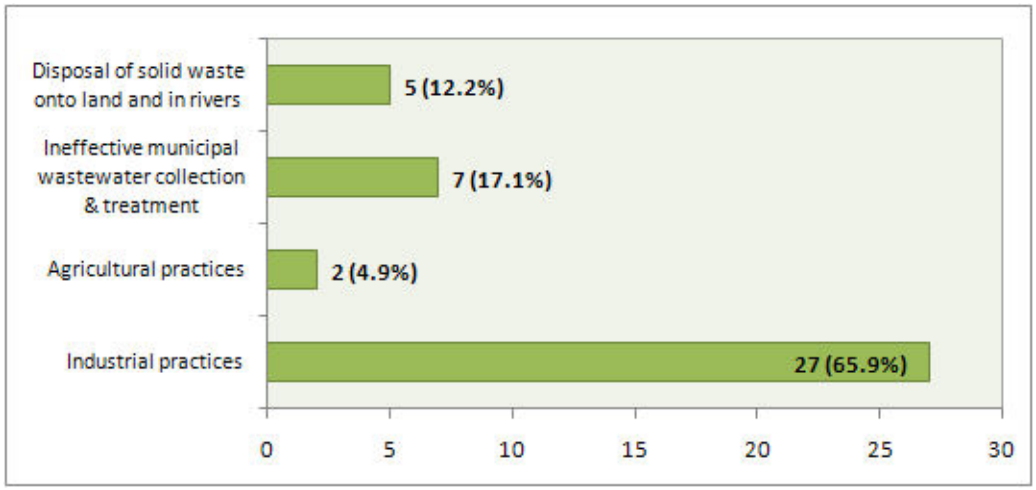


Administrative problems, as identified by participants

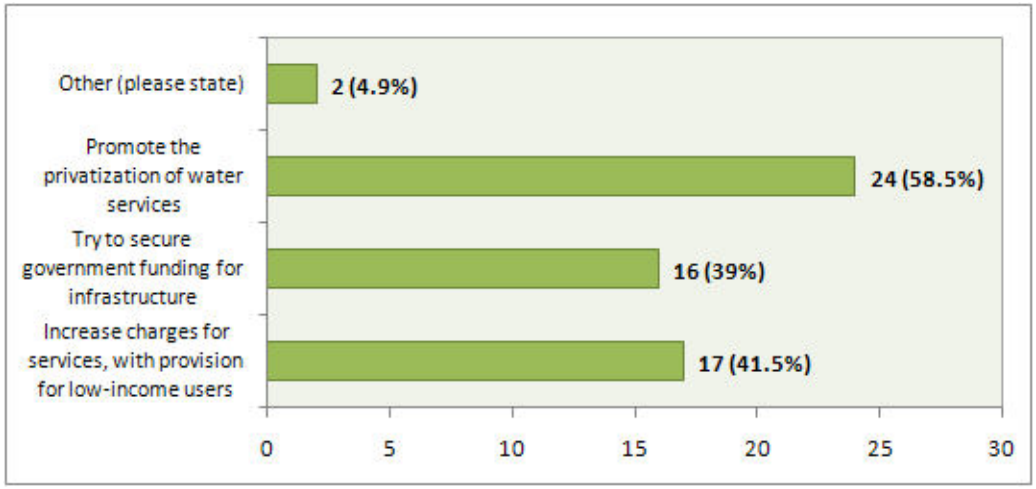
1. To solve the problem of the police of water and make it different from an administrative police in order to make it more efficient
2. Legislation on water law is not applied, all industrial discharges into the environment must pass through a treatment process by setting up a sewage treatment plant
3. Public awareness should be raised
4. To define the exact role of environment and the WRM - Application of the law in force
5. Working together hand in hand
6. Strengthening the prerogatives of the police of water - Financial incentive to the police of water officers -Protection of these officers
7. Provide the necessary means to authorities for the application of regulations
8. Define a list of polluting discharges
9. Stricter enforcement of regulations
10. Provide more resources to the administration to implement effective solutions including information flow and allocation of equipment (lab) for decision-making
11. Regular collection of general parameters of water quality and data exchange (databases)
12. Multiplicity of organisations involved in this area
13. The priorities of the administration are sometimes contradictory (exp; environmental protection, economic development, welfare ...)
14. The major obstacle is the non-response of the administration
15. All institutions are often not on the ground and the statistics are still unreliable, the problem is not taken seriously
16. Coordination between sectors (government) is non-existent, and set up a strategy for cooperation among the various stakeholders
17. The legislation is not enforced
18. Administrative problems
19. We should overpass the lack of continuing every project
20. Involve the municipalities as representatives of the state in the preparation and implementation of the action plan for prevention and control of water pollution
21. Provide information
22. Lack of application of law and regulation charges
23. Officials see that the environmental investment is not a major concern
24. Highlight the nature of pollutants and the technology of existing facilities or those that are to be established

3.3 Prioritizing objectives & Exploring alternative options for water pollution mitigation in the Seybouse

Which, according to your view, is the fact that contributes more to water pollution? (only one answer possible)



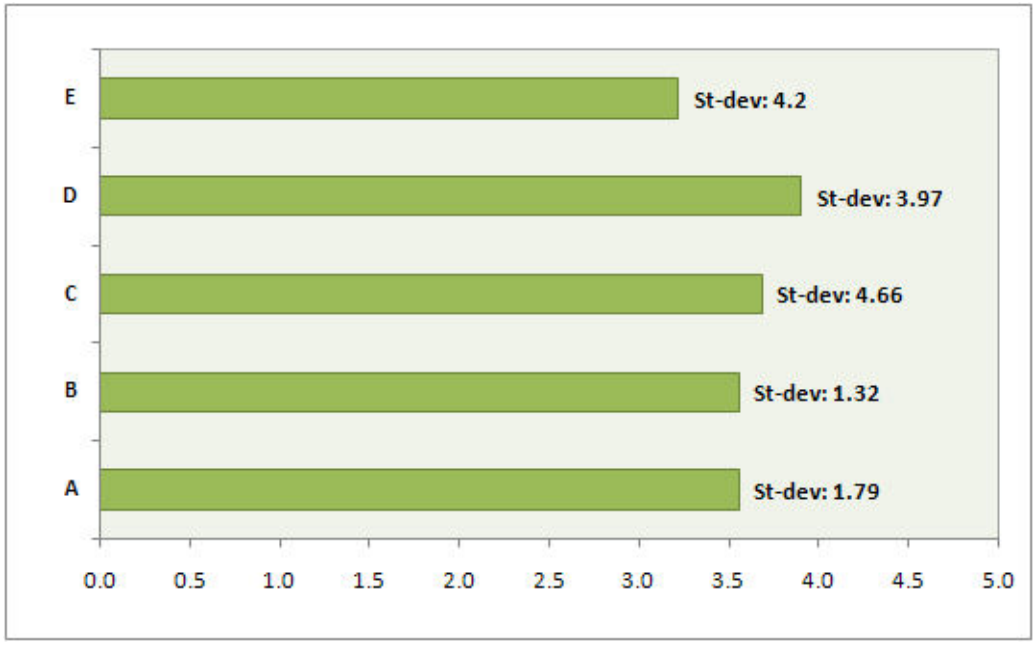
It can be claimed that water service providers cannot respond to the increasing need for new infrastructure, due to financial constraints. How do you think that this issue can be addressed? (more than one answer possible)



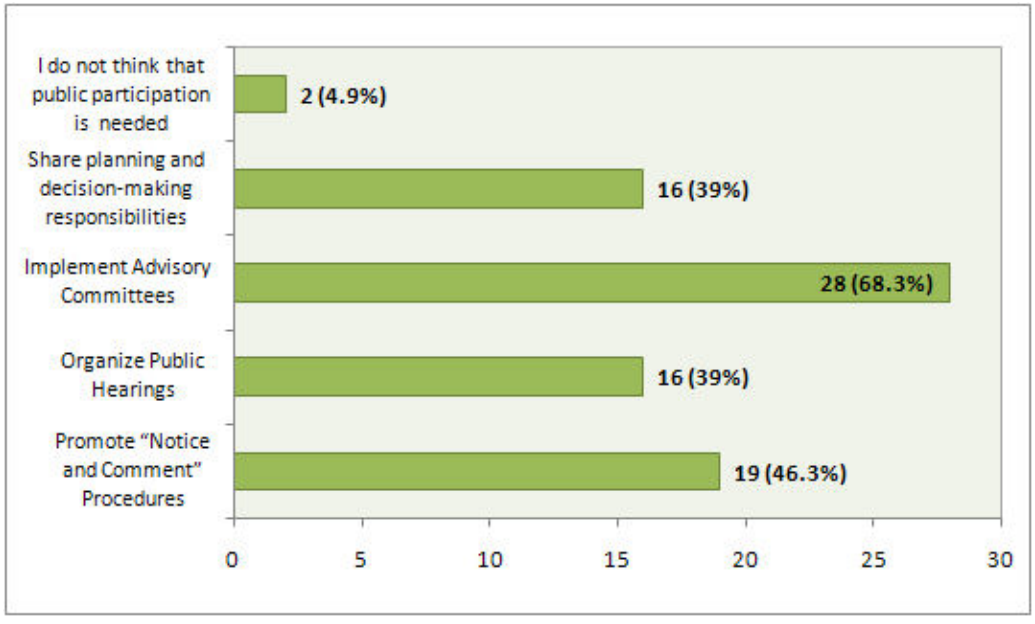
Comments by participants

1. Application of the legislation
2. The problem is not just financial, but organizational, amateurism, laxity, no limitation of powers, make legislation more severe

Industries, including small manufactories, are considered primary contributors to water pollution. Please rank the following measures according to the possible impact that they may have, using a scale from 1 (no contribution) to 5 (high contribution).
A. *Strict enforcement of legislation on discharge standards*
B. *Grants and economic incentives to industries for adopting environmental-friendly technologies (e.g. soft loans, grants, tax rebates)*
C. *Increasing education & awareness on economic benefits from improved environmental practices*
D. *Introduction of pollution charges*
E. *Introduction of tradable discharge permits*



Public participation is currently considered the key principle for developing sound and successful water management policies, because it is thought of as the only way to ensure that the interests of all users are taken into account. How do you think that public participation can be implemented in Algeria? (more than one answer possible)



Pollution from agrochemicals is often attributed to lack of awareness of farmers on how to apply fertilizers and pesticides. Which of the following measures you think would be most likely to have a significant impact on the current agricultural practices? (more than one answer possible)

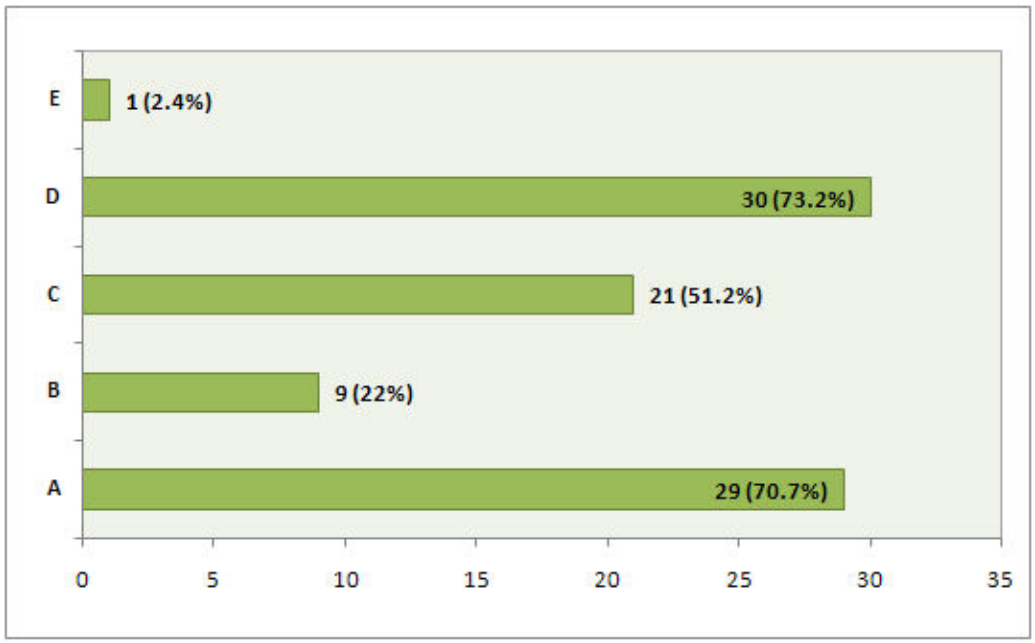
A. *Intensive awareness campaigns, including seminars on best practices*

B. *Development of cost-sharing schemes, where public authorities contribute to the cost of implementing measures or compensate farmers for income lost due to fertilizer restrictions*

C. *Application of pollution charges in case of excessive fertilizer/pesticide use*

D. *Promoting voluntary pollution control agreements*

E. *Other*

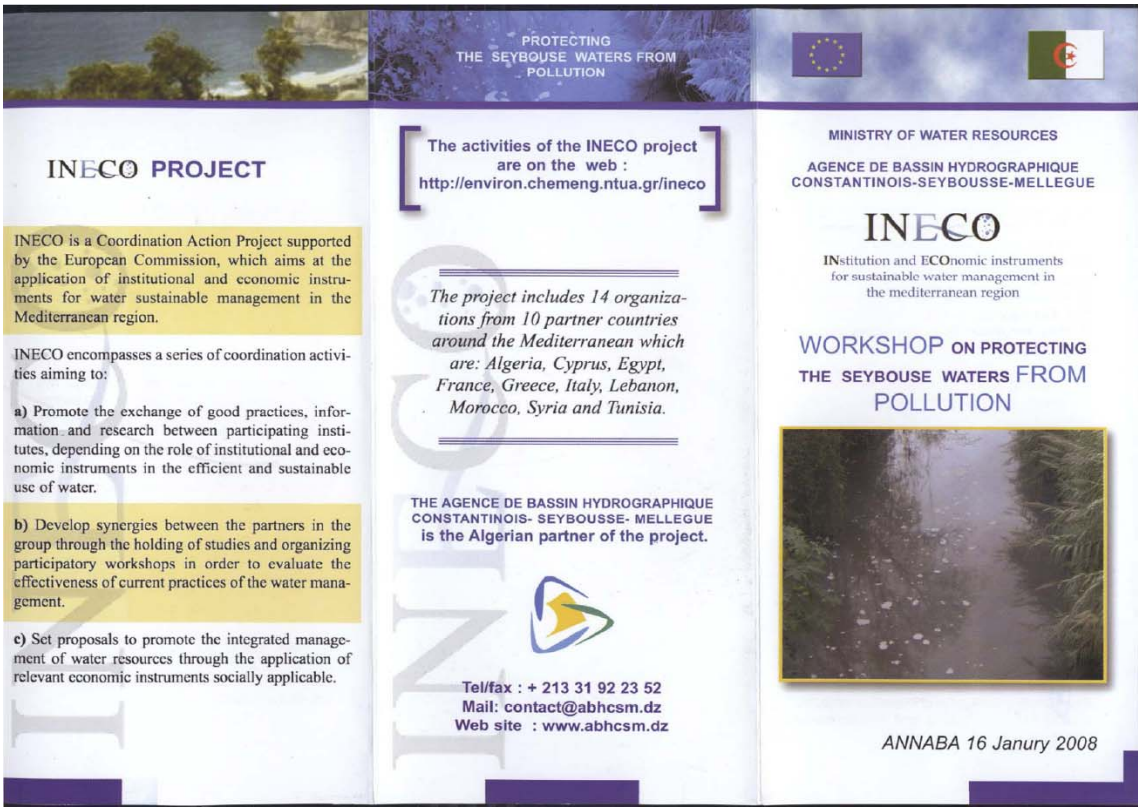


Other answers

1. Introduction of the concept of natural products.
2. Lack of enforcement on laws and instructions taken by the institutions involved in pollution abatement.

4 Event flier, programme and posters

4.1 Event flier (English version)



PROTECTING THE SEYBOUSE WATERS FROM POLLUTION

INECO PROJECT

INECO is a Coordination Action Project supported by the European Commission, which aims at the application of institutional and economic instruments for water sustainable management in the Mediterranean region.

INECO encompasses a series of coordination activities aiming to:

a) Promote the exchange of good practices, information and research between participating institutes, depending on the role of institutional and economic instruments in the efficient and sustainable use of water.

b) Develop synergies between the partners in the group through the holding of studies and organizing participatory workshops in order to evaluate the effectiveness of current practices of the water management.

c) Set proposals to promote the integrated management of water resources through the application of relevant economic instruments socially applicable.

The activities of the INECO project are on the web : http://environ.chemeng.ntua.gr/ineco

The project includes 14 organizations from 10 partner countries around the Mediterranean which are: Algeria, Cyprus, Egypt, France, Greece, Italy, Lebanon, Morocco, Syria and Tunisia.

THE AGENCE DE BASSIN HYDROGRAPHIQUE CONSTANTINOIS- SEYBOUSSE- MELLEGUE is the Algerian partner of the project.

Tel/fax : + 213 31 92 23 52
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Web site : www.abhcsm.dz

MINISTRY OF WATER RESOURCES

AGENCE DE BASSIN HYDROGRAPHIQUE CONSTANTINOIS-SEYBOUSSE-MELLEGUE

INECO

INstitution and ECOnomic instruments for sustainable water management in the mediterranean region

WORKSHOP ON PROTECTING THE SEYBOUSE WATERS FROM POLLUTION

ANNABA 16 Janury 2008

PROTECTING THE SEYBOUSE WATERS FROM POLLUTION

Protecting the Seybouse watersfrom pollution

AN OVERVIEW ON THE BASIN. DESCRIPTION

The basin of Seybouse is located in the north eastern region of Algeria and extends on a surface of 6471 km2 along 240km. It covers 86 municipalities and seven wilayas: Annaba, Tarf, Constantine, Skikda, Oum El Bouaghi, Guelma and Souk Ahras. Its waters are vital for people's life in the region.

The waters of the Seybouse are used for domestic, industrial and agricultural purposes.

THE RISKS THREATENING THE SEYBOUSE WATERS

The water basin of Seybouse is facing urban, industrial and agricultural pollution, that originates from the different cities and factories and even agricultural areas located on both banks of the river. The pollution is reaching a high level.

Its water-processing may be a good example of integrated management, since it would include elements of protecting surface and groundwater resources, rationalisation of domestic, agricultural and industrial uses, but also of pollution fighting and environmental protection.

DO YOU KNOW THAT?

4.5 million m3 are released annually into the river, of which 3 million m^3 are used oils.

INDUSTRIES IN THE WATER BASIN
The water basin includes 86 major industrial units; among them eight only have their own sewage treatment plant.

AREAS OF IRRIGATION
The water basin of Seybouse includes two major irrigation systems: the area of Guelma Bouchegouf (12900 ha) and that of Bounamoussa (4500 ha).

TREATMENT PLANTS
There is currently no treatment plants dealing with domestic sewage.

■Five units are under construction (Sedrata, Guelma, M'Daourouch, Bir Bouhouche, El Fedjoudj) **according to the programme of the Ministry of Water Resources,** and which will treat 130.000 m3/day on the horizon 2010.

■Two others are scheduled in Annaba and Oued Zenati respectively for the years 2008 and 2010. They will treat together 180.000 m3/day.

4.2 Event flier (French version)

LE PROJET INECO

Le projet INECO est un projet soutenu par la Commission Européenne, qui vise la mise en place d'instruments économiques et institutionnels pour la gestion durable des ressources en eau dans la zone méditerranéenne.

Le projet comporte une série d'activités de coordination visant à :

a) Promouvoir les échanges de bonnes pratiques, d'information et de recherche entre instituts qui participent, en fonction du rôle des instruments institutionnels et économiques dans l'usage efficace et durable de l'eau.

b) Développer les synergies entre les partenaires du groupement par l'organisation d'études et l'organisation d'ateliers participatifs afin d'évaluer l'efficacité des pratiques actuelles de gestion de l'eau.

c) Formuler les propositions afin de promouvoir la gestion intégrée des ressources en eau à travers l'application d'instruments économiques appropriés et socialement applicables.

Protection des eaux de la Seybouse contre la pollution

Le projet INECO et ses activités sont sur le site web : http://environ.chemeng.ntua.gr/ineco

Le projet inclut 14 organisations de 10 pays du pourtour méditerranéen : Algérie, Chypre, Egypte, France, Grèce, Italie, Liban, Maroc, Syrie, Tunisie.

L'AGENCE DE BASSIN HYDROGRAPHIQUE CONSTANTINOIS-SEYBOUSSE-MELLEGUE **est le partenaire algérien du projet.**

Tel/fax : + 213 31 92 23 52
Mail: contact@abhcsm.dz
Site web : www.abhcsm.dz

MINISTÈRE DES RESSOURCES EN EAU

AGENCE DE BASSIN HYDROGRAPHIQUE CONSTANTINOIS-SEYBOUSSE-MELLEGUE

INECO

INstitution and ECOnomic instruments for sustainable water management in the mediterranean region

ATELIER SUR LA PROTECTION DES EAUX DE LA SEYBOUSE CONTRE LA POLLUTION

ANNABA le 16 Janvier 2008

PROTECTION DES EAUX DE LA SEYBOUSE CONTRE LA POLLUTION

Protection des eaux de la Seybouse contre la pollution

APERÇU SUR LE BASSIN. DESCRIPTION

Le bassin de la Seybouse est situé dans la région nord est de l'Algérie et s'étend sur une superficie de 6471 km2 avec une longueur de 240km. Il couvre 86 communes et sept wilayas : Annaba, Tarf, Constantine, Skikda, Oum El Bouaghi, Guelma et Souk Ahras. Ses eaux représentent une source fondamentale de vie dans la région.

Les eaux de la Seybouse sont utilisées à des fins domestiques, industrielles et agricoles.

DANGERS MENACANT LE COURS DE LA SEYBOUSE.

Le bassin de la Seybouse est confronté à la pollution urbaine, industrielle et agricole. Cette pollution émane des différentes villes et usines et zones agricoles situées sur ses deux rives. La pollution atteint un degré élevé.

Son traitement peut être un bel exemple de gestion intégrée, puisque il inclurait des volets de protection de ressources superficielles et souterraines, de rationalisation d'usages domestiques, agricoles et industriels, mais aussi de lutte contre la pollution et de protection de l'environnement.

SAVEZ VOUS QUE ?

4,5 millions de m³ sont rejetés annuellement dans la rivière, sur lesquels 3 millions de m³ sont des huiles usagées.

LES INDUSTRIES DANS LE BASSIN
Le bassin comprend 86 unités industrielles importantes, parmi lesquelles huit seulement ont leur propre station d'épuration.

LES PÉRIMÈTRES D'IRRIGATION
Le bassin de la Seybouse englobe deux grands périmètres d'irrigation : le périmètre de Guelma Bouchegouf (12900 ha) et celui de Bounamoussa (4500 ha).

STATIONS D'EPURATION
Il n'y a pour l'instant pas de stations d'épuration traitant les effluents domestiques.

- Cinq unités sont en cours de construction (Sedrata, Guelma, M'Daourouch, Bir Bouhouche, El Fedjoudj), ***sur le programme du Ministère des Ressources en Eau,*** et traiteront 130.000m³/jour à l'horizon 2010.
- Deux autres sont programmées à Annaba et Oued Zenati respectivement pour 2008 et 2010. Elles traiteront ensemble 180.000 m³/jour.

4.3 Event flier (Arabic version)

وزارة المـــوارد المـــائيـة
وكـالة الحـوض الهـيدروغـرافي
لمنطقـة قسنطينة – سيبوس – ملاق

INECO
الأدوات الاقتصادية و المؤسساتية من أجل إدارة مستدامة للموارد المائية في منطقة المتوسط

حمـــاية ميـــاه حـوض سيبـــوس من التلـــوث

عنـابة يوم 16 جـانفي 2008

حمـــاية ميـــاه حـوض سيبـــوس من التلـــوث

المشروع INECO و نشـاطـاته متـواجـدة على مـوقع الـويب:
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يضم المشروع 14 مؤسسة تنظيمية من 10 دول من حوض البحـر الأبيض المتوسط هي: الجزائر، قبرص، مصر، فرنسا، اليونان، إيطاليا، لبنان، المغرب، سوريا، تونس.

وكـالة الحـوض الهـيدروغـرافي
لمنطقـة قسنطينة – سيبوس – ملاق
هي الشريك الجزائري لهذا المشروع

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مشـــروع INECO

المشروع INECO هو مشروع مدعم من طرف الإتحاد الأوروبي، و الذي يهدف إلى إنشاء الأدوات الاقـتصادية والمؤسساتية من اجل الإدارة المستدامة للموارد المائية في منطقة البحر الأبيض المتوسط.

و يشمـل المشـروع سلسلـة من الأنشطـة التنسيقيـة التي تهـدف إلى:

أ) تشجيع تبادل أفضل الممارسات، المعلومات و البحوث بين المعاهد المشاركة في العملية، و يتوقـف هذا على دور الأدوات الاقتصادية و المؤسساتية في الاستخدام الفعـال و المستدام للمياه.

ب) تطوير أوجه التآزر بين الشركاء في المجموعة من خلال تنظيم دراسات و ورشات عمل قائمة على المشاركة لتقييم فعالية الممارسات الحالية المطبقة في إدارة المياه.

ت) تقديم مقترحات لتعزيز الإدارة المتكاملة للموارد المائية من خلال تطبيق الأدوات الاقتصادية المناسبة و المقبـولة من الجانب الاجتماعي.

حمـــاية ميـــاه حـوض سيبـــوس من التلـــوث

حمـــاية ميـــاه حـوض سيبـــوس من التلـــوث

وصـف لحـوض سيبـوس

يقع حوض سيبـوس في شـمال شرق الجزائر و يغطي مساحة 6471 كيلومتر مربـع على طول 240 كلم. و هو يشمل 86 بـلدية و سبـع ولايات هي: عنابـة، الطارف ، سكيكدة، قسنطينة، أم البواقي، قالمة، و سوق أهراس. كما تعد مياه الحوض مصدرا أساسيا للحياة في المنطقة.

تستغـل ميـاه سيبـوس في كـل من الاستعمـالات المنـزلية، الصنـاعية و الـزراعية

المخـاطر التي تهـدد مجـرى سيبـوس

يواجه حوض سيبوس تلوثا حـضريا، صناعيا و زراعيا، الذي ينشأ من مختلف المدن والمصانع و المناطق الزراعية الواقعة على ضفتيه و قد بلغ التلوث درجة عالية.

يمكن اتخاذ معالجة هذا التلوث كأحســن مثال في الإدارة المتكاملة، بما أنها تشمل على عناصر حـماية موارد المياه السطحـية و الجوفية، و أيضا الترشـيد المتعلق بـكل من الاستخدامـات المنـزلية، الـزراعية و الصنـاعية و كذلك مكافحة التلوث و حماية البيئة.

هـــل تعلـــم بـــأن؟

يتـــم سنويـــا تصريف 4.5 مليون متر مكعب في الـــوادي، من بينها 3 مـــلايين متر مكعب هي عبـارة عن زيـــوت مستعملـــة.

الوحـدات الصنـاعية في الحـوض

يشمل الحوض على 86 وحدة صناعية كبرى، ثمانية منها فقط تحضى بمحطات للتطهير.

مســاحـات الـــري

يضم حوض سيبـــوس مســاحتي ري رئيسيتين: محيط قـالمة بـوشقوف (12 900 هكتار) و محيط بـوناموسة (4500 هكتار).

محطـات التطهيـر

لا توجد في الوقت الحالي أي محطة تطهير لمعالجة مياه الصرف الصحي المنزلي.

- خمس وحدات هي قـيد الإنشـاء (ســـدراتة، قـالمة، مداوروش، بئر بوحوش، الفجوج)، وفقـا لبرنامج وزارة الموارد المائية، و التي تقوم بمعالجة 130.000 متر مكعب في اليوم على أفـاق 2010.
- من المقرر انجـاز اثنين آخرين في كل من عنابة و وادي زناتي لعامي 2008 و 2010 على التوالي. حيث تقوم كل منهما بمعالجة 180.000 متر مكعب في اليوم.

4.4 Event programme

WORKSHOP AGENDA

Saturday, 19th January 2008

08:30 Registration - Welcome of participants
09:00 Welcoming addresses
09:30 The INECO Project - Principles and Approach
Dr. Jean-Marc Berland, International Office for Water
10:00 Water Pollution in the Seybouse River Basin - Causes, effects and proposal on solutions
Mr. Khatim Kherraz, General Director, Agence de Bassin Hydrographique de Constantinois-Seybousse - Mellegue
10:45 Coffee Break
11:15 Institutional and Economic Instruments for addressing water pollution issues: International Experiences
Prof. Bernard Barraqué, CNRS-LATTS
11:45 Questions - Debate
12:45 Recommendations & Conclusions
13:15 Lunch - End of Workshop

Contact for queries and further information:

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INECO
Institutional and Economic Instruments
for Sustainable Water Management in the Mediterranean Region
web site: http://environ.chemeng.ntua.gr/ineco

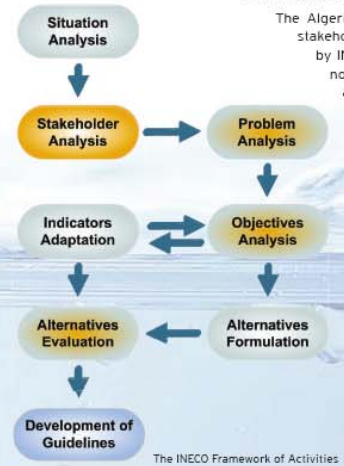
STAKEHOLDER WORKSHOP
"Building a common vision for mitigating water pollution in the Seybouse River Basin"
SATURDAY, 19th JANUARY 2008

SIXTH FRAMEWORK PROGRAMME

INECO is a Coordination Action supported by the European Commission (Integrating 6th Framework Programme, and addressing the "Specific Measures in Support of International Cooperation (INCO Programme) - Mediterranean Partner Countries (MPC)" Priority (Contract no: INCO-CT-2006-517672).

THE INECO PROJECT

INECO is a Coordination Action Project supported by the European Commission through the 6th Framework Programme, addressing the "Specific Measures in Support of International Cooperation (INCO Programme) - Mediterranean Partner Countries (MPC)" Priority. The INECO Consortium brings together 14 institutions from 10 Mediterranean Countries (Greece, France, Italy, Cyprus, Tunisia, Egypt, Lebanon, Syria, Algeria and Morocco), including public (6), private (7) and international organisations (1). The goal of INECO is to introduce an interdisciplinary approach to water management building upon the integration of three major aspects: environment, economics and society. INECO will discuss shared problems in the decision-making process and the deficiencies of the present governance structures around the Mediterranean Basin. Research focuses on alternative institutional and economic instruments which can promote equity, economic efficiency and environmental sustainability in the sharing and governing dimensions of water resources management.



The INECO Framework of Activities

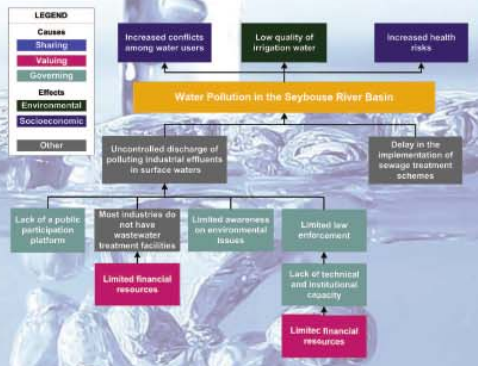
The Algeria workshop is one of the stakeholder workshops organised by INECO in Egypt, Syria, Lebanon, Cyprus, Tunisia, Algeria and Morocco. The workshops aim to develop a constructively engaged Integrated Water Resources Management process, and lay the foundations for reaching a common understanding on what the real problems are and how these could be addressed in a jointly agreed water resources management situation.

INECO IN ALGERIA - WATER POLLUTION IN THE SEYBOUSE RIVER BASIN

The Seybouse River Basin, with a total area of 6,471 km^2, is located in the northern part of Algeria. The Seybouse River (240 km length) constitutes an important water source, mainly used for the irrigation of large agricultural areas, which extend from the Guelma region to Annaba city.

The basin extends over 68 municipalities, located in seven wilayas (administrative divisions), and faces important domestic and industrial pollution, mostly originating from city industries situated along the two river banks: the annual industrial discharge is approximately equal to 4.5 million m^3; of this amount, 3 million m^3 corresponds to used oils from various sources. River pollution is also partly due to the lack of sewage treatment plants, as in several cases domestic wastewater is discharged directly into the river without prior treatment.

The most vulnerable areas are those where industrial activities are concentrated, i.e. Meboudja, Bouchegouf and Guelma. In these regions, aquifer pollution is also an issue, as run-off originating from the Edough and Gelaat Bou Sbaa mountains, carrying high loads of contaminants, infiltrates groundwater bodies. This in turn poses serious threats on human health, both direct (children often play on the river banks) and indirect (many farmers abstract water directly from the river for irrigation purposes, and soil productivity is also affected). Furthermore, the river ecosystem is also at risk, as flora and fauna are seriously threatened.



Causes and effects of water pollution in the Seybouse River Basin - A tentative analysis

THE ALGERIA WORKSHOP OBJECTIVES

The workshop aims to strengthen the alliance between the INECO Research Team and Local Stakeholders in Algeria by:

- Discussing on the focal water management problem experienced in the Seybouse River Basin;
- Promoting the development of a process where each contributor gains both a better understanding of the problem and insight on how other participants see the problem;
- Initiating the participatory involvement of stakeholders in determining, defining and evaluating alternative institutional and economic instruments towards problem mitigation.

The workshop will serve as a discussion forum on the problems and challenges faced by stakeholders. It will offer the opportunity for participants to share their experiences, knowledge, ideas, preferences, hopes, fears, opinions, and values.

4.5 Event posters

INECO Morocco Stakeholder Workshop

"Irrigation water use in the Oum Er Rbia Hydraulic Basin: Opening the dialogue"

Afourer, Beni Mellal
Friday, 21st March 2008

1 Workshop report

1.1 Introduction

The INECO Morocco workshop on "Efficient irrigation water use in the Oum Er Rbia Basin" was held in Afourer, Morocco on March 21st 2008. The workshop was organized in close collaboration with the Oum Er Rbia Hydraulic Basin Agency, and gathered all stakeholders dealing with irrigation water management issues in the area.

This document comprises the minutes of the workshop, including a summary of discussions and recommendations/actions agreed upon during the event.

1.2 Workshop presentations

The day started with presentations on the INECO project and the present situation regarding agricultural water use in the Oum Er RBia Hydraulic Basin. Presentations were made on the following issues:

- Welcoming speech; Mr. A. Zerouali, Director of the Oum Er Rabii hydraulic basin agency;
- The INECO project – Approach and principles; Prof. Dionysis Assimacopoulos, National Technical University of Athens, INECO project coordinator and Jean-Marc Berland, project leader at the International Water Office;
- Main water management problems in the OR basin; Mr. Mohamed Slassi, Management and planning of water resources division leader;
- Water losses in the Oum Er Rbia basin (focal problem) analysis of causes and effects; Dr. A. Affia, ISKANE Ingénierie;
- Saving water in the Haouz Regional Farming Development Office action area (ORMVAH); Mr. Mohamed ELAMGHARI, rural engineering chief engineer at ORMVAH
- Saving water in the Tadla Regional Farming Development Office action area (ORMVAT); Mohamed SAAF, department leader at ORMVAT
- Saving water in the Doukkala Regional Farming Development Office action area (ORMVAD); Mr. Guemimi, department leader at ORMVAD
- Problems related to saving irrigation water in the Beni Mellal Provoncial Farming Directorate (DPA) ; Mr. Ahmed MESSAADI, chief engineer at the Beni Mellal DPA
- Potable water and liquid purification in the regions of Chaouia Ouardigha and Tadla Azilal (ONEP); Mr. Mohamed ELHANANI, development division leader at the ONEP
- Feedback on experiences with saving water in the Tadla region; Mohamed RIAD, President of the Confederation of Associations of Irrigating Companies in the Tadla region
- Managing demand in irrigated farming: options and tools; Bernard BARRAQUE – CNRS research director.

After these presentations, Prof. Barraque asked whether there is ecological flow. The answer was that there is an allocation of 60 m³/s for sanitary purposes. This in practice is implemented through the integrated management of two dams and scheduled water releases in the water courses.

1.3 Summary of discussions on problem analysis

1.3.1 Resources required for reducing water losses

Firstly, the workshop debate focused on the resources that are required for reducing water losses. The first question that was raised concerned the reduction of losses from evaporation in storage reservoirs. The main solution to the problem would be to develop conjuctive use schemes and schedule releases so as to recharge water tables. A participant also noted that there have been efforts to develop vegetation over the surface of the storage reservoir, which would allow evaporation levels to be lowered. However, the effectiveness and implications of this option have not been fully studied yet.

The priority issue however does not concern evaporation. Presently, losses in networks reach 20% and in fields 50%. Therefore, the primary area of action would be the reduction of these losses. However, participants pointed out that in fact water is not lost from the natural system, as it recharges the water table. However, taking into account the current operation of the system, and the fact that groundwater extraction is uncontrollable, water can considered lost.

The reduction of irrigated areas is not an issue of State involvement; it is noteworthy that the introduction of more efficient irrigation techniques would not lower total agricultural demand but would simply increase the area that is irrigated.

Presently, irrigation requirements are estimated at 6,000 m³/ha on average, losses included. According to the opinions of experts, 30% can be saved if irrigation is carried out properly. Groundwater supplies 3000 m³/ha; therefore, it is clear that supplementary resources (surface water) need to be provided. It was further noted that the figure of 6,000 m³/ha is only on average; 8,000 m³/ha are required for certain, high value-added crops, such as citrus fruit trees. In this regard, the optimal solution would be the following:

- Save water in the field and reduce losses in the network;
- On the plot, promote a better choice of crops (crops which consume less water).

1.3.2 Conflicts in water use

Mr. Marzouk described a conflict over water use in the case of the city of Doukkala, for which water is supplied through a pipeline of 176 km. In this regard, it was noted that bilateral or trilateral agreements (between farmers, cities, industries) can help in preventing such conflicts, as the Agency cannot intervene in all cases. ONEP is the institution that provides potable water in bulk; distribution is in the responsibility of the local authorities.

Along the same line, it was underlined that energy requirements can enter into conflict/competition with farming requirements. Farmers need stable flow rates; hydroelectricity requirements however require abrupt releases of water. In this regard, water used for hydroelectricity cannot be used by irrigation, which corresponds to wastage. A better coordination of water releases would be required. Nevertheless, this action is very difficult to implement, because the primary aim of hydroelectricity production is to meet peak energy demands. In this regard, water releases will remain subject to these intermittent requirements and their irregular nature will remain. The establishment of rules that are known by all those involved should of course remain a priority.

Prof. Barraque underlined that in France irrigation is not a priority since the added value of a cubic metre in hydroelectricity production is much higher than in irrigation. It can therefore

be suggested to develop schemes that compensate farmers for the losses that they experience. Consultation in the management of hydroelectricity appears to be, however, a major demand of local farmers.

Whatever the case, there is consensus on the necessity of having more water in the water system. A pilot project on water saving, requiring heavy investment was launched in another Hydraulic Basin, in the framework of the National Water Policy. A monitoring committee was established to monitor its implementation. A similar action could be considered on the Oum Er Rbia basin.

1.3.3 Economic aspects

The possibility of using water pricing as an instrument for discouraging wasteful water use was also addressed.

Mr. El Anglamchoui pointed out the fact that the Office for maintenance and management of the canal does not have enough credit.

Prof. Barraque noted that low cost recovery through water tariffs often has detrimental effects. It is also necessary to correctly assess resource and opportunity costs (value of next best alternative solution).

The financing schemes for drip irrigation projects in small farms need to be revised. Grants must be provided to those who install the equipment, so that farmers do not longer have to pay for equipment by themselves and then wait for receiving the financial contribution. Currently, for studies, 60% of the cost is borne by the government, 20% by the agency and 20% is guaranteed by the region. A proposal is being made for 80% to be covered by the government and 20% by the agency. The president of the Farmers Association asked Prof. Assimacopoulos (INECO Project Coordinator) "how much he can put on the table" to support a water saving project in the Oum Er Rbia basin.

Prof. Assimacopoulos answered that the INECO project remains a very small project which only corresponds to a coordinated action. In this respect, no heavy investment can be made. Similar initiatives can however be pursued through the MEDA programme. Conversely, what INECO can provide is different:

- Continuity of action leading to better coordination and dialogue between local players;
- The INECO project informs people on local situations in other Mediterranean countries and in the European Union. Once these are better known, these situations can then be more easily granted assistance from the European Union;
- INECO is a network between different players around the Mediterranean basin. These players, once united, can form a pressure group.

1.3.4 Interactions between research and fieldwork

Mr. Riad noted the fact that presently we are having a lot of meetings, but farmers want solutions. What can researchers provide? Participants asserted that it is absolutely necessary to coordinate the actions of the Government and farmers via their representatives as well as research. In this regard, it is absolutely essential to include researchers present in the Basin in the different monitoring committees. A representative from the university underlined that a thesis on water savings in the Oum Er Rbia basin has already been carried out.

It was also noted that it is necessary to integrate private companies and encourage public-private partnerships. Certain farmers are themselves developing their own water saving irrigation techniques, which should be widely known. The answer given was that these methods have only been validated locally and that they must be validated and even adapted to other areas. This is where research must also be involved.

1.4 Organisational aspects

On the organizational side, there was agreement that participative management must emerge. Farmer associations need to be strengthened and the way that these associations are structured needs to be reformed. Lastly, the formation of an agency-level unit seems also a good idea to explore.

1.5 Recommendations generated by the workshop

At the end of the workshop, 15 recommendations were formulated in summary form.

- Encouraging a global vision of the water saving issue that integrates technical aspects, coordination between different players (managers and users) and the value per m^3 of water;
- Involvement in the water saving process of politicians, researchers and users (farmers, ORMVA, ONE, professional associations, etc.) and the private sector;
- Avoiding interference between institutions involved in the water sector while strengthening the role of coordination structures such as basin agencies;
- Strengthening water user associations so they can foster capacity building of farmers (education, training, increased awareness, etc.) and act as intermediaries with with public authorities. In this respect, it is recommended to revise regulatory texts which concern agricultural water user associations in a way that allows more effective action;
- Participants recommend that a 60% grant is agreed by the FDA to be paid directly to those who install water saving equipment in order to avoid a common problem that small landowners face in finding initially the money to buy the equipment;
- Ensuring equity in the sharing of costs for the management and maintenance of water conveyance networks;
- Making the water savings challenge a regional priority, following the Souss experience, where water saving projects will be carried out as part of a partnership between the state (60%), the ABH Souss (20%) and the regional assembly (20%);
- Initiating the promulgation of texts which regulate agency assistance in terms of water saving;
- Creating a strategic tracking unit;
- Making water tables a strategic resource to be monitored and known in terms of quality and quantity;
- In parallel with the additional supply that will be gained through through demand management, analyses should also be carried on wastewater reuse, siltation and eutrophication of water reserves in dams;
- Encouraging public-private partnerships;
- Carrying out investigations on the cost per m^3 of water saved and the corresponding positive impacts on farmers;

- Ensuring continuity in time and consultation through the INECO and ABHOER websites;
- A summary of workshops from the seven partner Mediterranean countries will be carried out and uploaded on the INECO website during the INECO project meeting planned for June.

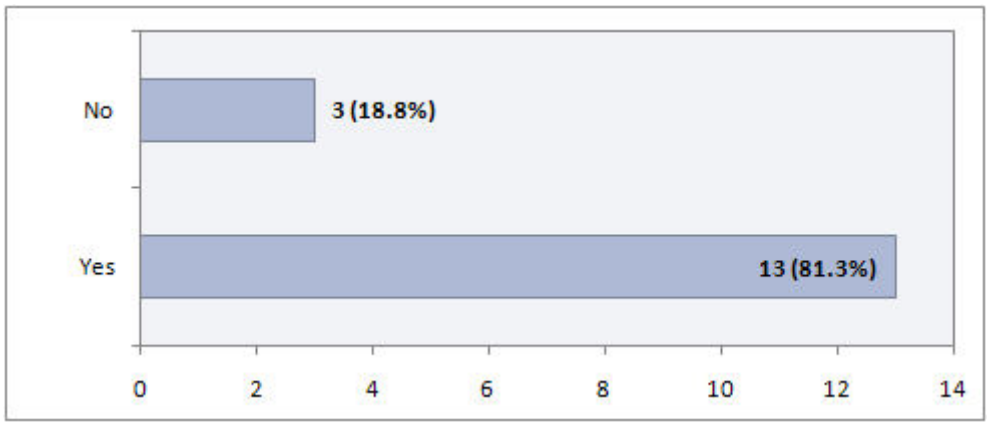
2 List of participants

1) Abdelaziz ZEROUALI, Directeur de l'Agence du Bassin Hydraulique de l'Oum Er Rbia
2) Dionysis ASSIMACOPOULOS, National Technical University of Athens, INECO project coordinator
3) Melle ELINA MANOLI, National Technical University of Athens, INECO project coordinator
4) Jean Marc BERLAND, Office International de l'Eau
5) Bernard BARRAQUE, ENGREF
6) Julien MARTINEZ, Agence de l'Eau Adour - Garonne
7) Abderrahmane AFFIA, ISKANE Ingénierie
8) Mohamed EL AMGHARI, ORMVA du Haouz
9) Houcein KHAMMOU, Service Eau Beni Mellal
10) Ahmed BOUKDIR, FST Béni Mellal
11) Abdellah BALGHITI, Confédération des Associations des Irrigants d'El Kelaa des Sraghna
12) Abdelhak EL MAOUNI, Confédération des Associations des Irrigants de Fariata
13) Hamid YOUSFI, Bureau Etude HYDROTADLA
14) Mohamed Rachid EL MESLOUHI, Agence du Bassin Hydraulique de l'Oum Er Rbia
15) Said HIKIOUI, Agence du Bassin Hydraulique de l'Oum Er Rbia
16) Mohamed EL KRIMI, F.B.C.G.
17) Mohamed SAAF, ORMVA du TADLA
18) Abdelhak GUEMIMI, ORMVA du DOUKKALA
19) Ahmed MESSAADI, DPA de BENI MELLAL
20) Rachid MEZZI, DPA de BENI MELLAL
21) Mohamed EL HANANI, ONEP KHOURIBGA
22) Mohamed RIAD, Fédération des Associations des Irrigants de Tadla
23) Abdessadek NGHIRA, Agence du Bassin Hydraulique de Sous-Massa
24) Abdelmajid BAIMI, Agence du Bassin Hydraulique de Tensift
25) Naima BOUCH, SUTA
26) Mustapha BAYOUMI, Agence du Bassin Hydraulique de l'Oum Er Rbia
27) Mohmad MARZOUK, Agence du Bassin Hydraulique de l'Oum Er Rbia
28) Brahim AGHAZZAF, Agence du Bassin Hydraulique de l'Oum Er Rbia
29) Riahi BACHIRAT, Agence du Bassin Hydraulique de l'Oum Er Rbia
30) Mohamed SLASSI, Agence du Bassin Hydraulique de l'Oum Er Rbia
31) Rachid RAJEL, Secrétariat d'Etat chargé de l'Eau et de l'Environnement
32) Abdellah FOTHI, ISKANE Ingénierie
33) Mohamed AJJBE, ONEP BENI MELLAL
34) Mustapha ENNOUHI, ONEP KHOURIBGA
35) Abdeljabar BAHRI, INRA BENI MELLAL

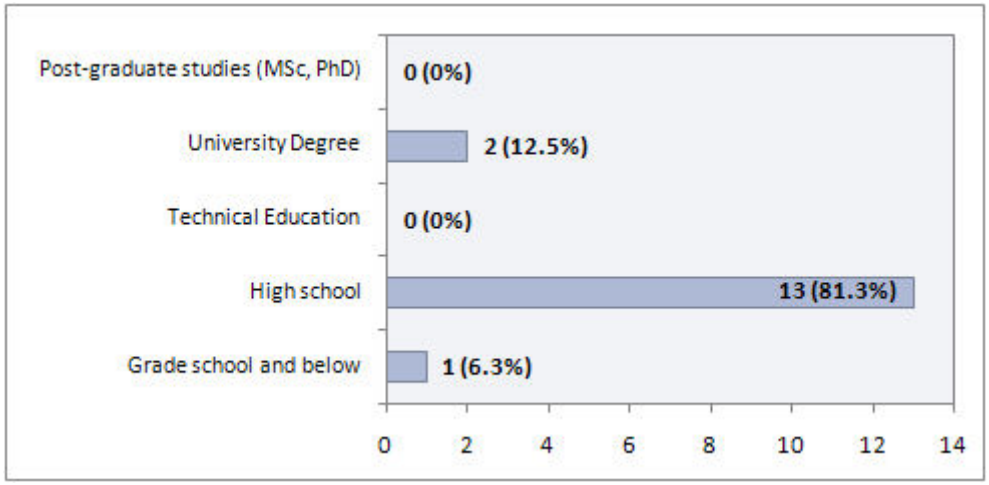
3 Workshop survey results

3.1 Respondents' background

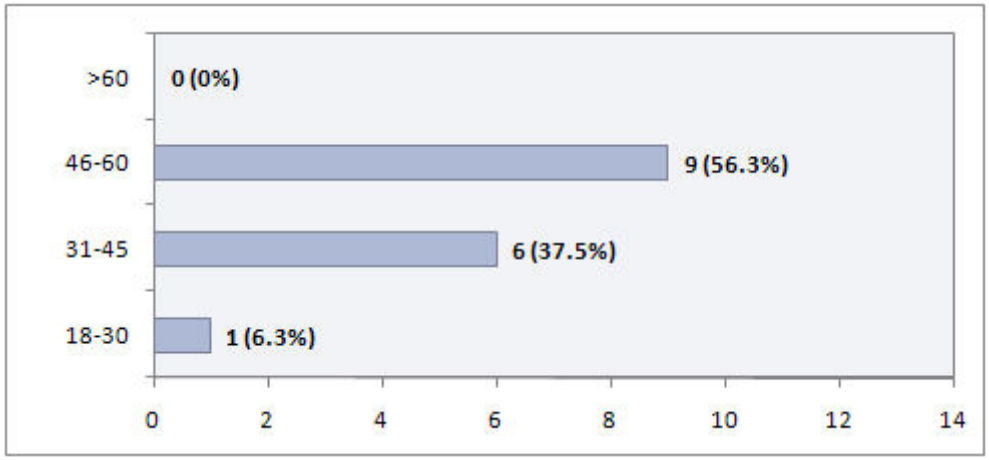
Permanent residents of the Oum Er Rbia Hydraulic Basin



Educational Background

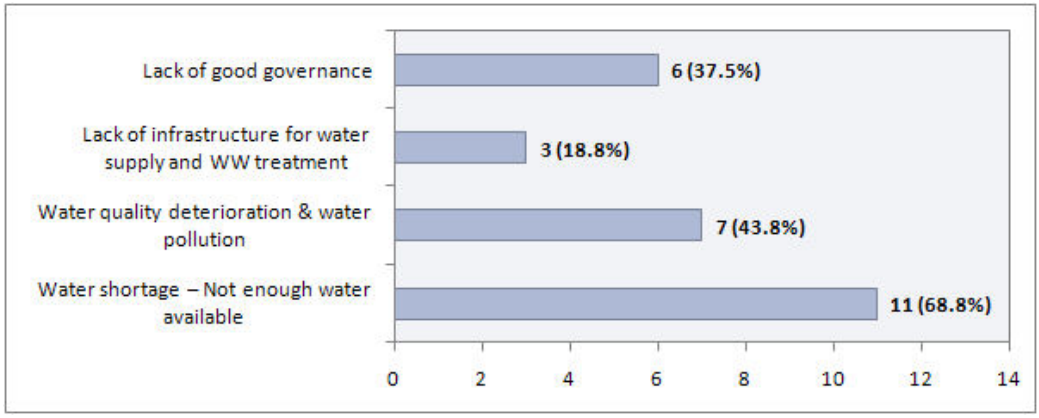


Age Group

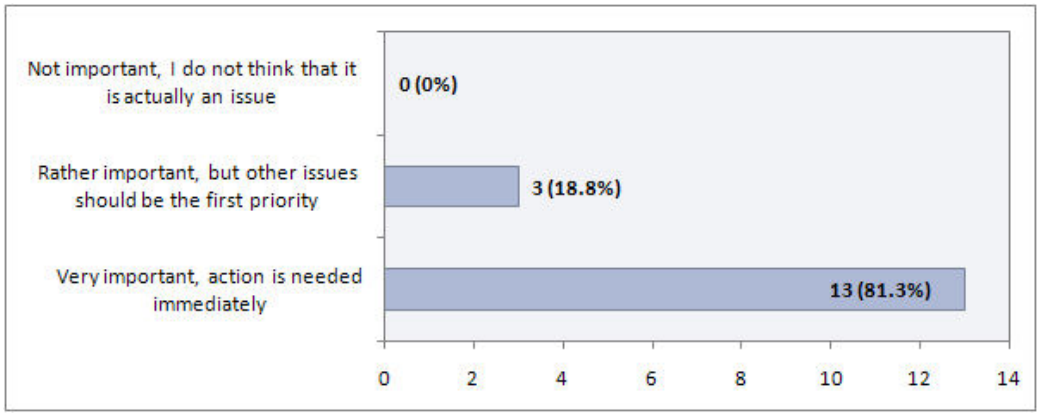


3.2 Perceptions on water management issues – Causes and effects to water stress in the Oum Er Rbia Hydraulic Basin

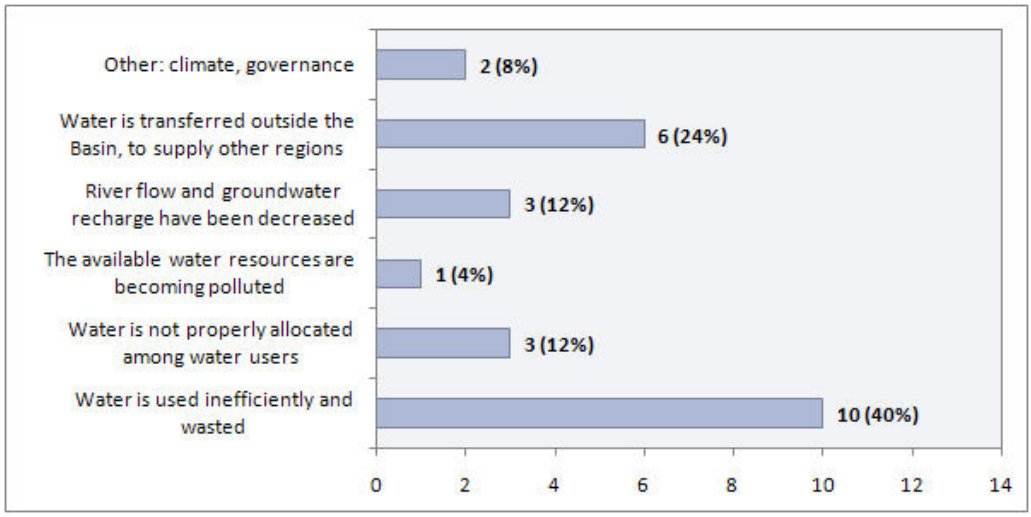
Which do you think is the most significant water-related problem currently faced in the Oum Er Rbia Basin?



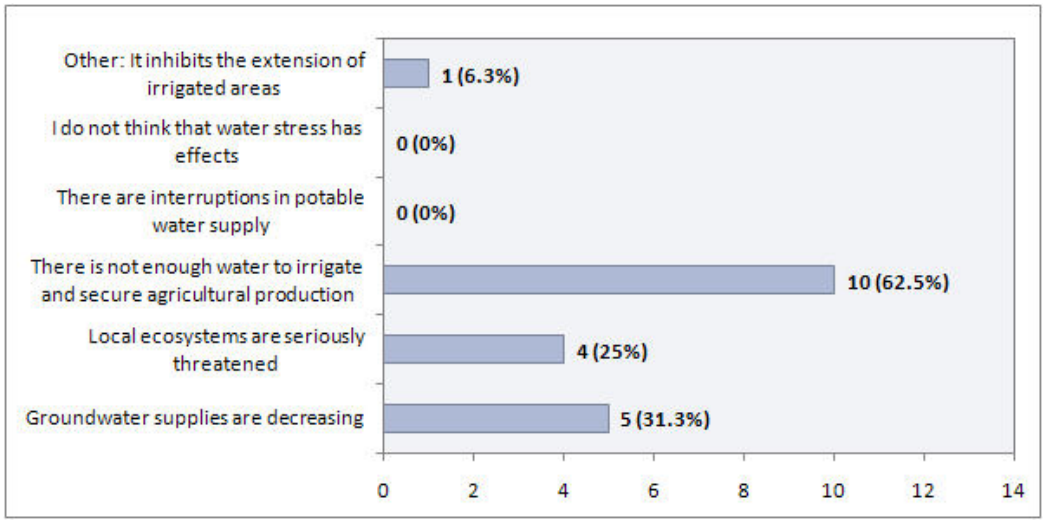
How significant do you think that water stress is in the Oum Er Rbia Hydraulic Basin?



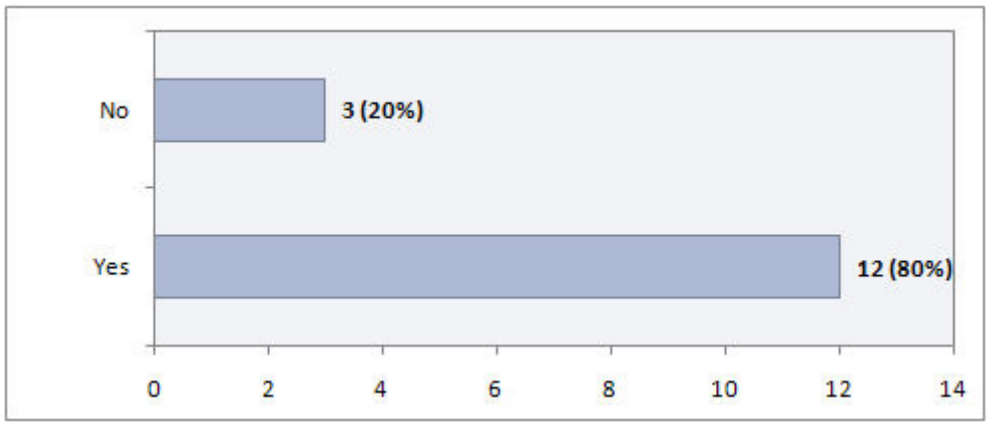
Which, according to your view, is the most important cause of water stress in the Oum Er Rbia Basin? (only one answer possible)



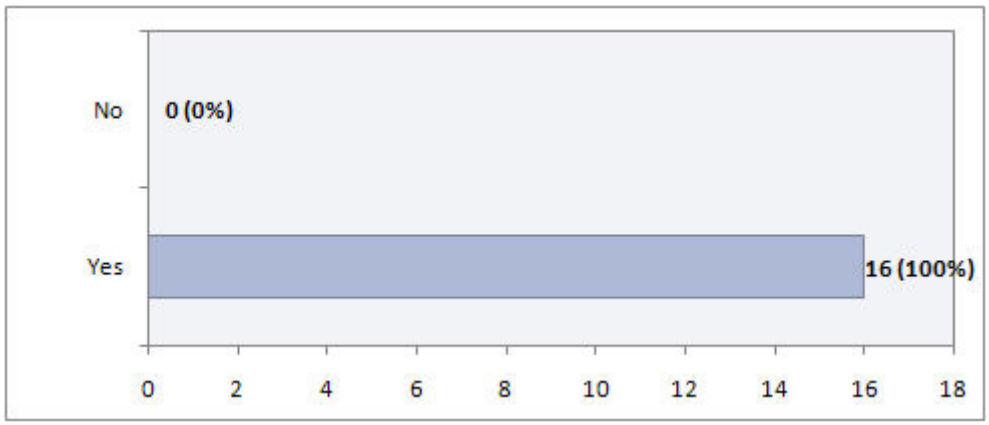
Which, according to your view, is the most important effect of water stress in the region? (only one answer possible)



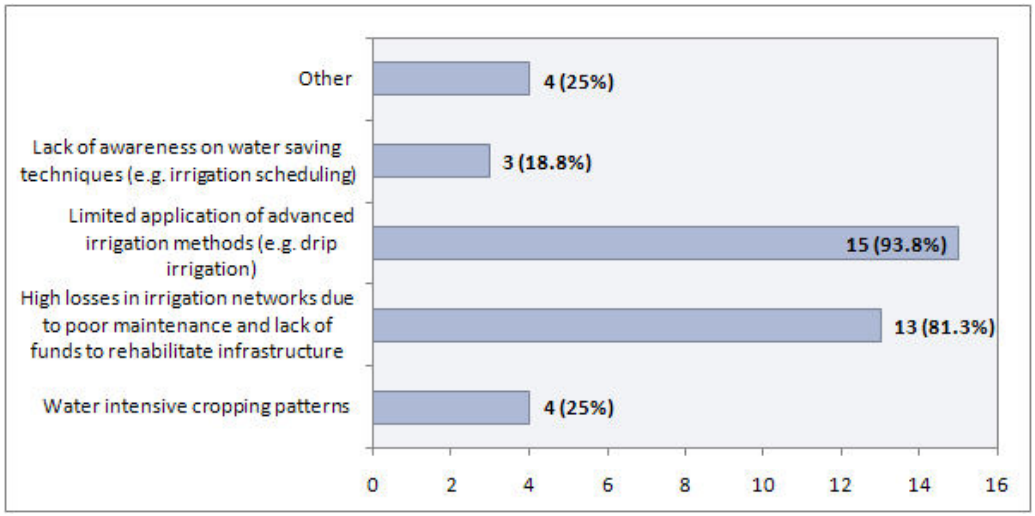
Has water stress affected your everyday life?



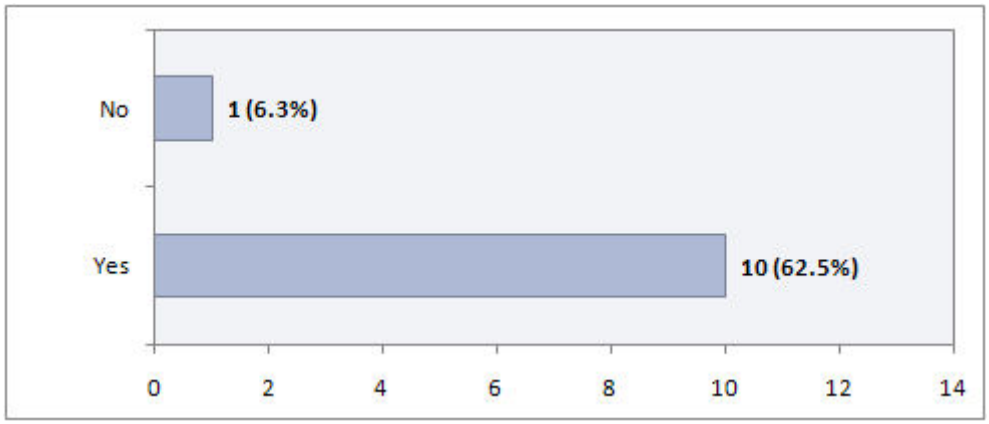
Irrigated agriculture is the largest water consumer in the Oum Er Rbia River Basin. Therefore, it becomes vital to use irrigation water efficiently, although this is not always the case. Do you agree with this last statement?



If yes, which do you think are the most important factors that contribute to inefficient water use in agriculture? (more than one answer possible)

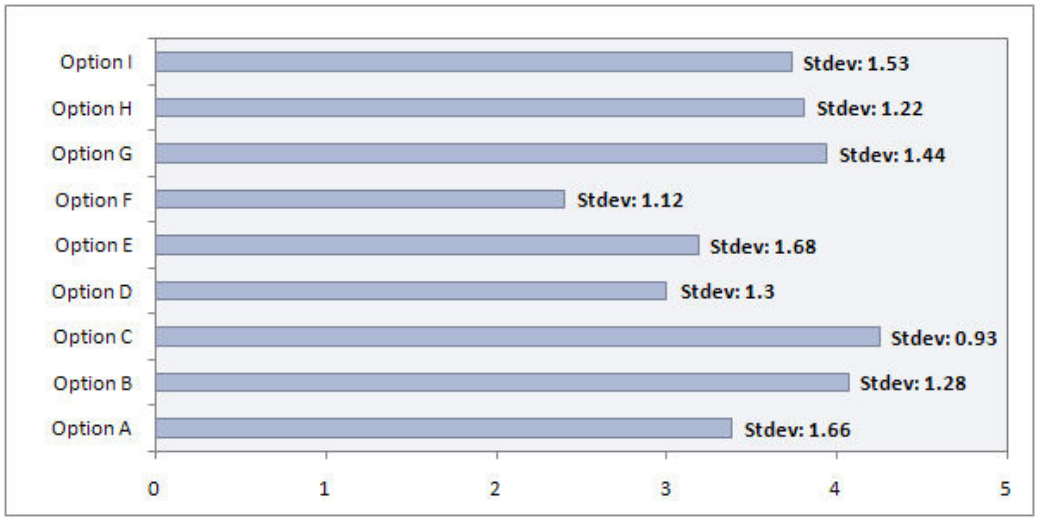


According to your personal view, are there administrative problems or constraints that should be overcome for effective solutions to be implemented?

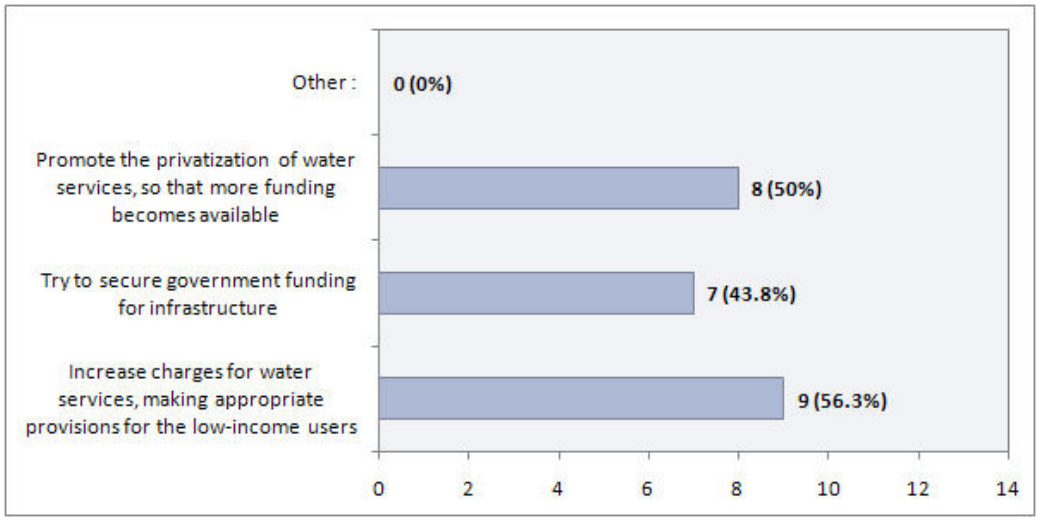


3.3 Prioritizing objectives and exploring alternative options

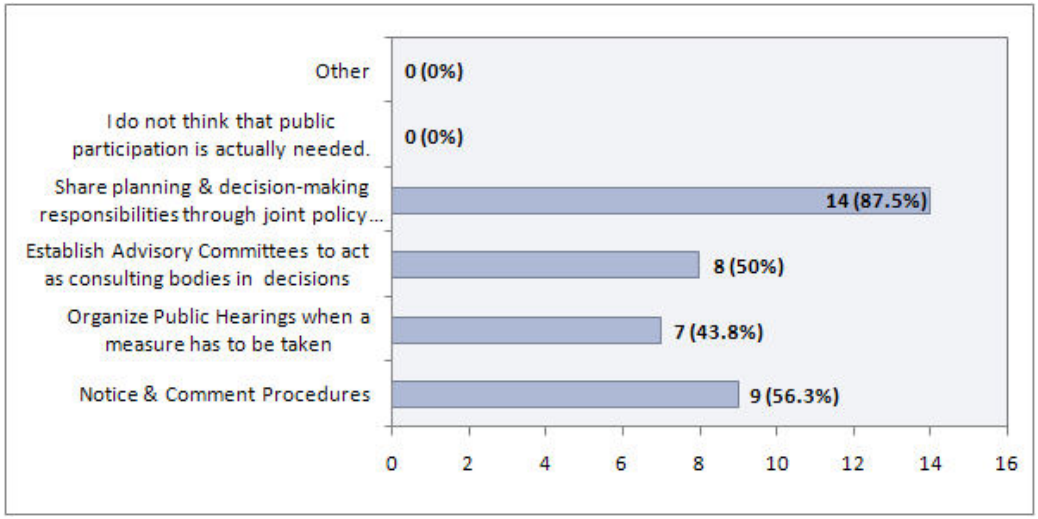
Please grade the effectiveness of following measures that could promote water saving in crop irrigation, using a scale from 1 (least effective) to 5 (most effective).
***A:** Technical measures to increase supply (e.g. reservoir construction, water transfers, wastewater reuse etc.)*
***B:** Grants and soft loans for the installation of efficient irrigation systems (e.g. drip irrigation)*
***C:** Training of farmers on appropriate irrigation practices (e.g. irrigation scheduling)*
***D:** Introduction/enforcement of legislation on maximum allowable withdrawals for the irrigation of specific crops*
***E:** Introduction of higher abstraction charges for surface and groundwater withdrawal, addressed to both individual farmers and collective systems*
***F:** Increase of volumetric rates for irrigation water supply*
***G:** Development of demonstration projects on advanced irrigation system*
***H:** Change of cropping patterns (shift towards less water intensive crops)*
***I:** Wider application of collective irrigation systems*



It can be claimed that water services cannot respond to the increasing need for new infrastructure, due to financial constraints. How do you think that this issue can be addressed? (more than one answer possible)



Public participation is currently considered the key principle of developing sound and successful water management policies, because it is seen as the only way to ensure that the interests of all users are taken into account. How do you think that public participation can be implemented in your country at the local level? (more than one answer possible)



4 Event fliers and programme

4.1 Event flier and programme (English version)

WORKSHOP AGENDA

Friday, March 21st 2008

08:30 Registration

Session 1: Introduction

09:00 Welcoming Address,
Mr. A. Zerouali, Director of Hydraulic Basin Agency of the Oum Er Rbia

09:10 The INECO project - Principles and approach,
Prof. Dionysis Assimacopoulos, National Technical University of Athens, INECO Project Coordinator

09:30 Main water management issues faced by the ABH OR,
Mr. Mohamed Slassi, Head of the Water Management and Planning Division

10:00 Water losses in the Oum Er Rbia Basin (Focal problem) - An analysis of causes and effects, *Dr. A. Affia, ISKANE Ingenierie*

10:20 Coffee Break

Session 2: Water use in the agricultural sector - The local experience

10:30 Water economy in the area under the responsibility of the Haouz Office of Agriculture, *Mr. Mohamed ELAMGHARI, Chief Engineer of Rural Management of the ORMVAH*

10:45 Water economy in the area under the responsibility of the Tadla Office of Agriculture,
Mr. Mohamed Saaf, Department Head of the ORMVAT

11:00 Water economy in the area under the responsibility of the Doukkala Office of Agriculture,
Mr. Guemimi, Department Head of the ORMVAD

11:15 Irrigation water management issues in the area under the responsibility of the Provincial Direction of Agriculture of Beni Mellal,
Mr. Ahmed Messaadi, Chief Engineer of the Beni Mellal DPA

11:30 Drinking water supply and wastewater management in the Chaouia Ouardigha and Tadla Azilal areas,
Mr. Mohamed El Hanani, Head of the Development Division of the ONEP

11:45 Lessons learnt from the Tadla water economy experiment,
Mohamed Riad, President of the Confederation of Farmers' Associations in the Tadla region

12:00 Lunch Break

Session 3: Discussion - Towards more efficient water use in the agricultural sector

14:30 Summary of 2nd Session outcomes

14:45 Institutional and economic instruments for more efficient water use in the agricultural sector, *Prof. A. Massarutto, Istituto di Economia e Politica dell' Energia e dell' Ambiente, Università Commerciale Luigi Bocconi*

15:15 Discussion on problem analysis and mitigation options, *All participants*

16:30 End of workshop

The INECO Consortium

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Dr. Jean-Marc Berland - *e-mail:* jm.berland@oieau.fr

International Network of Basin Organisations
Mr. Jean-Francois Donzier - *e-mail:* jf.donzier@wanadoo.fr

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Studies and Integration Consulting, Syria
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Agence du Bassin Hydraulique de l'Oum ER-Rbia

INECO

STAKEHOLDER WORKSHOP

"Irrigation water use in the Oum Er Rbia Hydraulic Basin Opening the dialogue"

21st March 2008

INECO

Institutional and Economic Instruments for Sustainable Water Management in the Mediterranean Region

web site: http://environ.chemeng.ntua.gr/ineco

SIXTH FRAMEWORK PROGRAMME

INECO is a Coordination Action supported by the European Commission through the 6th Framework Programme, and addressing the "Specific Measures in Support of International Cooperation (INCO Programme) - Mediterranean Partner Countries (MPC)" Priority (Contract no: INCO-CT-2006-517673).

THE INECO PROJECT

INECO is a Coordination Action Project supported by the European Commission through the 6th Framework Programme, addressing the "Specific Measures in Support of International Cooperation (INCO Programme) - Mediterranean Partner Countries (MPC)" Priority. The INECO Consortium brings together 14 institutions from 10 Mediterranean Countries (Greece, France, Italy, Cyprus, Tunisia, Egypt, Lebanon, Syria, Algeria and Morocco), including public (6), private (7) and international organisations (1). The goal of INECO is to introduce an interdisciplinary approach to water management building upon the integration of three major aspects: environment, economics and society. INECO discusses shared problems in the decision-making process and the deficiencies of the present governance structures around the Mediterranean Basin. Research focuses on alternative institutional and economic instruments which can promote equity, economic efficiency and environmental sustainability in the sharing and governing dimensions of water resources management.

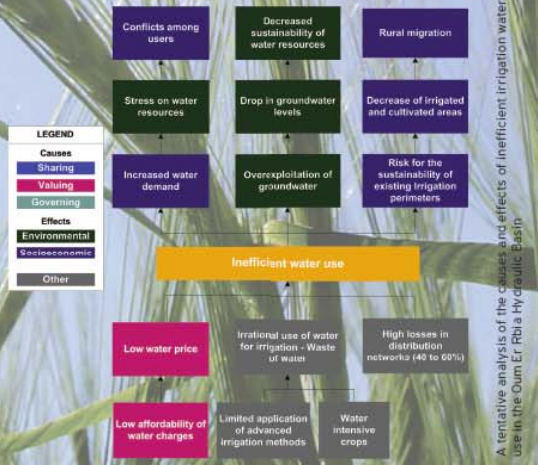
The INECO Framework of Activities

The Morocco workshop is one of the stakeholder workshops organised by INECO in Egypt, Syria, Lebanon, Cyprus, Tunisia, Algeria and Morocco. The workshops aim to develop a constructively engaged Integrated Water Resources Management process, and lay the foundations for reaching a common understanding on what the real problems are and how these could be addressed in a commonly agreed water resources management situation.

INECO IN MOROCCO - IRRIGATION WATER USE IN THE OUM ER RBIA HYDRAULIC BASIN

Due to its relative abundance of water resources and its strategic importance, the Oum Er Rbia (OER) Hydraulic Basin has been the focus of important investments on hydraulic infrastructure. However, the region still faces significant water management challenges, related to environmental sustainability and the availability of water, in terms of both quantity and quality. To mitigate the increasingly important water stress issues, several actions have been planned and implemented by the State, such as measures to regulate water flow, the development of an extended irrigation network, inter-basin transfers to large cities and the engagement in a National Debate on water-related issues.

However, there are still technical and management issues that need to be addressed, such as groundwater overexploitation due to overpumping and to the reduction in precipitation,, water quality deterioration, inefficient and wasteful water use and flood protection. As most available resources have already been exploited, present water management efforts focus primarily on demand



A tentative analysis of the causes and effects of inefficient irrigation water use in the Oum Er Rbia Hydraulic Basin

management; losses in irrigation distribution networks currently amount to 20% of water supply delivered, and efficiency in crop irrigation does not exceed 50%. Furthermore, it is estimated that only 10% of irrigated areas are presently equipped with advanced irrigation systems. Although domestic demand corresponds to a rather small amount of the total water use, losses in distribution networks are equally important, amounting to 35%. In the above context, the initiative undertaken by INECO aims at establishing a discussion forum with all parties on measures and actions that can support a shift towards better informed and efficient water use, especially in agricultural and irrigation practices.

THE MOROCCO WORKSHOP OBJECTIVES

The workshop aims to strengthen the alliance between the INECO Research Team and Local Stakeholders in the Oum Er Rbia Hydraulic Basin by:

- Discussing on the focal water management problem experienced in the region;
- Promoting the development of a process where each contributor gains both a better understanding of the problem and insight on how other participants see the problem;
- Initiating the participatory involvement of stakeholders in determining, defining and evaluating alternative institutional and economic instruments towards problem mitigation.

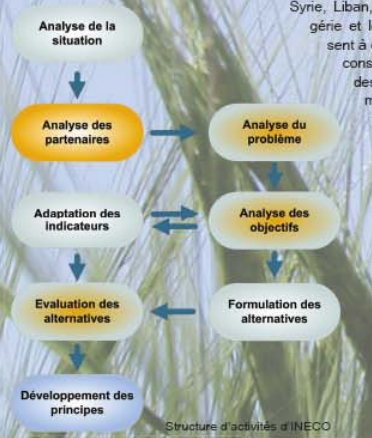
The workshop will serve as a discussion forum on the problems and challenges faced by stakeholders. It will offer the opportunity for participants to share their experiences, knowledge, ideas, preferences, hopes, fears, opinions, and values.

4.2 Event flier and programme (French version)

LE PROJET INECO

INECO est un Projet d'Action de Coordination supporté par la Commission Européenne à travers le 6ème Programme cadre, adresser des "Mesures Spécifiques pour soutenir la Coopération Internationale (Programme-INCO) - Priorité des Pays Partenaires Méditerranéens (MPC). Le Consortium INECO rassemble 14 institutions de 10 Pays Méditerranéens (Grèce, France, Italie, Chypre, Tunisie, Egypte, Liban, Syrie, Algérie et Maroc), comprenant des organisations publiques (5), privées (7) et internationales (1). L'objectif de INECO est d'introduire une approche interdisciplinaire pour la gestion de l'eau basée sur l'intégration de trois aspects majeurs: environnement, économie et société. INECO discute les problèmes partagés dans le processus de prise de décision et les manques des structures de gouvernance actuelles autour du bassin Méditerranéen. Les recherches se focaliseront sur les instruments institutionnels et économiques alternatives qui peuvent encourager l'équité, l'efficacité économique et la durabilité de l'environnement selon les dimensions de partage et gouvernance de la gestion des ressources en l'eau.

L'atelier au Maroc est l'un des ateliers des stakeholders organisés par INECO en Egypte, Syrie, Liban, Chypre, la Tunisie, l'Algérie et le Maroc. Les ateliers visent à développer un processus constructif de Gestion Intégrée des Ressources en Eau, et à mettre en place les fondations pour atteindre une compréhension commune de ce que sont les vrais problèmes et comment ceux-ci pourraient être redressés dans une situation communément convenue de la gestion des ressources en eau.

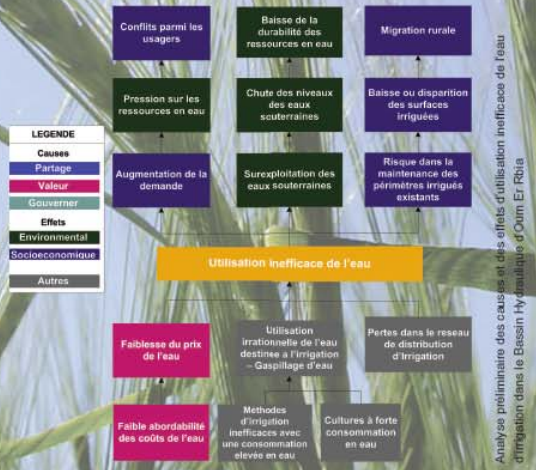


Structure d'activités d'INECO

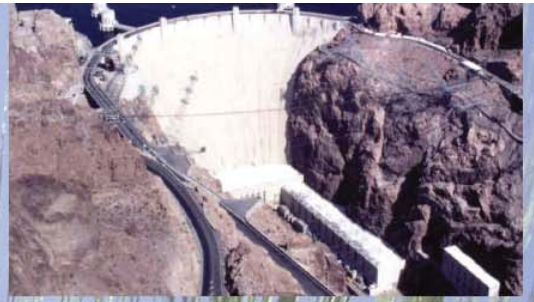
INECO AU MAROC: UTILISATION DE L'EAU D'IRRIGATION DANS L'OUM ER RBIA

Vu son abondance relative en ressources hydriques et son importance stratégique, le bassin hydraulique del'Oum Er Rbia (OER) a bénéficié d'importants investissements en infrastructures hydrauliques. Cependant, la région affronte encore des défis considérables en matière de gestion de l'eau en rapport avec la durabilité environnementale et la disponibilité de l'eau en termes de quantité et de qualité. En vue d'atténuer les effets de plus en plus importants du stress hydrique, plusieurs actions ont été organisées et rendues effectives par le État, telles que les mesures de régulation des écoulements, le développement d'un réseau étendu d'irrigation, les transferts interbassins vers de grandes villes et l'engagement dans un Débat National sur les questions relatives à l'eau.

Cependant, il y a encore des questions techniques et de gestion qui ont besoin d'être redressées, telles que la surexploitation des eaux souterraines due au surpompage et à la réduction des précipitations, la détérioration de la qualité de l'eau, les pertes dans l'utilisation de l'eau et dans la protection contre les inon-



Analyse préliminaire des causes et des effets d'utilisation inefficace de l'eau d'irrigation dans le Bassin Hydraulique d'Oum Er Rbia



dations. Comme la plupart des ressources disponibles ont déjà été exploitées, les efforts actuels de gestion de l'eau se concentrent à l'origine, sur la gestion de la demande : les pertes dans les réseaux de la distribution de l'irrigation se chiffrent actuellement à 20% de la fourniture d'eau délivrée, et l'efficacité des cultures d'irrigation ne dépasse pas 50%. En outre, il est estimé que, pour l'instant, seulement 10% des régions irriguées sont équipées avec les systèmes d'irrigation avancés. Bien que la demande domestique corresponde plutôt à une petite quantité de l'usage global de l'eau, les pertes dans les réseaux de la distribution sont également importantes et peuvent atteindre à 35%. Dans le contexte précité, l'initiative entreprise par INECO vise à établir un forum de discussion avec toutes les parties sur les mesures et actions qui peuvent conduire à un changement vers une utilisation plus efficace et des usagers mieux informé, surtout dans le domaine agricole et de l'irrigation.

LES OBJECTIFS DE L'ATELIER AU MAROC

L'atelier vise à renforcer l'alliance entre l'Équipe de Recherche d'INECO et les Stakeholders Locaux dans le bassin hydraulique de l'Oum Er Rbia par:

- La discussion du problème focal de la gestion de l'eau vécu dans la région;
- L'encouragement du développement d'un processus où chaque contributaire acquiert une meilleure compréhension du problème tout en regardant comment les autres participants voient le problème;
- L'initiation de la participation des stakeholders dans la détermination, la définition et l'évaluation des instruments institutionnels et économiques alternatifs vers l'aténuation du problème.

L'atelier servira de forum de discussion sur les problèmes et défis affrontés par les stakeholders. Il offrira l'occasion aux participants pour partager leurs expériences, connaissances, idées, préférences, espérances, peurs, opinions, et valeurs.

4.3 Event flier and programme (Arabic version)

مشروع إ نيكو

يشكل إ نيكو مشروعا عمليا للتنسيق، مدعما من طرف المفوضية الأوربية عبر البرنامج الإطاري السادس، والقاضي باتخاذ التدابير الخاصة لدعم التعاون الدولي (برنامج إ نيكو) أسبقيات الدول المتوسطية الشريكة. يجمع اتحاد إ نيكو 14 مؤسسة من بين 10 دول متوسطية (اليونان، فرنسا، إيطاليا، قبرص، تونس، مصر، لبنان، سوريا، الجزائر و المغرب) بما في ذالك القطاع العام (6)، القطاع الخاص (7) والمنظمات الدولية (1). هدف إ نيكو هو إدخال طريقة (تقارب) متعدد الاختصاصات لوضع أسس تدبير مالي من خلال إدماج ثلاثة جوانب رئيسية : البيئة، الاقتصاد والمجتمع. سيناقش إ نيكو المشاكل المشتركة في عملية اتخاذ القرار والنقص الحاصل في الهيكلة الحالية للإدارة حول الحوض المتوسطي. تتركز الأبحاث على الوسائل الإدارية والاقتصادية البديلة والتي تشجع على الإنصاف، الفاعلية الاقتصادية والحفاظ على البيئة حسب الأبعاد التشاركية والإدارية في تدبير مصادر المياه.

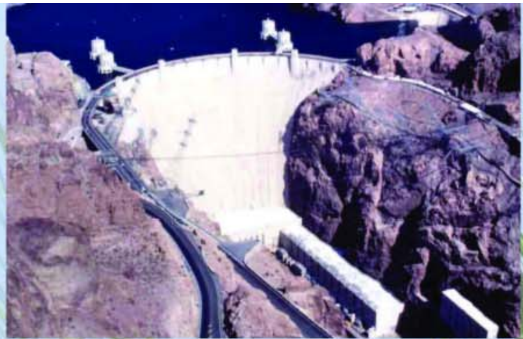
تنتمي ورشة العمل المغربية الى باقي ورشات الأطراف المعنية بالأمر المنظمة من طرف إ نيكو في مصر، سوريا، لبنان، قبرص، تونس، الجزائر والمغرب.

تهدف ورشات العمل هذه إلى تطوير عملية تدبير بناءة تطوعية مدمجة للموارد المائية.

إنيكو في المغرب : استعمال مياه الري في حوض أم الربيع

بسبب الغزارة النسبية لموارده المائية ولأهميته الإستراتيجية، حضي الحوض المائي لأم الربيع (OER) باهتمام هام للاستثمارات المخصصة للبنيات التحتية المائية. لكن لازالت هذه الجهة تواجه تحديات كبيرة في مجال تدبير الماء، فيما يخص الحفاظ على البيئة وتوفير المياه كما وكيفا، للتخفيف من نتائج الضغط المستمر على الماء، برمجت العديد من الترتيبات من طرف الدولة كالتحكم في صبيب المياه، تطوير شبكة الري المتسعة النطاق، تحويل الماء ما بين الأحواض إلى المدن الكبرى والاشتراك في حوار وطني حول الحلول في مجال الماء.

لكن لازالت هناك عراقيل تدبيرية وتقنية في حاجة إلى الاهتمام كالاستغلال المفرط للمياه الجوفية نتيجة الضخ غير المحدود وضئالة التساقطات المطرية، تدهور جودة المياه،
الاستعمال غير الفعال والملوث للماء والوقاية من الفيضانات. بما أن مجمل المصادر المتوفرة قد تم استغلالها فإن المجهودات الحالية لتدبير الماء تتركز أولا على تدبير الطلب.



تقدر التسربات في شبكة توزيع الري ب 20 %من كمية الماء المسلمة بينما لا تتجاوز فعالية سقي المحاصيل 50 %، علاوة على ذلك تعتبر فقط 10 % من المساحات المسقية مجهزة بأنظمة الري المتطورة. رغم أن الطلب المنزلي يشكل جزءا ضئيلا من مجموع المياه المستعملة فإن التسربات في الشبكات تبقى متوازية الأهمية و تصل إلى 35 % . في إطار هذا السياق، فإن المبادرة المتبعة من طرف إ نيكو موجهة لوضع منتدى حوار مع جميع الأطراف حول الإجراءات والأعمال التي تساعد على التحول نحو استعمال الماء بطريقة مطلعة وفعالة أحسن استعمال، خاصة في مجال الفلاحة والري

أهداف ورشة العمل المغربية

تهدف ورشة العمل إلى تعزيز التحالف بين فريق البحث إ نيكو و المعنيين بالأمر المحليين في الحوض المائي لواد أم الربيع ب :

- نقاش حول المشكل المركزي في تدبير الماء والذي يحظى بتجربة في الجهة ؛
- الدفع بتطوير طريقة عمل التي يحظى من خلالها كل مساهم بتفهم أحسن للمشكل وكيف يرى داخلها المشاركون الآخرون نفس المشكل ؛
- بدء التفاف تشاركي للمعنيين بالأمر للتحقق والتعريف والتقييم للآليات الإدارية والاقتصادية البديلة من أجل التخفيف من المشكل.

ستصبح ورشة العمل منتدى حوار حول المشاكل والتحديات التي تواجه المعنيين بالأمر، وستعطي المشاركين الفرصة لتقاسم التجارب، المعرفة، الأفكار، الميولات، الآمال، المخاوف، الآراء والقيم.