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Specific Support Action

NETWORK FOR EXCHANGE OF METHODOLOGIES AND EXPERTISE ON SUSTAINABLE WATER AND LAND MANAGEMENT IN THE MEDITERRANEAN

April 2007 – June 2009

Final Scientific Report

SIXTH FRAMEWORK PROGRAMME

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ACRONYM : SOWAMED

NETWORK FOR EXCHANGE OF METHODOLOGIES AND EXPERTISE ON SUSTAINABLE WATER AND LAND MANAGEMENT IN THE MEDITERRANEAN.

PROJECT CO-ORDINATOR : Institut de Recherche pour le Développement (France)

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Final Scientific report

In memory of Madame Raouda Mougou, researcher at INRGREF who left us at the end of the project

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Preface

The main aims of the SOWAMED project are: i) the establishment of a methodology exchange network and ii) the building of an expertise capacity among the partners of research projects of the INCO-MED Program in the domain of sustainable "Land and Water resource management and prevention of risks on cultivated and inhabited watersheds".
These objectives have been achieved through:

- A kick-off meeting held at SupAgro (Montpellier, France) on the 28th and 29th of June 2007.
- Three regional workshops targeting specific thematic :
  - "Cultivated watersheds in hills and mountains" which was held at Diplomat Hotel, Tunis, Tunisia from the 28th of February to the 1st of March 2008.
  - "Management of irrigated perimeters" which was held on the 1st and 2nd of June 2008 at the University of Jordan (UoJ), Amman, Jordan
  - "Water and land use planning" which was held at Institut Agronomique et Vétérinaire Hassan II (IAV), Rabat on 27th and 28th of October 2008.
- A final workshop for future activities which was held on the 1st and 2nd of June 2009 at ACSAD, Damascus, Syria
- A website platform which is serving as a basis for information exchange and partner search activities for network members. It also allowed us to develop a database on models developed through Inco-Med projects, on impacts of global changes on soil and water resources for all relevant stakeholders in Mediterranean countries : http://www.sowamed.ird.fr/
- Two training sessions opened to SOWAMED scientists and to relevant stakeholders :
  - Training session on spatial techniques for analyses and modeling useful in water and soil sciences held on the 3rd and 4th of June 2008 at University of Jordan (UoJ), Amman, Jordan
  - Training session on participatory approaches in soil and water project management held at Institut Agronomique et Vétérinaire Hassan II (IAV), Rabat on 28th and 30th of October 2008.

  All the courses given during these two training sessions are available on the web platform and can be discussed through E-Forum.
- A specific training session for managing the web site from different focus points in the Mediterranean Partners Countries.
- The creation of a database of regional and local Mediterranean contact partners and EU actors. This database forms the basis of an information network of institutions engaged in all aspects of water and soil management. It is used for one-way communication through mailing lists and newsletters, as well as multi-lateral dialogue at workshops and events.

During SOWAMED project, the numerous INCO MED studies aiming to assess (i) causes, status and impact of land degradation in dry lands, (ii) irrigation management in different kind of perimeters, (iii) schemes of land and water planning, have been analyzed. The different databases on models, methodologies produced by these studies on one hand and on experts having worked or having been trained on impact of global changes on soil and water resources on the other hand are the most useful delivery to improve decision making for sustainable development in dry lands at local, national sub-regional and global levels. In the

way recommended by Zdruli et al (2005), SOWAMED made available an interactive and comprehensive framework of assessment methods of land and water management.
Despite the short duration allocated to the project, several administrative difficulties (as the delivery of all visas for travelling in due time), the length to get the funding, we can affirm that SOWAMED reached its goals.

SOWAMED held five international meetings, one in Europe, two in North Africa and two in Middle East and three training sessions. A web platform is available for scientists, students and stakeholders in the field of soil and water management focusing on arid and semi arid areas of the Mediterranean. Training sessions have been organized for young researchers and post-doctoral fellows as well as for decision makers in services and development agencies. These took place during the project as transversal activities to the regional workshops. The topics: “spatial techniques for analyses and modeling” and “participatory approaches for soil and water management projects” have been addressed in a practical way: how to manage GIS, choice of parameters for modeling, social acceptability of technical alternatives, etc. These training sessions covered 12 to 15 trainees each, they are available on the web platform and are set up as E-Learning courses through an E-Forum. Products of INCO MED program in the field of water and soil sciences and technologies have been strongly disseminated through different networks coordinated by ACSAD in the Arab Countries. The file of the experts set up by SOWAMED has been presented and promoted in several exhibition as industrial and trade fairs. ACSAD promoted it not only in the Mediterranean Arab countries but also in Emirates, Kuwait and Arabia where Euro-Mediterranean expertise is easily exported.

SOWAMED meetings were great opportunities not only for European and Mediterranean scientists to meet, but also for several stakeholders in the important issues of land and water management. SOWAMED meetings met the agenda of the Union for the Mediterranean and had fruitful contacts with different research projects under construction in this framework. It is foreseen that SOWAMED network will be involved in future researches on local and regional impacts of global climate and human activities on Mediterranean continental surfaces and interfaces.

SOWAMED action produced long-term benefits and impetus for the promotion of tools elaborated by the INCO MED program concerning (i) the understanding of the effect of global change on water and soil resources, (ii) the sustainable management of soils and water in Mediterranean Partner Countries. To this end, studies, assessment reports, databases, models and recommendation papers have been gathered. It targeted at facilitating future partnership creation and supporting the development and implementation of Community international co-operation programs and development policies for Mediterranean Partner Countries. At the final workshop in Damascus, representatives of the SICMED program were invited. This program of research on continental surfaces and interfaces around the Mediterranean Sea is a part of the initiative of the scientific “Chantier Méditerranéen” launched by the European presidency of France. This project managed by the same labs will involve the SOWAMED network.

All SOWAMED works have been realized in a very friendly atmosphere. The various difficulties have been overcome with different institutional and non institutional support.

List of Participants

The scientific consortium who undertook the SOWAMED project was constituted by (i) three participants from the EU countries, a French governmental research institute, a Swedish university and a SME based in Brussels and (ii) four governmental research and educational institutions from the Mediterranean Partners Countries. Each participant from MPC was chosen among research institutions concerned by the scientific themes of the project. This partner from the research part worked with the stakeholders in the field of soil and water management. During the project, very strong linkages have been built between the educational and research institution with different stakeholders in Jordan, Morocco, Syria and Tunisia. This goal was not completely reached in Algeria.

Each institution gave to the consortium very qualified staff that has a very good knowledge of framework programs:

1. Institut de Recherche pour le Développement: IRD. Le Sextant - 44, boulevard de Dunkerque - CS 90009 - 13572 Marseille cedex 02. France http://www.ird.fr . The Institut de Recherche pour le Développement (IRD, formerly Orstom) is a French public science and technology research institute under the joint authority of the French ministries in charge of research and overseas development.
    - Jean Albergel (Ph.D), hydrologist, senior scientist, coordinator.
    - Jacques Claude, hydrologist, senior scientist, scientific adviser
    - Richard Escadafal (Ph.D), soil scientist, senior scientist.
    - Cécile Fontana, manager assistant in charge of financial reports.
    - Christina Corban, hydrologist, junior scientist, coordinator assistant.
    - Sergio Vallejo, computing engineer, developer of the platform and webmaster.
    - Michel Lepage, GIS specialist.

2. Department of water resources engineering of Lund University. 1 John Ericson´s road, Po Box 118. SE-22100. Lund Sweden. http://aqua.tvrl.lth.se/. Department of water resources engineering is a legal entity of the Lund University, Sweden. The Department of water resources engineering is situated within the Faculty of engineering (Lund Institute of Technology) at Lund University.
    - Ronny Berndtsson (Ph.D), Professor in Water Resources Engineering.
    - Linus Zhang, Associated Professor in Water Resources Engineering.

3. Institut Agronomique et Vétérinaire Hassan II : IAV HII BP 6202-Instituts, 10101-Rabat, Maroc. www.iavh2.org/. The Agronomic and veterinarian Hassan II institute is an institution for higher education and research which has as first objective to give to Moroccan and foreign students a high-level training. IAV coordinated the participation of two main regional stakeholders involved in land planning and water management in the Haouz plain and in the North of Morocco.
    - Mohamed Mejjati Alami (Ph.D), Professor agro pastoralist.
    - Mohamed Benmoussa, Professor, irrigation civil engineering.

4. Institut National de Recherche en Génie Rural et Eaux et Forêts: INRGREF. 10 Rue Khedy Ayad, 2080 Ariana, Tunisia. www.iresa.agrinet.tn/fr/instit/p_inrgref.htm. The Institut National de Recherche en Génie Rural et Eaux et Forêts, INRGREF is a public

establishment under the umbrella of the Tunisian Institute for agricultural research and higher education (IRESA). It contributes to the elaboration of the national research policy in the domains of Waters, Forests and the Rural Engineering. It organizes and executes any scientific research in connection with the aforesaid domains. INRGREF coordinated the participation of DG ACTA to the project as the main stakeholder in soil and water conservation programs in Tunisia.

- Slah Nasri (Ph.D), hydrologist, specialist in soil and water conservation.
- Raouda Mougou, climatologist, specialist in agro climatology.

5. University of Jordan Department of Agronomy. The university of Jordan Amman 11942 Jordan. http://www.ju.edu.jo. The University of Jordan (UoJ) is both a modern as well as old institution of Higher Education in Jordan. Established in 1962, the University has, since then, applied itself to the advancement of knowledge no less than to its dissemination. In its capacity as a comprehensive teaching, research and community-service institution, the University of Jordan enables its students to choose from a wide range of programs. The Faculty of Agriculture (FA) at the University is the leading agricultural higher education institute in Jordan and the Middle East. UJ coordinated the participation of the technical services of Ministries of Irrigation and of Agriculture in Jordan.
    - Mohamed Shatanawi (Ph.D), Professor in agronomy, Dean of Faculty of Agronomy.
    - Jawad Al Bakri (Ph.D), Agriculture, land, water and environment specialist.
    - Maisa'a Shammout (Ph.D), Water and environment researcher.

6. Arab Center for the Studies of Arid Zones and Dry Lands: ACSAD. P.O.Box: 2440 Damascus, Syria. http://www.acsad.org.
    - Abdallah Droubi (Ph.D). Director Water Department, hydro chemist.
    - Ihab Jnad (Ph.D). Surface water resources expert at ACSAD.
    - Omran Alshihabi (Ph.D), Faculty of Agriculture, expert at ACSAD.

7. Université Saad Dahlab de Blida : USDB Route De Soumaa BP 270 Blida. Algéria. http://www.univ-blida.dz. The Blida Saad Dahlab University (S.D.B.U) (Algeria) opened its doors in 1981 as a university grouping diverse institutes. The academic premises of Blida were set up as a university in 1989. It is about one of the most important universities of Algeria. Its department of Rural Engineering, steered by Professor Rémini Boualem, leads research in the domains of water and soil management. This department federates at the country level several projects on water sciences. USDB coordinated in Algeria the participation of ANRH (National Hydraulic Resources Agency) which is the main stakeholder in Algeria for soil and water resources management.
    - Boualem Remini (Ph.D). Professor in Water Resources Engineering.
    - Djellali Bensfia (Ph.D). Water Engineering.

8. Innovation & Development Consulting: I&DC 8 av. Milcamps 1030 Brussels Belgium. http://www.idconsulting.be. IDC is a Belgian SME based in Brussels. IDC is in the forefront of smaller sized strategy and management-consulting firms. IDC has been founded in 1997 by high level professionals with deep experience in knowledge base building, dissemination, training and participatory research.
    - Anna Balzarini.
    - Giorgio Constantino;

Work package n° 0: Project management

(Dr Jean Albergel, Jacques Claude)

IRD team managed the specific scientific action, including the technical co-ordination and the financial and administrative tasks. University of Lund and I&DC took in charge the organization of the training sessions. The overall management of SOWAMED was guaranteed by the coordinator, Jean Albergel assisted by Cécile Fontana as regards the financial reporting. A Management Board formed by the different leaders of the work packages and by the scientific adviser Jacques Claude assisted the coordinator. This Management Board met five times during the project:

- 28th of June 2007 in Montpellier.
- 28th of March 2008 in Tunis.
- 1st of June 2008 in Amman.
- 28th of October 2008 in Rabat.
- 1st of June 2009 in Damascus.

Interaction and communication with the Commission have been realized in good conditions in spite of several changes of the scientific and financial persons in charge of that SSA at the Commission. The Management Board regrets that the coordinator was not warned by the EC of these changes of persons. The coordinator was obliged to go fishing information when he did not have answer to his E-mails for a long time.

The Management Board requested an extension to the SOWAMED contract, in April 2009. Three principal reasons of this request to extend the SOWAMED contract were:

- The organization of a last workshop which allowed SOWAMED network to be invested in the "Mediterranean Chantier". For that, it got additional funds from IRD directorate of information and communication to organize a joint workshop in Damascus on June 2nd and 3rd
- End of the translation of the Web site and training of the managers of this site for his transfer to the ACSAD.
- The possibility of using the funds of the project until June 30 for these different activities.

After acceptance of an extension of three months of the contract, the coordinator realized the modifications of the contract and communicated to all the partners the new one.

In Damascus, the Management Board noticed that SOWAMED project reached the main objectives consigned in the Work Packages:

- Census and analyze of INCO MED projects on water and land management in the Mediterranean basin,
- Organization of three workshops on the main topics relative to water and land management in the Mediterranean basin,
- Creation and installation of Internet tools for information exchange and for a data base on analyzed INCO MED projects,
- Organization of two training courses and setting these courses under E-Learning,
- Inventorying of experts and researchers trained by INCO MED projects ; creation of a network,

- Translation in Arabic of the Web site and installation of Internet tools at ACSAD with training of website managers.

The project however knew some administrative problems:

- Impossibility for two partners to receive the allocated funds (problem of banking account and problem between laboratories and central administration). INRGREF in Tunisia and USDB asked IRD to manage their expenses. The commission asked to present their expenses in form C entitled IRD.
- Late response of the commission on the first year financial statement with requests for explanation.

Work package n°1: Establishment of the network.

(Dr Jean Albergel, Jacques Claude)

The main objectives of work package 1 were to establish the SOWAMED network and to define common methodology to analyze the different INCO Med projects. All partners have participated to this work package and have presented their results during the kick off meeting held in Montpellier on the 28th and 29th of June 2007. These results have been gathered in the report of the kick off meeting. The kick off meeting allowed the 8 partners to get to know each other, to clarify and to reach consensus about the project's main objectives and set-up. They set up a detailed work plan for the project duration.

The principal network members are the coordinators and institutional partners of the projects. They have associated other institutions in their country accordingly to the interest and capacities they demonstrated. Several young scientists trained during the INCO program have been identified. SOWAMED got in touch with them and associated them to its initiative and invited them to participate to all its activities. All the members of the network SOWAMED are listed on the Web site. They are 137 people completely registered with a short C.V on SOWAMED Intranet. Most of them are from Europe and MPC: Belgium, France, Sweden, Algeria, Kingdom of Jordan, Lebanon, Kingdom of Morocco, Syria an Tunisia.

The originality of this network is to gather scientists and stakeholders involved in management of water and soil in the Mediterranean region and having participated in the INCO MED program or having been trained by this program (Master's degree, Ph.D's...)

Each participating institution established a list of people involved in previous INCO MED projects and prepared as well as a list of the stakeholders that have been invited to participate in the workshops and the training sessions. In addition to the list of potential participants to the workshops, the leaders of WP3, WP4 and WP5, coordinated to have the same organization of the workshops and the training sessions.

The partners elaborated a consensual methodology for the network activities. They defined the different INCOMED projects relevant for this SSA. They agreed on a list of 68 projects (Appendix 1) and they share them between the 3 main identified topics. Of course, a project can be analyzed in one, two or three topics.

They identified relevant sub-topics and agreed on the working methodology. The following chart was adopted to analyze a project.

Acronym |
Complete title |
Abstract of Programme |
Reference |
Starting date | Ending date |
Objective(s) |
Results |
Model(s) implemented or used by the project |
Database(s) implemented or used by the project |
DSS (Decision Support System) |
Project partners |
Project participant(s) |
Project trainee(s) |
Geographic precisions |
Keywords |
Partner(s) of the project |
Country(ies) |
Contact |
Contact organisation | Web site |

Work package n°2: Reference data base, GIS and DSS models library, construction of web site & forum.

(Sergio Vallejo, Dr. Christina Corban)

The main activity of work package 2 was the building of a web site with a friendly interface to make different materials available and to be used as a communication tool by the members of the network and as an E-Learning plate-form for the training sessions. This web site includes an E-forum for exchanging ideas and technologies. The work consisted in:

- Collecting the information from projects publications and final reports (each participant contributed to the collection of all information available in their countries including works and application achieved in continuation of EU projects.)
- Building and developing the website.
- Managing the E-forum.

The main web site is hosted by an IRD server: http://www.sowamed.ird.fr . ACSAD will soon host the website with a complete Arabic version. This Web site was conceived in a way that it can be updated by different members of SOWAMED network according to rights granted as WIKI pages. A training session was preformed for the main web managers.

The information architecture is using as framework some concepts of the ISO Reference Model for Open Distributed Processing (RM-ODP). This model introduces the concept of viewpoint to describe a system from a particular set of concerns. All the viewpoints are relevant to the description and design of distributed systems, but the computation and engineering models concern most directly the design and implementation of the distributed systems. This model affirms that for any given information system there are a number of user categories or “roles” interested in the system but with relative different

views, different issues, requirements and vocabularies describing the system. The model tries to recognize these interests using a viewpoint approach. Each viewpoint represents a different abstraction of the system. The viewpoints are five: enterprise viewpoint, information viewpoint, computation viewpoint, engineering viewpoint and technology.

The aim of this internet platform is twofold. First, it will serve as a basis for information exchange and partnering activities for network members. Secondly, it aims to make available all data and models concerning impacts of global changes on soil and water resources for all relevant stakeholders in Mediterranean countries.

Two categories of public are targeted by this internet platform. In the scope of the project, the targeted public is the experts on water and soil management in the Arab world. Water and soil management is declined in three sub-themes (corresponding to the three exchange workshops of the project): cultivated watersheds in hills and mountains, management of irrigated perimeters and water and land use planning. This expertise network is one of the main objectives of SOWAMED. The default members of this network are the project partners who invite other experts to join it. The member experts become also users of the network and the INCO-MED projects reference database.

Out of the scope of SOWAMED its results interest decision makers of governmental agencies and ministers who need access to diverse and reliable forms of data sufficiently processed. They need scientific expertise and technological abilities and adequate tools to implement their policies and programs. SOWAMED internet platform aims to contribute to this decision process in a very practical way.

Decisional process model:
1. Need of forecasting studies on the implementation of policies and programs
2. Require expert advice, consultant, working group or private engineering companies
3. Decision maker searches a scientific or expert advice based on scientific results from different sources
4. Decision maker searches the answer in the existing documentation without contacting and expert
5. Expert uses his/her own experience or uses his/her surrounding professional network

Two communities of users have been identified. The first community is the partners within the project's lifetime period. The second is an extended community of experts - confirmed or young doctoral - which have joined the network by invitation or subscribed by themselves. A third potential community is development or governmental agents who search expertise or information on methods and adequate tools for their own projects.

The internet platform governance includes the coordinator, the management board, the project leaders and the network members. Coordinator and Management board have in charge the building and the general management of the internet platform, the project leaders are responsible for assembling the necessary information to describe the analyzed INCO projects and enter this information in the database. The network members will offer their expertise to participate to the elaboration of development and management of water and land plans; they are: persons, organizations or institutions with geographic scopes, policies and programs of their own. Table 1 defines the agents, their main goals and interests. A more functional description of the agents' roles is proposed in Table 2.

Table 1: Agents and their expectations

Agent	**Role**	**Goals**	**Expectations**
Coordinator	Responsible of the overall management of SOWAMED, implementation of the IT applications	Implement the web platform which should contain the following sections: [1] an Intranet accessible only to SOWAMED members, an Internet site open to external members, [2] a central library with documents related to the objectives of SOWAMED, [3] sections corresponding to the different tasks and concrete Mediterranean partners, [3] a debate section	Network project partners and extend it to a wider circle of users who need expertise, advice and accurate information on methods, models and data in a particular context.
Management board member	the coordinator is a board member	SOWAMED project leaders are responsible for assembling, comparing and capitalizing information about a specific project in their own countries and enter INCO-MED or related projects description to the reference database. They can enter profiles in the experts' network database or invite experts to do so.	Project leaders expect to have an overview of the current and expertise developed on sustainable water and land management in the Mediterranean declined in three topics: cultivated watersheds in hills and mountains, management on irrigated perimeters and water and land use planning
Expert (confirmed or young doctoral)	External member of the Network	An expert is a person who has a confirmed experience in a relevant domain of SOWAMED project. He/she can become a member of the expert network by subscribing and entering his/her profile. Once its membership approved he/she can exchange with other members.	An expert member of the network motivations could be: [1] to promote himself among a professional community. [2] to be part of an expertise network in his own domain. [3] to exchange with the other members of the network [4] to consult the documentation of the Internet platform
Development agent			He is interested in consulting the experts' database or the projects similar to those of his responsibility.
Everybody	No specific role	Subscribe to the diffusion	

Agent	Role	Goals	Expectations
		list Send a question to the Network Download documents	

Table 2: Functional view of the agents and their roles

Agent	Status	Role
General coordinator	Super Administrator	The general coordinator impulses the *design, implementation and administration* of the project IT tools base in the objectives of the project. He enters information to describe the projects. He enters and searches expert profiles diffused mainly in an Internet/Intranet platform. He creates the project expertise network database of regional and local Mediterranean contact partners and EU actors. Establish and animate an e-forum for exchanging ideas and technologies. Gives access rights to the IS members depending on their role. Uploads resources and documents to the Intranet or the Internet Enters expert profiles to the IS and promotes this expertise list. Update the website pages
Project leaders	Administrator	SOWAMED coordinators are responsible for assembling, comparing and capitalising information about a specific project in their own countries and enter INCO-MED or related projects description to the reference database. They can edit, modify or delete the projects they enter to the reference database. Enter, modify or delete its profile to the experts' network database. Promote or invite other experts to enter their profiles in the SOWAMED experts' network database. Enter an expert profile (if possible with its authorization) to the experts' network database. Edit experts' profiles to which he is authorized to access. ACSAD is in charge of the network promotion in the non Mediterranean Arab countries.
Experts (confirmed or young doctoral)	Registered visitor with access to other experts files (totally or partially) after identification	Enter, delete or modify his profile. The definitive access to the experts' network must be authorized by the system administrator. Consult Projects Reference Database to search methods, models and data by keyword, date, country, and index. Search another expert in the reference database. Contact another expert using the mail engine (facultative function). Propose new experts to the network. Propose new projects in the Information system. Invite new experts using the mail engine. Upload or download documents

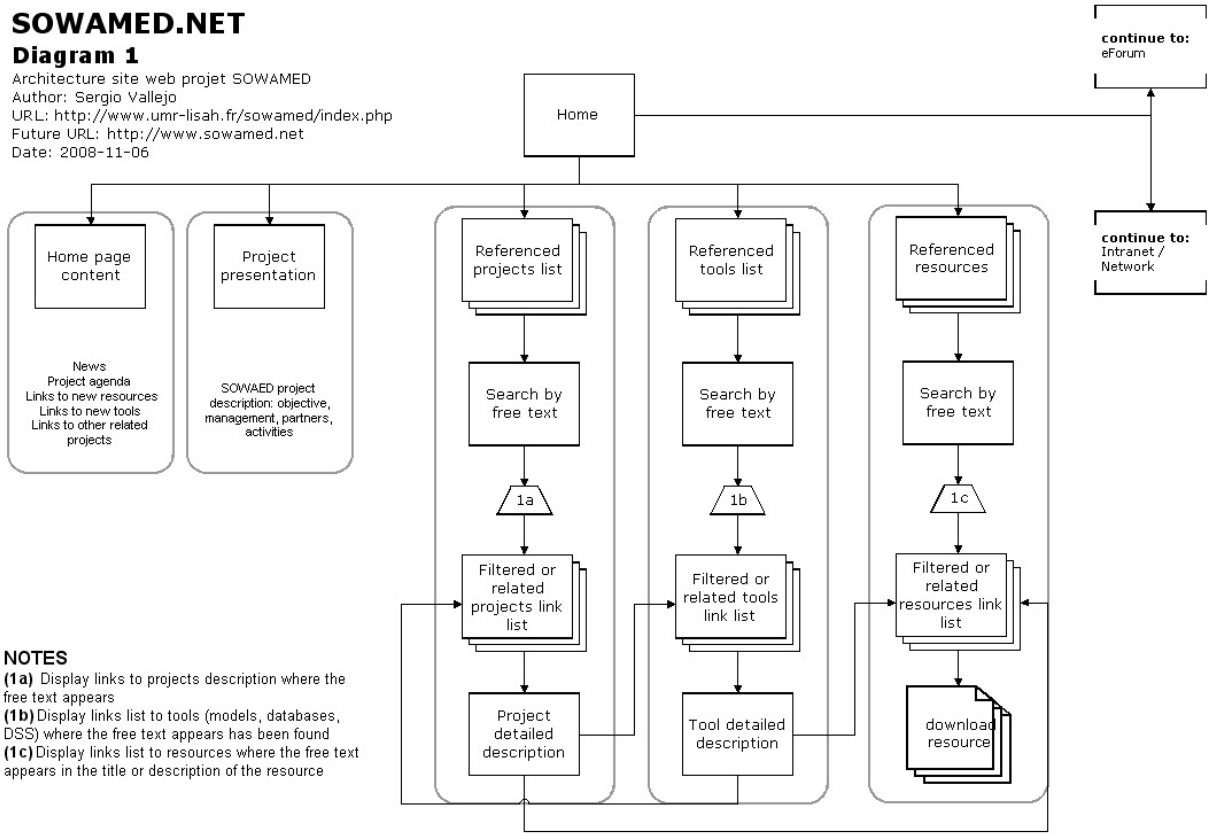
Agent	Status	Role
Developme nt agent	Registered visitor interested in consulting the experts files after self identification	Subscribe to the diffusion list Enter his profile to the Information System Enter a question to the Network on a specific theme Search and expert for a particular question (by name, domain, country, keyword) Search information on methods, models, tools used in the projects reference database. Download documents
Everybody	Visitor	Subscribe to the e-forum Send a question to the Network Download documents

The system permits to exchange methodologies by comparing initial objectives and contexts in order to choose for a given situation the best suited method(s) to new situations. Exchanges are achieved through regional workshops and referenced in the project information system. Documents developed through the regional workshops and training sessions are published in different forms. The website diffuses these documents between network members or a large audience.

The Internet Platform is divided in zones of access depending in the privileges of the agent or user. The first zone (diagram 1), is the main portal accessible to everybody. It describes mainly the SOWAMED project and gives complete or selected access to the referenced project database. No identification is needed at this stage. A second zone (Diagram 2) is the SOWAMED Intranet for the partners of the project. This zone is reserved for the project's management and exchange (e.g. administrative documents) between partners so identification is needed. A third zone gives access to SOWAMED expertise network database. Identification is needed to consult this zone. Some user cases scenarios are presented in appendix 2. This appendix is giving also Software requirements and general requirements to implement the internet platform.

SOWAMED.NET
Diagram 1

Architecture site web projet SOWAMED
Author: Sergio Vallejo
URL: http://www.umr-lisah.fr/sowamed/index.php
Future URL: http://www.sowamed.net
Date: 2008-11-06

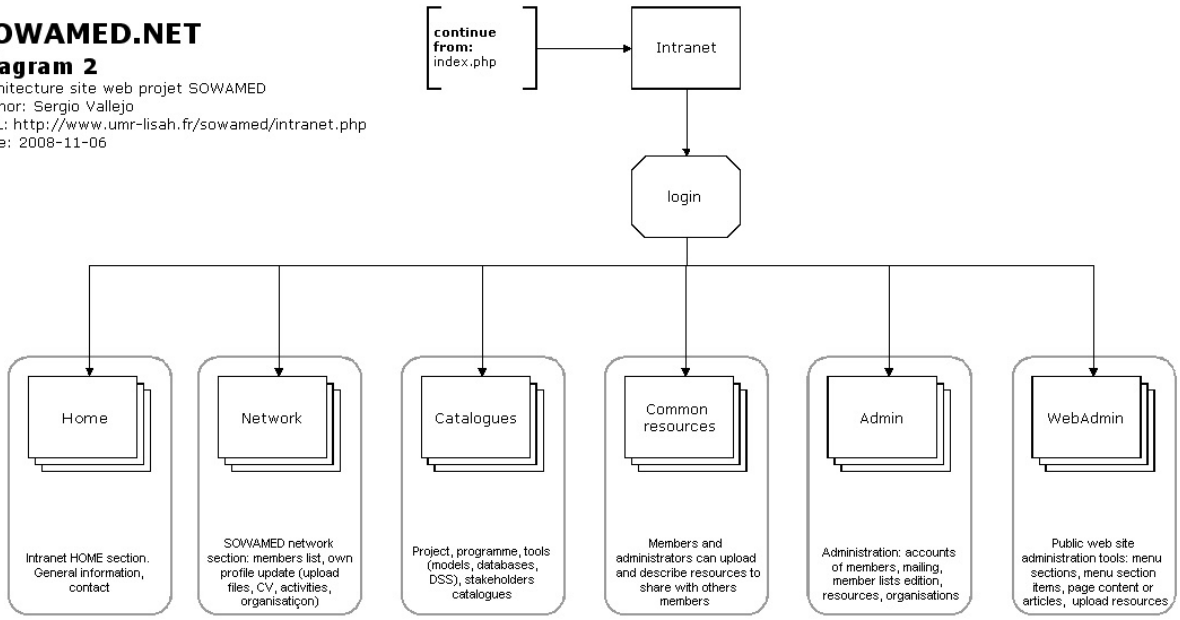


NOTES

(1a) Display links to projects description where the free text appears
(1b) Display links list to tools (models, databases, DSS) where the free text appears has been found
(1c) Display links list to resources where the free text appears in the title or description of the resource

SOWAMED.NET
Diagram 2

Architecture site web projet SOWAMED
Author: Sergio Vallejo
URL: http://www.umr-lisah.fr/sowamed/intranet.php
Date: 2008-11-06



Work package 3: Regional workshop on methodology exchanges «development of cultivated watersheds in hills and mountains»

(Dr. Slah Nasri, Raoudah Mougou)

The main objective of the regional workshop on cultivated watersheds in hills and mountains was to carry out an overview of the current methodologies developed for land development and for water conservation in semiarid hilly lands.
The meeting was held on 28th, 29th of February and 1st March 2008, at Diplomat Hotel, Tunis, Tunisia. The course of the meeting proceeded in accordance with the points listed in the Agenda (see: Annex 3). The minute of this workshop has been published by INRGREF and IRD.: http://www.sowamed.ird.fr/index.php?page=resource : "Report of the 1st SOWAMED regional workshop on cultivated watersheds in hills and mountains"

Analyzed projects

Within the framework of this work package 14 projects were analyzed. Tools, databases, models and elaborated DSS have been located and listed. This information is archived on the Web site. The following table gives the analyzed projects in the framework of this work package and shows the different archived data.

Table 3: Projects analyzed in the framework of WP3

N°	Project Title	Acronym	Obj	Res	Mod	DB	DSS	Prtn	Prtp	Trn	Kw	geo
2	Effects of land use and land management practices changes on land degradation under forest and grazing ecosystems		■	■							■	
4	Interaction between migration, land and water management and resource exploitation in the oasis of the Maghreb		■	■							■	
5	Combining systematic and participatory approaches for developing and promoting strategies for sustainable land and water management		■	■							■	
6	Impact of climate variability on agro-ecosystems and water resources in drylands		■	■							■	
8	Effects of land use and land management practices changes on land degradation under forest and grazing ecosystems		■	■							■	
14	Sustainable Management of Water Resources by Automated Real-Time Monitoring	ALERT	■	■	■	■		■	■	■	■	■
15	Mitigation of Water Stress through new Approaches to Integrating Management, Technical, Economic and Institutional Instruments	AquaStress	■	■	■		■	■	■	■	■	■
18	Changes in arid Mediterranean ecosystems on the long term through earth observation	CAMELEO	■	■	■	■			■	■	■	■
19	Effects of climate change variability in water availability and water management practices in Western Mediterranean	CLIMED	■	■	■	■		■	■	■	■	■
23	A Surveillance System for Assessing and Monitoring of Desertification	DESURVEY	■	■	■	■		■	■	■	■	■
26	A decision support system for mitigation of drought impacts in the Mediterranean region	DSS-DROUGHT	■	■	■			■	■		■	■
32	Research on lakes in hilly areas in the semi-arid Mediterranean	HYDROMED	■	■	■	■		■	■		■	■
40	The inco project cluster for water application projects in the south mediterranean countries	MEDAQUA	■	■	■	■		■	■		■	■
57	Traditional water techniques: Cultural heritage for a sustainable future	SHADUF	■	■	■	■		■	■		■	■

Obj=Objective, Res=Results, Mod=Models, DB=DataBase, DSS=Decision Support System, Prtn=Partners, Prtp=Participants, Trns=Trainees, kword=Keywords, geo=geographic précisions

Under this theme two projects were pointed out:

Research on hill reservoirs in the semi-arid zone of the Mediterranean: HYDROMED (Jean Albergel)

HYDROMED was one of the last FP4 STD projects. It started in November 1996 and ended in April 2001. HYDROMED is a pilot project for SOWAMED for it established a strong cooperation between the main participants in SOWAMED.
The objectives were:
To lead a reflection on projects of small and medium hydraulic systems in the semi arid Mediterranean periphery:

- To study an optimal management for each type of hill reservoirs. The use of the supplement of water resource by users raises both downstream the artificial lake.
- To define an optimal land use planning upstream and downstream the dams. The development of lands close to the lake downstream (gravity irrigation) or on slopes (pumping) requires adequate management. Fish breeding is a possibility to valorise the new water resource, just as the tourist exploitation of some sites.
- To assess the impact of one or several lakes on the environment. The hill reservoir is considered as an artificial structure of little size with very few impacts on the environment. This postulate has often occulted researches on real impacts and on ecosystems modifications

The outcomes and results were numerous and can be summarized as:

- Development of a regional data-base of high quality based on a network of experimental watersheds including the pilot sites.
- Development of data and modeling tools to support appropriate development of renewable resources in Mediterranean areas
- Improved scientific understanding of the hydrology of arid and semi arid areas including surface water-groundwater interactions, as a basis for improved and innovative resources management.
- Modeling software called HYDROMED was developed to design the hill reservoirs hydrology.
- A framework for analysis of strategic water management issues, including use of alternative hydraulic works to the large dams and the deep drillings.
- An impressive list of publications (121 titles). A specific training program, exchange of students and direction of 6 PhD theses.
- Development of new studies concerning environmental issues for cultivated small watersheds.
- Maintenance of long term observatories. HYDROMED left 10 pilot sites well equipped (automatic data loggers for measuring different hydrological parameters).

http://www.sowamed.ird.fr/index.php?page=resource "Session N°3 - HYDROMED Research on lakes in hilly areas in the semi-arid Mediterranean"

Mitigation of water stress through new approaches to integrating management, technical economic and institutional instruments AQUASTRESS (Slah Nasri)

AQUASTRESS was one of the last FP6 projects. It started in 2005 and ended in 2008
It is a project financed by the Union European which gathers 14 Mediterranean countries (IT; UK; NL; GR; RO; PT; BG; HU; DK; CY; FR; Tunisia; Morocco; Egypt) and involves 35 research institutions. The project is interested in 08 experimental sites: 1 Guadiana, Portugal, 2 Flumendosa, Italy, 3 Vecht, Netherlands, 4 Przemsza, Poland, 5 Iskar, Bulgaria, 6 Cyprus, Cyprus, 7 Merguellil, Tunisia, 8 Tadla, Morocco:
The three French institutions involved in the project are IRD, CIRAD and CEMAGREF. The INRGREF is sub-contractor with IRD within the framework of the convention of research between the two institutions. The research team of IRD and INRGREF is responsible of the work package WP3.1 relating to the "Water Harvesting": Alternative resources - Harvest of rainwater.
Objectives of Aquastress project: In agreement with the coordination of Work Package 3.1: "Alternative water Resources", the objectives of the operation of research on the harvest of rainwater were defined as follows:

- To analyze some water harvesting techniques allowing the reduction of water runoff on cultivated slopes semi arid Mediterranean regions.
- To define hydrological function of these techniques and their impact on water harvesting and erosion decrease on different scales, (I) scale of elementary technique, (II) scale of the small area catchment.
- Two types of water harvesting techniques are mainly studied: (I) the hill reservoirs and anti-erosive benches in level lines. The choice of these two techniques is justified by their important presence on the pilot site of the Aquastress project in Tunisia: the catchment area of Oued Merguelil and by their large existence in Mediterranean semi-arid areas. In Tunisia, it was built in one decade, more than 700 hill reservoirs and about 900.000 hectares (approximately the ¼ of the SAU in semi arid regions) were arranged in anti-erosive benches. These two techniques seem credits of Mediterranean semi arid regions and complementary to large hydraulics for management of hill slope lands.

Assets of research in soil and water conservation in hilly dry lands

Last outcomes of research in soil and water conservation in the Mediterranean region have been presented. The presentations outlined the use that can be made of former projects in planning and modeling land and water management.

A research Observatory on Runoff and Erosion, Kamech, Cap Bon, Tunisia – OMERE (Damien Raclot)

Kamech is a 2.45 km2 catchment upstream of a hill reservoir. It is situated in the Cap Bon, North Tunisia, in a semi-arid to sub-humid bioclimatic stage (P = 600 mm/y, ETP = 1500 mm/y). It was a pilot site in HYDROMED project and transformed since 2002 in a "Mediterannean Observatory of Water and Rural Environment". A full set of experimental devices on the field is used to achieve detailed measurements and to build data bases that are used to:
Analyze land use and management impacts on water balance and hydrological conditions
Characterize inter-rill, rill and gully erosion dynamics in relation to anthropogenic activities, as well as siltation in the hill reservoir

Develop a generic hydrological distributed model for cultivated area
Support cooperative research and training programs with other projects in the frame of EU INCO activities or at regional level.
OMERE is for now funded by the French Ministry of Research but it is a heritage of INCO-MED and integrated in SOWAMED network.
http://www.umr-lisah.fr/omere

http://www.sowamed.ird.fr/index.php?page=resource "Kamech, Cap Bon, Tunisia - Environmental Research Observatory OMERE (mediterreanean observatory of water and rural environment)"

Runoff and Erosion in sloping cultivated areas in the Tunisian Dorsal (Hamadi Habaieb)

This research supports the Tunisian national strategy which aims at a total control of surface water and a protection of fragile areas and hydraulic infrastructures downstream. Through the construction of hill reservoirs and watersheds management the objectives of this strategy are to:

- reduce the arable soils losses (estimated at 10000 ha/y)
- reduce siltation in dams reservoirs (estimated at 25 Mm3/y)
- increase the deep infiltration to subjacent aquifers
- mobilise most part of the 500 Mm3/y of water flow that are still not controlled and not used
- create conditions for small scale irrigation around hill reservoirs

Using the huge database on hill reservoirs and small watersheds built by DG ACTA since 1995, numerous studies and training applications are going on that allow to:

- quantify surface runoff on watersheds and siltation in small hill reservoirs
- quantify the soil losses upstream the reservoirs and estimate the life duration of these works
- quantify the water volumes that can feed the aquifers and the water resources stocked in reservoirs available for different uses (irrigation, cattle breeding, domestic…)

This action involves numerous national stakeholders and governmental departments: DG ACTA, DGRE, CRDAs, INAT, INRGREF, etc. It is open to international cooperation and the Tunisian strategy for small watersheds management is considered as a model in the Mediterranean.

Runoff Modelisation on sloping cultivated areas in the Mediterranean (Roger Moussa)

In agricultural catchments, hydrological processes are largely variable in space due to human impact causing hydrological discontinuities such as ditches network, field limits, drains, and tillage practices. MHYDAS, a distributed hydrological model, was especially developed to take into account these hydrological discontinuities. MHYDAS is based on a segmentation of the basin surface into “hydrological units”, a segmentation of the aquifer into “aquifer units” and a segmentation of the channel network into reaches. Runoff from each hydrological unit is estimated using a deterministic model based on the pounding-time algorithm and then routed through the ditches network using the diffusive wave equation. Detailed descriptions are provided for the main model procedures: subdivision

of the catchment into units, computation of rainfall excess, infiltration, baseflow, exchange between channel network and groundwater, and routing flow on hill slopes and through the channel network. Pollutant and erosion transfer modules were also developed, and a friendly graphical user interface is under development. Three kinds of parameters can be distinguished: geometrical characteristics of fields and ditches extracted from DEMs, soil hydrodynamic properties measured in-situ and parameters to be calibrated. MHYDAS enables to simulate the part of rainfall infiltrated on hydrological units, the part of flow exchanged between the ditch network and the groundwater and the hydrograph at the fields and the catchment outlets. Application cases for water and pollutant transfer in various agro-hydro-meteorological conditions are presented and compared: i) on a vineyard experimental catchment in Mediterranean climate (91 ha; Hérault, southern France); ii) on artificially drained lowland catchments in temperate climate (5 ha; Rostock, northern Germany); iii) on a tropical banana crop catchment on volcanic deposits (19 ha; Guadeloupe, French Antilles). The model was calibrated and validated at both the plot (1000 – 10000 m^2) and the catchment (0.1 – 10 km^2) scales. Results show the impacts on water and pollutant transfer of hydrological discontinuities (field limits, tillage practices, ditches, drains), of various climatic conditions (Mediterranean, temperate and tropical) and various vegetation cover (vineyard, wheat, banana).

The presentation focused on the use of MHYDAS model in various situations and applications. MHYDAS is a flexible model based on the segmentation of the space in small units that can be described through their physical and environmental characteristics coming from different GIS layers. The parameterization of hydrologic process is performed at the units scale and transferred to adjacent units. The results depend on the accuracy of unit description and the choices made on significant parameters. Several examples of MHYDAS use were exposed, among which the analyse of the influence of anti-erosive "banquettes" in El Gouazine catchment (Tunisia)

MHYDAS appears as a modeling open platform that allows creating different models from different simulation processes, at various scales depending of the choices of the users and the accuracy of field measurements.

Brain storming session: which needs in research for the stakeholders?

The Round Table realized between the scientists and the actors of the development was very interesting. It brought very original lighting in the relations between research and development. Mr Débabria who represented the general direction of land management soil conservation at the Tunisian ministry of agriculture indicated that the transfers from research towards development are not only transferable methodologies. He showed by leaning on HYDROMED project and on the ambitious program of realization of hill reservoirs in Tunisia that the most useful for this program were the new concepts brought by the scientists rather than their work on the formulae for sizing the dams. Indeed, this project allowed the evolution of the concept "hill reservoir" from only a work for soil and water conservation (protecting bigger dams from siltation) to a work for increasing water resources and useful for micro-irrigation. This led to an increase of the size of these reservoirs and to plan annex water and soil conservation structures within their catchments to protect and increase this water resource.

Mr Annis BEN RAYANA member of IRESA (Institution de la Recherche et de l'Enseignement Supérieure Agricole) presented the priority research programmes on water and soil conservation in Tunisia followed by a discussion. After a short presentation of IRESA his speech focused on the main strategy and research programmes in Tunisia. He explained that one of the main research priorities is the preservation and sustainable management of natural resources. In this domain, five federator projects have been launched and among them we must mention the research on the CES (Conservation des Eaux et des Sols – Water and Soil Conservation) actions and its impacts. Three main actions of research are planned within this project: sustainable management of water and soil resources, design and impact of anti-erosive infrastructures, effect of spreading on soil properties and nutritional properties of olive trees.

Work package n°4: Regional workshop on methodology exchanges « management of irrigated perimeters »

(Prof Dr. Muhammad Shatanawi, Dr. Jawad Al Bakri, Dr. Aymen Sulieman)

The main objectives of the regional workshop on methodology exchanges for « management of irrigated perimeters » are:

- To carry out an overview of the current methodologies developed for different types of irrigation: modern perimeters, micro irrigation and oasis.
- To exchange models and data bases on water consumption by vegetation in semiarid regions with comparison among different methods of irrigation.
- To test models and DSS on irrigation management.

The workshop took place in Amman during the period 1-2 June 2008 at the campus of the University of Jordan. A three-days training followed the workshop and focused on the use of spatial techniques.
The course of the meeting proceeded in accordance with the points listed in the Agenda (see: Annex 4).

The minute of this workshop have been published leaded by UoJ and IRD.
http://www.sowamed.ird.fr/index.php?page=resource "Jordan Report of the 3rd SOWAMED Workshop on Water and Land Use Planning"

Analyzed projects

Within the framework of this work package 13 projects were analyzed. Tools, databases, models and elaborated DSS have been located and listed. This information is archived on the Web site. The following table gives the analyzed projects in the framework of this work package and shows the different archived data.

Table 4 : Projects analyzed in the framework of WP4

N°	Project Title	Acronym	Obj	Res	Mod	DB	DSS	Prtn	Prtp	Trn	Kw	geo
7	Sustainability and optimisation of treatment and use of wastewater in agriculture											
9	Developing sustainable water management for the Jordan Valley	J.V.W										
15	Mitigation of Water Stress through new Approaches to Integrating Management, Technical, Economic and Institutional Instruments	AquaStress										
22	A future for the Dead Sea Basin: Options for a more sustainable water management	DEAD SEA										

N°	Project Title	Acronym	Obj	Res	Mod	DB	DSS	Prtn	Prtp	Trn	Kw	geo
25	Deficit irrigation for Mediterranean agricultural systems	DIMAS	■	■	■	■	■	■	■	■	■	■
31	Sustainable water use in mediterranean horticulture	HORTIMED	■	■							■	
35	Improved management tools for water-limited irrigation: combining ground and satellite information through models	IRRIMED	■	■	■	■	■	■	■	■	■	■
36	Partial root drying : a sustainable irrigation system for efficient water use without reducing fruit yield	IRRISPLIT	■	■							■	
53	Diagnosis and control of salinity and nitrate pollution in Mediterranean irrigated agriculture	QUALIWATER	■	■							■	
59	Soil and Water Management in the Mediterranean	SOWAMED	■	■	■	■		■	■	■	■	■
65	Water Saving in Mediterranean agriculture	WASAMED	■	■	■	■	■	■	■	■	■	■
66	WATer use Efficiency in natural vegetation and agricultural areas by Remote sensing in the MEDiterranean basin	WATERMED	■	■	■	■			■	■	■	■
67	Management improvements of WUE and NUE of Mediterranean strategic crops (wheat and barley)	WatNitMED	■	■							■	

Obj=Objective, Res=Results, Mod=Models, DB=Data Base, DSS=Decision Support System, Prtn=Partners, Prtp=Participants, Trns=Trainees, kword=Keywords, geo=geographic precisions

During the workshop research papers have been presented. They have been elaborated from the analyzed INCO MED projects and principally from the two projects chosen as case studies in this workpackage:

Deficit irrigation for Mediterranean agricultural systems. DIMAS

- **Deficit irrigation on lemon in Jordan (Ayman Sulciman, UoJ, Jordan)**
  Results from field experiments on deficit irrigation were presented. The experimental site was the citrus orchard of the Agricultural Research Station of Jordan. Different treatments of deficit irrigation (DI) and their influence on the water use efficiency (WUE) and the water savings during 2005, 2006 and 2007 were presented. This project generated a set of recommendations for DI and water efficiency use. The session was followed by some questions and discussions on the initial state of the soil and the deeper percolation losses.

- **Deficit irrigation on Orange in Jordan (Nabil Bani Hani, NCARE, Jordan)**
  Deficit irrigation has been also studied in an area in the north of the of Jordan Valley, where rainfall is relatively high. The crop was orange cultivated since 16 years ago. Three different treatments of regular DI were applied. Results of 2006 and 2007 showed high WUE under DI treatment when compared with full irrigation without significant effects on crop quality. Several questions were raised by participants on the impact of high rainfall on the obtained results and the contribution of DI in solving water scarcity problem, particularly during the hot seasons of summer when water allocation becomes the main problem in Jordan Valley.

Improved management tools for water-limited irrigation: combining ground and satellite information through models – IRRIMED

- **Analysis of IRRIMED Project (Michel Le Page, France)**
  The approach of the project was based on combining ground and satellite information though models. The IRRIMED applied water and micrometeorological measurement

methods in different study sites located in Jordan, Morocco and Tunisia. The integration of both GIS and remote sensing techniques was used to classify crops, to derive Kc from NDVI and to calculate ET. The main outcomes from the project were land use mapping, advanced micromet, SVAT models application to predict actual ETR, and water consumption mapping. The webpage of the project is www.irrimed.org with a complete documentation and material from the training sessions.

A question was raised on the possibility of extending the IRRIMED. Obviously, there is intention and fund for extension. However, a similar project called PLEIADE will study 19 sites around the world.

- **Management of cultivated and irrigated areas around and upstream hill reservoirs in semi arid regions of Tunisia (Slah Nasri, Tunisia).**

  The context of this irrigation project and the country's hydrological and physical characteristics were introduced to the participants with reference to erosion and land degradation. The presentation included the National Strategy of Surface Runoff Mobilisation and Soil Conservation which was implemented between the years 1990 to 2000 and re-implemented for a second period from 2002 to 2006. As a result of implementing this strategy, hill reservoirs where constructed until December 2006 to protect soils from erosion, to increase groundwater recharge and to utilize more water for irrigation. Important output programmes during this period were HYDROMED and IRRIMED.

  IRRIMED project has focused on better management of irrigation water resources, particularly under micro-irrigation systems which saved water and increased WUE. The IRRIMED methodology included measurements at different scales or levels using field and satellite measurements combined with several models. The approach showed excellent results that need transfer at farm level and extrapolation to other areas, the case of HYDROMED.

- **Combining ground and satellite information for irrigation management in Jordan (Mohammed Jitan, NCARE, Jordan)**

  The area is the Jordan valley which is the most irrigated land in the country. A main canal transports 20m3/s and other major development activities are implemented. The methodology includes the collection of data, establishment of the study area, equipment of the study area, GIS applications. Results include field data measurements for the alfalfa crop to obtain the ETC values. EDDY model was used to estimate ET. Modified Kc values where used. Results show also that water needs are less than those considered by the farmers; that means that water economies can be made. Results show also that the FAO Kc values are overestimated for corn in the studied area. Land cover mapping using remote sensing techniques where used to make daily balances. These results can be a decision tool for water distribution. ETc was estimated using also remote sensing data. NDVI values permitted to develop Kc values and images showing where the water supply or infrastructure must be implemented. Permanent automated stations will permit to cross diverse data. Many of the data came from the University of Jordan works. This project was a successful cooperation with excellent results and publications.

Work package n°5: regional workshop on methodology exchanges «regional workshop on water and land use planning »

(Mejjati Alami)

The main objective of the regional workshop on water and land use planning is to carry out an overview of the current methodologies developed for water and land use planning, especially where an accurate competition exists between rural and urban uses.
The meeting was held on 27, 28 October 2008, in Rabat, Morocco. The minute of this workshop have been published leaded by IAV and IRD.

Analyzed projects

Within the framework of this work package 18 projects were analyzed. Tools, databases, models and elaborated DSS have been located and listed. This information is archived on the Web site. The following table gives the analyzed projects in the framework of this work package and shows the different archived data.

Table 5 : Projects analyzed in the framework of WP5

N°	Project Title	Acronym	Obj	Res	Mod	DB	DSS	Prtn	Prtp	Trn	Kw	geo
2	Effects of land use and land management practices changes on land degradation under forest and grazing ecosystems		■	■							■	
5	Combining systematic and participatory approaches for developing and promoting strategies for sustainable land and water management		■	■							■	
8	Effects of land use and land management practices changes on land degradation under forest and grazing ecosystems		■	■							■	
20	Institutional and Economic Instruments for Sustainable Water Management in the Mediterranean Region	INECO	■	■							■	
30	Mediterranean Cooperation for Water Desalination Policies in the Perspective of a Sustainable Development	MedCoDesal	■	■	■	■		■	■	■	■	■
41	Mediterranean co-ordination and dissemination of land conservation management to combat land degradation for the sustainable use of natural resources in the Mediterranean coastal zone	MEDCOASTLAND	■	■	■	■	■	■	■	■	■	■
44	MEditeranean Development of Innovative Technologies for intergAted waTer managEment	MEDITATE	■	■	■	■		■	■	■	■	■
46	Mediterranean usage of biotechnological treated effluent water	MEDUSA	■								■	
47	Policy Initiative to Overcome Water Competition between the Vital Economic Sectors of Agriculture and Tourism in the Mediterranean	MEDWATER Policy.	■	■	■	■		■	■	■	■	■
51	Optimisation for Sustainable Water Resources Management	OPTIMA	■	■	■	■	■	■	■	■	■	■
54	Integrated Decision Support System for Risk Assessment and Management	RAMWASS	■	■	■	■	■	■	■	■	■	■
58	Sustainable Management of Scarce Resources in the Coastal Zone	SMART	■	■	■	■	■	■	■	■	■	■
60	Sustainable Water Management in Mediterranean coastal aquifers: Recharge Assessment and Modeling Issues	SWIMED	■	■	■	■	■	■	■	■	■	■
63	WAter supply watersheD planning and management: an Integrated approach	WADI	■	■	■			■	■	■	■	■
64	Water Resources Management under Drought Conditions: Criteria and Tools for Conjunctive Use	WAM-ME	■	■	■	■	■	■	■	■	■	■

N°	Project Title	Acronym	Obj	Res	Mod	DB	DSS	Prtn	Prtp	Trn	Kw	geo
	of Conventional and Marginal Waters in Mediterranean Regions											
65	Water Saving in Mediterranean agriculture	WASAMED										
66	WATer use Efficiency in natural vegetation and agricultural areas by Remote sensing in the MEDiterranean basin	WATERMED										
67	Management improvements of WUE and NUE of Mediterranean strategic crops (wheat and barley)	WatNitMED										

Obj=Objective, Res=Results, Mod=Models, DB=DataBase, DSS=Decision Support System, Prtn=Partners, Prtp=Participants, Trns=Trainees, kword=Keywords, geo=geographic precisions

In order to carry out an overview of the current methodologies developed for Water and Land Use Planning, IAV did a review of the projects funded by the European Commission from 1996 to 2006 (Table 5). The comments can be summarized as follows:

- Earlier efforts emphasized more on the development of scientific knowledge to support environmental quality standards and objectives, focusing on situation analysis supported by data collection, validation and decision support tools.
- Several projects funded through FP5 focused on Integrated Water Resources Management (IWRM), adopting a multidisciplinary, stakeholder-driven approach and recognizing or integrating social and economic aspects, and finally the water programmes of FP6 were characterized by the emphasis on IWRM and the increasing participation of end-users from public and private sectors, including non-EU partners.

Over all we can point out that some sub-themes were more invested by the Euro-Mediterranean research than others, although these seemed very important. At the same time, other projects addressed specific research topics or dealt with specific areas.

Some projects were in support of technological innovation (eg: MedCodesal, IWRMS), and others of policy development (e.g.: Medwater policy, Ineco).
Research on water savings in Mediterranean Agriculture emphasized on the importance of communication in this field considering the local and the regional level.
Research on Climate change and water availability management illustrated the impact of these changes on the ecosystem and gave recommendations on how to proceed in order to make the society adapt to the foreseen changes in water regimes.
We can conclude by saying that EU water-related research is marked by the gradual transition from water supply to demand management and to constructively integrated water allocation and management. The increasing concern over global change and the need for proactive management in view of extreme hydro-climatic events should lead to the integration of research into policy.

Some research projects very relevant to our theme:

WADEMED project

- WADEMED was one of the 5th INCOMED projects and started in 2004. The project aimed to create an integrated knowledge database of experiences made in the management of water demand in the Mediterranean region. The project had the

ambition to identify the barriers to implementation of measures to save water and to propose recommendations for improving management policies of water demand.
Amongst its achievements, WADEMED contributed to the international debate on the sharing of responsibilities in the management of hydro-agricultural by an analysis of patterns of cooperation on water management in Europe (Germany, France) and in 3 countries in the Maghreb.

- WADEMED contributed to the study of improved gravity irrigation techniques and accompanying groups of farmers to formulate collective projects for water saving. The economic evaluation of benefits and costs of various modes of resource allocation in agriculture must take into account environmental impacts, insurance for food security, and foster land use planning. Wademed contributed to the success of dialogues between researchers, institutions and professional organizations: agricultural, industrial, farmers; in devising approaches to animation and dialogue.

WASAMED project

- This project was also among the ones financed through the 5th Framework programme. It started in 2003. The WASAMED objectives were to contribute to improve management of limited water resources and sustainable development in the Mediterranean Region. WASAMED intended to constitute a tool and a contribution to reduce pressure on natural waters through an improved and sustainable balance water demand-water supply. Establish a Mediterranean-wide structure to enable communication and sharing of experience between researchers, decision makers and end-users.

- The communication was focused on the integrated management of agricultural water saving in the Mediterranean (considering local and regional level). It has been gradually consolidated and contextualized in the frame of sustainable development considering the integration of different technical notions (and disciplines) and the criteria of social, economic, environmental and institutional sustainability, and their inter-linkages too.

- Ethical values like equity, solidarity and justice in the benefits shared as a result of water saving and reallocation has been also gradually consolidated in communication with stakeholders.

- As result, the concept of water allocation efficiency is not anymore treated only by using conventional technical or economic criteria but by incorporating the above ethical values.

http://www.sowamed.ird.fr/index.php?page=resource
"SOWAMED_CatalogueProjLandUsePlanning_Alami0609.pdf"

Discussion and exchanges, main topics and trends

In October 2008, the Regional Workshop on water and land use planning was held in Rabat at the IAV.
During this meeting, we discussed the current methodologies dealing with water and land use planning then we made an overview of the strategies developed by the governmental institutions for managing theses resources and finally we did an evaluation of the degree of competition between the vital water sectors.
During the debate, there was recognition of the need to give bigger attention to the protection and conservation of the water resources and increasing efficiency of water use on the farm and beyond.
In terms of soil and water conservation planning, watershed management has an important role to play in the process of meeting international sustainable development goals. Water and forest management should be implemented within the integrated resources planning framework. We do need a new generation of watershed management: Watershed perspective.
Dealing with sustainable water management for agricultural use, there is a need for adaptive management of demand replacing a sector allocation and at the same time modernization of irrigation methods and use of water saving systems.
A great competition for water is emerging between countries, urban and rural areas, but also between different sectors of activity, which may result in the future by a greater politicization of issues related to the water.
We can conclude by saying that a new and consistent approach is needed to cope with the demand for water at local and regional levels and to assure mitigation and adaptation measures to face these global changes. Equitable, optimal and sustainable management of water resources and services demands an integrated approach, coordinated action and the sharing of responsibilities by the various tiers of government, local agencies, private companies, environmental groups and other NGO's.

Research Needs

One of the challenges facing the research in the field of water and land use planning is how to convert the water managing policies determined by political processes with the fundamentals exposed by ecosystem and social science.
Explicit efforts have to be made in order to bridge the gap between the ecosystem science and economics version of sustainable management, and the reflecting underlying fundamentals and the perceptions of water managing actors in society.
This would make the research more directly relevant for planning and decision making in the complex politics in which water management takes part.
The political nature of this process should be acknowledged in order to increase the impact of Science. At the same time, the research approaches taking into consideration the social constructed preferences of water management for human consumption and food security will have better chances to bridge this gap.

Work package n°6: Training of expertise

Training has been implemented in many INCO-MED projects and most of them formulated recommendations to accelerate local water managing practices and water policy (EU-INCO Water research from FP4 to FP6 Critical view)
INCO-MED projects identified as being of interest for SOWAMED on Water and Land use management can be classified:
Projects including spatial techniques of analysis and representation: GREM, IWRMS, CLIMED, LANDWATERMED, HYDROMED
Projects including geophysical and remote sensing methods: DESURVEY, CAMELEO, WATERMED, LANDWATERMED, IRRIMED
Projects including hydraulic and hydrological modeling: HYDROMED, IWRS, DSS-DROUGHT, WADI, SHADUF, ORE OMERE, MEDITATE
Projects on farming sustainability in water resources management: ELMAA, IRIISPLIT, HORTIMED, WATERMED, WASAMED, DIMAS
Projects on governance of water: MELIA, WADEMED, GEWAMED
Projects on water at stake, cultivated areas and the environment: TOWIMET, CAMELEO
Projects on risk analysis and integrated management.

Following the analysis of needs in training two sessions were organized:

- In Amman a session on spatial techniques for analyses and modeling took place on 3rd -5th of June, 2008. The agenda of this training session is giving in appendix
- In Rabat a session on "water management and water projects" took place on 28th an 29th of October 2008

At the same time as the organization of the training courses, it was decided to oversee a work of Ph.D theses from the data of a finished INCO project. This work of thesis was based on the data, the models and all the experiences of a finished INCO project. This work of thesis has to exemplify a valorization of a project of the FP. HYDROMED project was targeted.

Training session in Amman (Ronny Berndtsson)

In line with the SOWAMED objectives (Specific Support Action, SSA) intended to support the implementation of the Sixth EU Framework Programme (FP6), specific training sessions were arranged. According to this training was arranged including four major analyses and modeling tools for spatial data; geostatistics and spatial correlation, geomorphological transfer function runoff modeling, remote sensing, and GIS (geographical information systems). Basic statistical analyses include analysis of variation and correlation in and between parameters and variables for a spatial area or time series. Statistical analysis and modeling may be performed for time series as well as series represented in space. Statistical parameters may be represented by a space coordinate. Statistical modeling may then be performed jointly in space and time such as spatial correlation and/or geostatistical analysis. Geomorphological transfer function modeling is a technique to model runoff from a drainage network with limited input data. It may be a powerful technique using the drainage pattern from, e.g., remote sensing or GIS. Remote sensing surveys can provide important mapping of spatial variation in such variables as groundwater quality, soil water content, etc. These maps can be combined with maps of land use and, for example, root zone extraction to evaluate needs for irrigation. Various

types of data collection methods are included here such as satellite, air plane, land vehicles, and boats. A specific powerful tool when many layers of spatial data are at hand is geographical information systems (GIS). GIS techniques are especially well suited to management problems when geophysical data are to be combined with resource needs. The general level of needed skills and technical background for students are thought to be engineering level for management of spatial resources at catchment level corresponding to bachelor or master university level.

The above training methods are made available online at the SOWAMED homepage: http://www.sowamed.ird.fr/. Consequently both lectures, training material, software, training data, examples, and contact persons are freely available as E-learning at this homepage. The homepage was decided at the last SOWAMED meeting in Syria to be kept continuously updated during the next 3-year period.

Training session in Rabat (Anna Balzarini)

Accordingly to the project WP6, the main objective was to give a basic education on the project's studied themes and a practical teaching of the tools proposed in SOWAMED through a cross-disciplinary education.

In this frame was implemented the Training in Morocco (29-30 October 2008, Rabat) organized in three sessions: Sustainable water resources management (M. El Moujabber), Gender & water resources (C.Njebet), Water saving education (A. Balzarini).

The Regional "Workshop on water and land use planning" (October 27th – 28th, 2008, Rabat) was held just before the training session.

Concerning water resources management it has been considered that only about 17% of the world's cropland is irrigated, but that land produces more than one-third of the food and fiber harvested worldwide. However, expansion will not be as easy as it was in the past, given the loss of irrigated lands by salinization, and increasing competition for limited supplies of good-quality irrigation water and the rising costs of developing those supplies. Increasing the production of food and fiber to support a larger world population requires that we improve the performance and enhance the sustainability of irrigation systems in many regions. Therefore a sustainable irrigation system is one that will continue to generate agricultural products at reasonable costs into the future and ensure that environment is itself maintained so that it can sustain the communities that depend upon it. For irrigation to be sustainable, irrigation and drainage must be conducted in a way that does not degrade the quality of land, water and other natural resources that contribute to both agricultural production and environmental quality.

This session was focused on several issues as sustainable extraction from rivers and aquifers, improving water use efficiency, managing drainage to minimize water logging and salinization, surface and sub-surface drainage, groundwater pumping, principles of a good reuse system and economic incentives.

The training session devoted to gender and dissemination have been considered also in the frame of water resources management.

Dissemination activities are normally undertaken in order to guarantee that the disseminated object, like knowledge, project results or other information can be available and those they are known and, where possible, exploited, by other users in other contexts.

But dissemination has 2 dictionary definitions: to scatter widely, as in sowing seed and to spread abroad; promulgate: disseminate information.
What was in the training interest was a sum of both definitions in connected actions.
To better disseminate seeds we need to prepare the 'ground' in way that the 'seeds' could easy develop. Similarly to succeed in promulgate, is better to prepare the receptors to receive the spread information.
The logic consequence is providing education as prerequisite to enable the knowledge transfers. Through the education we can expect a better dissemination, therefore increased knowledge, better sensitization to the object and creation of new culture.
It is also very important to careful prepare the dissemination to obtain successful results. During the training session we have focalized our attention over several questions before acting, as why, what, when, how and who.

The training outputs were summarised in the definition of the "5 keys" for a good dissemination: PURPOSE - GOALS - TIME PLANNING - TARGET - INSTRUMENTS
From the analysis of each key the final output was the definition of an overall key to enable the addressee best reception of the dissemination self, is to create new culture through education.
The education is the instrument to achieve a future adult's generation able to better effort natural resources uses and sustainable water management.

One of the main issues of the training was the role of Gender in the water management and into water management education too.
During the session were presented the general aspects of gender condition in the developed countries, but also into African scenarios. We have started with the initiation to gender concept, than we had an historical analysis and the gender aspects related to water approach.
The second part was dedicated to the gender analysis tools.
The lecturer conclusion about "Gender and development" is that this is a very relevant issue in the sustainable development/management. To achieve equitable and sustainable development we need the cooperation with men and women taking decisions together.

In addition we must have a good strategy for identification and comparison of practical needs and interest of both men and women. Therefore utilising the gender analysis we would identify, design and operate the development.

The trainees were involved with pleasure the knowledge transfer methods was approved.
Presentations, resume and training content are available online at the SOWAMED website
http://www.sowamed.ird.fr/resource/RES308_WP6_InitConceptGenre_NDJEBET.pdf
http://www.sowamed.ird.fr/resource/RES306_WP6_ActivitesEducatives_BALZARINI.pdf
http://www.sowamed.ird.fr/resource/RES307_WP6_DissEducJeunes_P1P2_BALZARINI.pdf
http://www.sowamed.ird.fr/resource/RES310_WP6_IntroductionSustainableAgriculture.pdf
http://www.sowamed.ird.fr/resource/RES311_WP6_SustainableIrrigation.pdf
http://www.sowamed.ird.fr/resource/RES312_WP6_SoilConservation.pdf

SOWAMED Ph.D projects (Ronny Berndtsson)

A specific output from the SOWAMED project was a thesis produced and paper presented based on data collected during the HYDROMED project. Ms. Sihem Jebari, INRGREF, Tunis, Tunisia defended her Ph.D thesis Water erosion modeling using fractal rainfall

disaggregation, a study in semiarid Tunisia, on 12 June, 2009, at Lund University . Appended paper also published are:

I. Jebari, S. (2009) Temporal aspects of soil erosion in Tunisia. Submitted to: Hydrological Sciences Journal.

II. Jebari, S., Berndtsson, R., Lebdi, F. & Bahri, A. (2008) Sediment, discharge and precipitation variation in the wadi Mellegue catchment during the last 50 years. Annales de l'INRGREF 11, 116-122.

III. Jebari, S., Berndtsson, R., Bahri, A. & Boufaroua, M. (2008) Exceptional rainfall characteristics related to erosion risk in semiarid Tunisia. The Open Hydrology Journal, 2 (9), 25-33.

IV. Jebari, S., Berndtsson, R., Bahri, A. & Boufaroua, M. (2009) Spatial soil loss risk and reservoir siltation in semiarid Tunisian. Accepted for publication in Hydrological Sciences Journal.

V. Jebari, S., Berndtsson, R., Uvo, C. & Bahri, A. (2007) Regionalizing fine time-scale rainfall affected by topography in semi-arid Tunisia. Hydrological Sciences Journal, 52 (6), 1199-1215.

VI. Jebari, S., Berndtsson, R. & Olsson, J. (2008) Relationship between scaling in rainfall and water erosion in semiarid Tunisia. To be submitted.

VII. Jebari, S. & Olsson, J. (2009) Erosion modeling based on a fractal rainfall approach. Submitted to: Hydrological Processes.

Below follows the abstract for the thesis:

Abstract
In the Tunisian semiarid area, water erosion processes have led to negative economic and environmental consequences in a context of limited water resources. To characterize and predict these degradation phenomena, a comprehensive high-resolution data base on erosive rainfall, together with siltation records for 28 small reservoirs were analyzed. The studied small reservoir network displays a general life-span of about 14 years. The average soil loss is 14.5 tons/ha/year. The complex relationship between the erosive rainfall events and the annual soil loss rates can be explained by two important factors. The first factor is related to the soil "degradation cycle". It determines the soil particle delivery potential of the catchment. The second factor corresponds to the "degradation front". The latter presents a north-western/south-eastern direction.

To investigate rainfall disaggregation possibilities, a regionalization of fine time-scale and daily rainfall was undertaken. The results showed that the spatial properties are typically non-isotropic. Clustering showed that two different homogeneous rainfall subgroups are closely related to the predominant convective and frontal rainfall types. The comparison illustrated important similarities between the maximum 15-min and the daily rainfall data.
The above findings were an incentive to explore the multiplicative properties of a 4-year rainfall time series. The time series showed scaling behavior for time scales up to 100 min

that coincides with the most active erosion process time scale. Moreover, the temporal structure of rainfall was reproduced using a disaggregation model (Olsson, 1998). The observed and generated rainfall time series displayed several similar characteristics. This allowed the reproduction of erosivity for erosive rainfall events longer than 45 minutes. The erosion modeling was performed using the USLE/GIS approach. Maps of observed and generated spatial erosion distribution were combined with the Masson's and Wischmeier-Smith's erosion limit intervals. According to the above, the potential of rainfall scaling-based approaches to predict water erosion levels in semiarid areas seems promising. Using this approach may help soil and water authorities in semiarid areas to better manage soil erosion problems.

References

Jebari, S., (2009), Water erosion modeling using fractal rainfall disaggregation, a study in semiarid Tunisia, D. Sc. Thesis, TVVR 1047, Dep. of Water Resour. Eng., Lund Univ., **Lund, pp. 41 + 7 app.**

Work package n°7: Dissemination, promotion, offers of expertise

(Abdallah Droubi, Omran Alshihabi)

The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD) coordinated this WP7. It used its scientific network among Arab countries to disseminate all the results. ACSAD was established in Damascus, Syria in 1968. It is a specialized Arab organization working within the framework of the League of Arab States with the objective of unifying the Arab efforts which aim to develop the scientific agricultural research in the arid and semi-arid areas, help in the exchange of information and experiences and make use of the scientific progress and the modern agricultural techniques in order to increase the agricultural production.

Dissemination of principle results of INCOMED projects involving Arabic countries

ACSAD provided policy makers at national level with information on data base, models, DSS available for water and soil management in semiarid areas.

ACSAD offers to Arab League Member States training programs where the results of different INCO MED project are used. HYDROMED model has been presented and diffused to many stakeholders in water harvesting. Different data available on irrigation from IRRIMED or DIMASC have been widely presented.

ACSAD took the opportunity of the numerous technical and scientific demonstrations to present and diffuse the results of the INCO MED program which have been analyzed by SOWAMED. This activity begun in the last months of the project is going on. The main demonstrations where the ACSAD was able to make the promotion of INCO MED products are:

- Training workshop on integral watershed management was held in ACSAD in collaboration with GTZ on 27-31/7/2008. In this training workshop different

results and futures from the project INCO-MED in addition to the project SOWAMED were presented. Nombre of participants was thirty.

- On November 24th, 2008, an important ACSAD delegation of scientists visited the INRA in MOROCCO. In this opportunity, the various INCO MED projects on water and soil management have been quoted. The SOWAMED project and the work of analyses of these projects were presented.

- The project SOWAMED was presented also in a training workshop about ground water pollution for technicians from Yemen which held in ACSAD centre in Damascus on the period 11-17/1/2009.

- First Conference on Scientific Agricultural Research held in Damascus during 23 - 25 February 2009. Syrian Ministry of Agriculture and Agrarian Reform and ACSAD met with the Arab delegations participating in a specific workshop aiming to strengthen a joint action to help achieve the Arab food and water security.

- On 28 April 2009 ACSAD Scientists accompanying the Director General Prof. Dr Rafik Ali Saleh visited ICBA, International Center for Biosaline Agriculture, in Dubai, United Arab Emirates. ACSAD scientists shared with their colleagues the latest results of different projects in improved salt-tolerant varieties of fodder, dates and bioenergy trees; the improved management of saline water for irrigation; increased support for capacity building; and strong partnerships with donors, the private sectors and national research and development programs.

- A training workshop on rainfall harvesting was held in Damascus on the period 25-29/10/2009 for technicians from Syria and Iraq, SOWAMED was promoted in this workshop.

Dissemination to a large public

ACSAD used the results of SOWAMED to elaborate communication instruments and articles explaining to the large public the stakes of water and soil management.

Data base of Expert

The list of stakeholders and experts was enlarged from workshop to another held up during the project, a number of stakeholders from different organizations were invited to participate in the training accompanied every workshop. ACSAD, en collaboration with coordinators of SOWAMED en each country, expanded this list from his own archive and relationship with the Arabic organizations.
From Tunisia: INRGREF, CAWTAR, CRDA Tunis, CRDA Le Kef, CRDA Beja, CRDA Siliana, CRDA Zaghouan, DGACTA, DGRE, DRS / DGACTA, ESA Mograne, ESIER, Faculté des Sciences de Gafsa, Faculté des Sciences Tunis, INAT, INRAT, IRD, IRESA, IRA, ISA, DGGREE.
From Syria: ACSAD – DWR, Damascus University, Syrian Ministry of Irrigation, Aga Khan Foundation, GCSAR, DAWSSA, GCEA, AECS.
From Morocco: IAV, ORMVA Haouz, Secrétariat d'Etat chargé de l'Eau, PIN – PCRD, HCEFLCD, SEE Maroc, ORMVA Tadlos, ONEP.

From Lebanon: UL Faculty of Agriculture, CNRS RSC, AUB, CNRS Liban, MEWR Lebanon, Litani River Authority, USJ Beyrouth, WATMED, MOA Lebanon, UN-ESCWA, AUB.
From Jordan: UoJ (FoA), NCARE, MWI, UoJ WERSC, NCARTT, AABU, MWI – WRP, JMD.
En addition of other European organizations from France, Belgium, Sued …
This list will continue to expand and grow after the end of project when the administration task of the web site will be shared among different actors from several countries.

ACSAD established an experts' data base in three topics of the workshops. This database includes 137 names of experts belonging from 6 Arab countries, 4 European countries and one sub Saharan country. Main of the experts supplied their CV. For each, the following data are referenced: country, name, gender, degree, institution, address, e-mail address, activities, participation to SOWAMED workshops, CV (when available). This list can be displayed by name, by country or by the tree main items of SOWAMED program:

- Cultivated watersheds in hills and mountains,
- Management of irrigated perimeters,
- Water and land use planning.

This data base of experts is available on the intranet (Login and password are needed): http://www.sowamed.ird.fr/intranet.php?menusection=network

As the experts are belonging to SOWAMED network, they have a login and a password. If a new member wants to be on the list, he (she) applies to ACSAD and he (she) will receive a login and a password and he (she) will be able to fill his profile. He (she) will be allowed to attach all the files he wants to give his CV and/or description of his (her) institution, and/or his (her) motivation.

This data base is completed by the description of 71 institutions in Europe or in MPC performing research or using results of research in Soil and Water Management in North Africa and Middle East.

ACSAD has already begun to make the promotion of these experts and plans to pursue this activity through these various workshops and conferences which it organizes in the Arabic world.

This promotion is also made by the proposition of these experts to the various current projects. ACSAD uses this expert's list for the trainings which it organizes. ACSAD makes a commitment to diffuse to these experts all the useful information. The database of the experts includes an engine to edit E-mailing lists following various criteria: countries, institutions, topic…

Translation into Arabic of the SOWAMED Website

The translation of the website is completely performed. It will be very soon on line. Managers for the website have been trained, so that almost 3 partners from the MPC will be able to up-date it.

SOWAMED – SICMED workshop in Damascus

This workshop was not planned in the contract. It was strongly asked by two partners from MPC (UoJ and ACSAD) who wanted:

- to make a last point on the various subjects of SOWAMED to highlight crosscutting issues,
- to plan SOWAMED network in the future by catching the opportunities offered by the scientific projects within the framework of new "Chantier Méditerranéen" launched by President Sarkosy during the European presidency of France.

The proposal to organize this last workshop was unanimously agreed and encouraged by the advisory board and by the scientific council of SOWAMED. A request to fund this event was directly sent to the IRD. IRD gave 5000 euro organize this workshop. We decided that this sum would be used for the organization of the workshop and for the training session to manage the Web site. The participants would take in charge their journey.

The workshop took place in Damascus on June 1-2 of 2009 at ACSAD campus. One day training followed the workshop and focused on the transfer of the website to ACSAD server and on management to update the website.

The agenda of the workshop was:

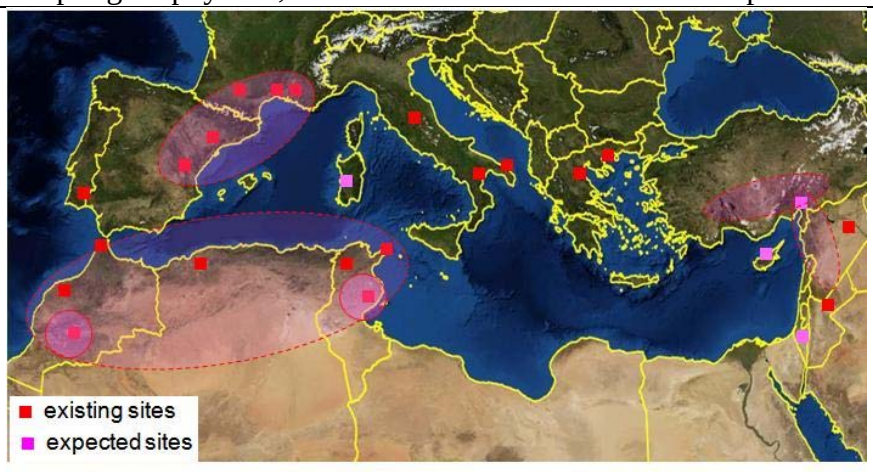
- Introducing the DAMASCUS Workshop: Dr Abdallah Droubi, Prof Shatanawi.
- SOWAMED PROJECT, Framework, objectives, results: Jean Albergel, Jacques Claude.
- Topic "cultivated watersheds in hills and mountains" Tunis workshop (28 February to 1st March 08), state of the art, advances done by the INCO MED Program, Needs in new research programmes. INRGREF, Slah Nasri, Raoudha Mougou
- Topic "irrigated perimeters" Amman workshop (1-3 June 2008), state of the art, advances done by the INCO MED Program, Needs in new research programmes. UoJ, Prof Mohamed Shatanawi, Dr Jawad Al Bakri
- Topic "Land and water management" Rabat workshop (27 – 28 October 2008), state of the art, advances done by the INCO MED Program, Needs in new research programmes. IAV, Prof Mohamed Mejjati Alami
- Training in SOWAMED, and continuation of EU-collaboration through Erasmus Mundus and use of data and software from previous EU-projects. Lund University, Prof Ronny Berndtsson
- Involving civil society in soil and water projects, gender issues : IDC, Anna Balzarini
- Dissemination, offers of expertise ACSAD, Dr Omran Alshihabi
- Presentation of "chantier Méditerrannée" Jean Albergel
- SICMED ; project on studying continental surfaces and interfaces in the Mediterranean: Marc Voltz and Ghani Chehbouni
- Round table: how SOWAMED NETWORK can be a partner in SICMED...

The most convincing result of this workshop was the participation of SOWAMED network into the future SICMED project. The main objective of this project is to study the changes in the functioning of Mediterranean eco-anthropo-systems as constrained by climatic and human pressures. The observation and the modeling of hydrological and biogeochemical fluxes at the continental interfaces will allow understanding (i) biotechnical mechanisms, (ii) biophysical mechanisms. The study of mechanisms is not only to increase knowledge, but also to improve the management of the Mediterranean eco-anthropo-systems. For that, the project will aim to seek innovative management strategies of the Mediterranean eco-anthropo-systems and to develop tools and methodologies for managing natural resources and landscapes.

SICMED project wants to build a multilateral project that enables to repeat similar research in different countries. It will be involved in the following environmental issues:

- Rarefaction of water resources already limited
- Soil degradation (erosion, salinization, artificialization, compaction)
- Decrease in carbon content of soils by land cultivation
- Soil and water contamination (nitrates, xenobiotics, metal traces,..)
- Deforestation
- Loss in biodiversity and landscape diversity
- Hot spot of climate change (increasing temperature, decreasing rainfall)

The following chart shows the different sites chosen by SICMED project and gives the observation and modeling strategy. All the chosen sites in North Africa and Middle East are former sites of INCO-MED projects. Several sites in Europe have been also already studied in INCO MED projects or in European STD projects.

<table>
<tr><th colspan="5">SICMED – Observation and Modeling strategy
A nested approach from the local EAS to the landscape and regional scales</th></tr>
<tr><td></td><td>Field scale</td><td>Landscape scale
Catchment</td><td>Small region
Basin</td><td>Large region</td></tr>
<tr><td></td><td colspan="4">Experimental sites
Coupling biophysical, biotechnical and socio-economical processes</td></tr>
<tr><td>Observation
• field
• Remote sensing</td><td colspan="4" rowspan="3"> 
</td></tr>
<tr><td>Modeling
• Processes
• Integration
• Participative</td></tr>
<tr><td>• data bases & GIS
• Capacity building</td></tr>
</table>

(Marc Voltz)

SICMED project would like to promote the following elements of scientific strategy:

- Favoring regional approaches and avoid isolated case studies,
    - select a range of representative eco-anthropo-system,

    - perform studies over nested spatial scales (local, field, catchment, region) or over gradients of ecosystems.
- Developing systemic approaches of eco-anthropo-systems,
    - by linking biophysical/biotechnical and social sciences approaches,
    - by studying the interactions of several functions of the eco-anthropo-systems.
- Defining research targets that are specific to the sustainable development of Mediterranean eco-anthropo-systems.
- Studying new management strategies as much as possible.

Conclusions

Over a period of 30 months, SOWAMED reached its main objectives :

1. SOWAMED established a network of scientists and stakeholders working on soil and water management in the Mediterranean Basin. SOWAMED inventoried, assembled, and organized the results from 68 different INCO-MED projects focussing on environmental issues and their impacts on water and soils.
2. SOWAMED sat up a reference data base, GIS, and DSS, as well as modeling tools developed through the projects.
3. SOWAMED facilitated the development of expertise on sustainable water and land management and on risk prevention by promoting the most suitable tools put forth by the INCO MED program. SOWAMED achieved this objective through regional workshops focusing on three specific issues: the management of cultivated watersheds in mountains and hills (water conservation management and land development); the management of traditional irrigated perimeters (small and medium hydraulic works SMH) and intensive irrigation systems; and the management of water and land used especially in peri-urban agricultural perimeters (competition for land and the use of non-conventional water resources).
4. SOWAMED gave an opportunity to reinforce capacities of expertise: training sessions have been organized for young researchers and post-doctoral fellows as well as for decision makers in services and development agencies. These training sessions covered 12 to 15 trainees each and are available on the Web. SOWAMED trained a PhD student who defended her thesis Water erosion modeling using fractal rainfall disaggregation, a study in semiarid Tunisia, on 12 June, 2009, at Lund University. She used for that the data and the field experiments of the INCOMED Project HYDROMED.
5. SOWAMED dissemination and valorised many methodologies and data obtained through the INCOMED programme on soil and water. ACSAD promoted the INCOMED expertise on soil and water in all Arab countries including the non Mediterranean Arab countries (Emirates, Kuwait and Arabia) where Euro-Mediterranean expertise can be easily exported.
6. SOWAMED produced 7 academic papers, published or accepted in international review. This deliverable is not usual for a SSA.
7. Finally, SOWAMED allowed gathering researchers of different academic and non academic organizations in the Mediterranean countries. These researchers are ready to launch a new large scale research project on the analysis of the processes on the continental surfaces of the Mediterranean basin and at the interfaces Soil / Agro-systems / Hydro-systems / atmosphere. The main field experiments set up by INCOMED program will be revisited and used.

Appendix 1: List of projects analyzed by SOWAMED

N°	Title	Acronym		Programme	Starting	Ending
1	Development of remote sensing technics for evaluating the spatial and temporal distribution of hydrological parameters in arid basins		IC18-CT-1997-0154	INCO	01/11/1997	30/04/2001
2	Effects of land use and land management practices changes on land degradation under forest and grazing ecosystems		IC18-CT-1997-0147	INCO	01/11/1997	31/10/2000
3	Mediterranean cooperation for water desalination policies in the perspective of a sustainable development		IC18-CT-1997-0142	INCO	01/10/1997	30/11/2000
4	Interaction between migration, land and water management and resource exploitation in the oasis of the Maghreb		IC18-CT-1997-0134	INCO	01/03/1998	28/02/2001
5	Combining systematic and participatory approaches for developing and promoting strategies for sustainable land and water management		IC18-CT-1996-0107	INCO	01/11/1996	31/01/2000
6	Impact of climate variability on agro-ecosystems and water resources in drylands		IC18-CT-1996-0069	INCO	01/01/1997	30/06/2000
7	Sustainability and optimisation of treatment and use of wastewater in agriculture		IC18980272	INCO	01/10/1998	30/09/2002
8	Effects of land use and land management practices changes on land degradation under forest and grazing ecosystems		IC18970147	INCO	01/11/1997	31/10/2000
9	Developing sustainable water management for the Jordan Valley	J.V.W	IC18-CT-1997		01/11/1997	30/04/2001
10	Optimising marginal resources in intensive horticultural production in Southern Turkey and Northern Egypt		IC18-CT-1996-0082		01/12/1996	30/06/2000
11	Modulation of plant-bacteria interactions to enhance tolerance to water deficit for grain legumes in the Mediterranean dry lands	AQUARHIZ	INCO-CT2004-509115	FP6-INCO	01/03/2004	28/02/2007
12	From river catchment areas to the sea: A comparative and integrated approach to the ecology of Mediterranean coastal zones for sustainable development	MED-CORE	ICA3-CT-2002-10003	INCO 2	01/12/2002	30/11/2005
13	Co-ordination action for autonomous desalination units based on renewable energy systems	ADU-RES	INCO-CT2004-509093	FP6-INCO	01/04/2004	30/09/2006
14	Sustainable Management of Water Resources by Automated Real-Time Monitoring	ALERT	505329	FP6-INCO	01/06/2004	31/05/2007
15	Mitigation of Water Stress through new Approaches to Integrating Management, Technical, Economic and Institutional Instruments	AquaStress	511231-2		01/02/2005	31/01/2009
16	Multi-stakeholder Platform for ASEM S&T cooperation on sustainable water use	ASEMWATERNE	INCO-CT2005-510897	FP6-INCO	01/09/2005	31/08/2009
17	A system approach to wastewater biotreatment for the protection of Mediterranean coastal areas	BIOWATSYST	IC18-CT-1997-0163	INCO	01/11/1997	28/02/2001
18	Changes in arid Mediterranean ecosystems on the long term through earth observation	CAMELEO	INCO-DC ERBIC18CT97 0155	INCO	01/01/1998	31/12/2001
19	Effects of climate change variability in water availability and water management practices in Western	CLIMED	ICA3-CT-2000-30005	INCO 2	01/03/2001	31/05/2004

N°	Title	Acronym		Programme	Starting	Ending
	Mediterranean					
20	Sustainability of Mediterranean coastal lagoon ecosystems under semi-arid climate	COLASU	ICA3-CT-2002-10012	INCO 2	01/07/2002	30/06/2005
21	Development of cost-effective reclamation technologies for domestic wastewater and the appropriate agricultural use of the treated effluent under (semi-) arid climate conditions	Coretech	ICA3-CT-1999-00012	INCO 2	01/04/2000	31/12/2003
22	A future for the Dead Sea Basin: Options for a more sustainable water management	DEAD SEA	ICA3-CT-2002-10019	INCO 2	01/02/2003	31/01/2006
23	A Surveillance System for Assessing and Monitoring of Desertification	DESURVEY	3950	FP6-INCO	11/03/2005	10/03/2010
24	Innovative decision making for sustainable water management in developing countries	DIM-SUM	INCO-CT2004-510905	FP6-INCO	01/01/2005	30/06/2008
25	Deficit irrigation for Mediterranean agricultural systems	DIMAS	INCO-CT2004-509087	FP6-INCO	01/09/2004	31/08/2007
26	A decision support system for mitigation of drought impacts in the Mediterranean region	DSS-DROUGHT	IC18-CT-1997-0169	INCO	01/11/1997	31/07/2001
27	Integrated water management of Mediterranean phosphate mining and local agricultural systems	ELMAA	15410	FP6-INCO	01/09/2005	31/08/2008
28	Evidence-based policy for integrated control of forested river catchments in extreme rainfall and snowmelt	EPIC-FORCE	INCO-CT2004-510739	FP6-INCO	01/02/2005	31/01/2008
29	Mainstreaming gender dimensions into water resources development and management in the Mediterranean region	GEWAMED	INCO-CT2005-517696	FP6-INCO	15/02/2006	14/02/2010
30	Groundwater recharge in the Eastern Mediterranean (GREM)- A comparative study on integrated evaluation techniques for groundwater resources	GREM	IC18-CT-1997-0143	INCO	01/10/1997	31/03/2001
31	Sustainable water use in mediterranean horticulture	HORTIMED	ICA3-CT-1999-00009	INCO 2	01/03/2000	31/08/2003
32	Research on lakes in hilly areas in the semi-arid Mediterranean	HYDROMED	IC18-CT-1996-0091	INCO	01/11/1996	01/04/2001
33	Interaction between migration, land and water management and resource exploitation in the Oasis of Maghreb	IMARON	IC18-CT-1997-0134		01/03/1998	28/02/2001
34	Institutional and Economic Instruments for Sustainable Water Management in the Mediterranean Region	INECO	INCO-CT-2006-517673	FP6-INCO	01/07/2006	30/06/2009
35	Improved management tools for water-limited irrigation: combining ground and satellite information through models	IRRIMED	ICA3-CT-2002-10027	INCO 2	01/04/2003	31/03/2007
36	Partial root drying : a sustainable irrigation system for efficient water use without reducing fruit yield	IRRISPLIT	ICA3-CT-1999-00008	INCO 2	01/03/2000	28/02/2003
37	The development of an innovative computer based integrated water resources management system in semiarid catchments for water resources analyses and prognostic scenario planning	IWRMS	IC18-CT-1997-0144	INCO	15/09/1997	14/01/2001
38	Geo-Information for Sustainable Management of Land and Water Resources in the Mediterranean Region	LAND WATER MED	ICA3-CT-2000-30008	INCO 2	01/05/2001	30/04/2005
39	Water Recyling and Reuse by Application of Membrane Bioreactors: Textile and Municipal Wastewater as Examples	MBR-Recycling	ICA3-CT-1999-00013	INCO 2	01/03/2000	31/05/2003
40	The inco project cluster for water application projects in the south	MEDAQUA	ICA3-CT-1999-50002	INCO 2	01/01/2003	30/07/2004

N°	Title	Acronym		Programme	Starting	Ending
	mediterranean countries					
41	Mediterranean co-ordination and dissemination of land conservation management to combat land degradation for the sustainable use of natural resources in the Mediterranean coastal zone	MEDCOASTLAND	ICA3-CT-2002-10002	INCO 2	01/10/2002	0000-00-00
42	Mediterranean Cooperation for Water Desalination Policies in the Perspective of a Sustainable Development	MedCoDesal	ERBIC18CT970142		10/01/1997	30/09/2000
43	Advanced technologies for treatment of industrial and coastal waters of the Mediterranean Region	MEDINDUS	INCO-CT2004-509159	FP6-INCO	01/10/2004	30/09/2007
44	MEditeranean Development of Innovative Technologies for intergAted waTer managEment	MEDITATE	INCO-CT2004-509112	FP6-INCO	01/05/2004	30/04/2007
45	Mediterranean Drought Preparedness and Mitigation Planning	MEDROPLAN	2003 / 059-770		15/06/2003	07/01/2007
46	Mediterranean usage of biotechnological treated effluent water	MEDUSA	ICA3-CT-1999-00010	INCO 2	01/03/2000	31/08/2004
47	Policy Initiative to Overcome Water Competition between the Vital Economic Sectors of Agriculture and Tourism in the Mediterranean	MEDWATER P.	ICA3-CT-2000-30002	INCO 2	01/05/2001	30/04/2003
48	Mediterranean Dialogue on Integrated Water Management	MELIA	517612	FP6-INCO	01/09/2006	01/09/2009
49	Monitoring and modeling coastal lagoons: making management tools for aquatic resources in North Africa	MELMARINA	ICA3-CT-2002-10009	INCO 2	01/12/2002	28/02/2006
50	Network on Governance, Science and Technology for Sustainable Water Resource Management in the Mediterranean	NOSTRUM-DSS	INCO-CT-2004-509158	FP6-INCO	01/08/2004	31/07/2007
51	Optimisation for Sustainable Water Resources Management	OPTIMA	INCO-CT-2004-509091		07/01/2004	30/06/2007
52	Native perennial forage plants for sustainability of farming systems in the Western Mediterranean	PERMED	INCO-CT2004-509140	FP6-INCO	01/10/2004	30/09/2008
53	Diagnosis and control of salinity and nitrate pollution in Mediterranean irrigated agriculture	QUALIWATER	INCO-CT2005-015031	FP6-INCO	01/01/2006	31/12/2009
54	Integrated Decision Support System for Risk Assessment and Management	RAMWASS	SUSTDEV-2005-3.II.2.1	FP6-INCO	01/01/2006	01/07/2008
55	Control of bacterial regrowth in water supply distribution systems in watershort European and Mediterranean countries	REGROWTH	IC18-CT-1997-0136	INCO	01/11/1997	30/06/2001
56	Renewables for isolated systems - Energy supply and waste water treatment	RISE	INCO-CT2004-509161	FP6-INCO	01/12/2004	30/11/2007
57	Traditional water techniques: Cultural heritage for a sustainable future	SHADUF	INCO-CT2004-509110	FP6-INCO	01/07/2004	30/09/2007
58	Sustainable Management of Scarce Resources in the Coastal Zone	SMART	ICA3-CT-2002-10006	INCO 2	01/09/2002	31/08/2005
59	Soil and Water Management in the Mediterranean	SOWAMED	INCO-CT-2007-043613		30/04/2007	30/06/2009
60	Sustainable Water Management in Mediterranean coastal aquifers: Recharge Assessment and Modeling Issues	SWIMED	ICA3-CT-2002-10004	INCO 2	01/01/2003	31/12/2005
61	A strategic approach for the implementation of policies aiming to prevent the environmental problems caused by toxic metal cations in industrial wastewater	TOXMET	ICA3-CT-2000-30006	INCO 2	01/01/2001	31/12/2003
62	Water demand management knowledge base in the Mediterranean	WADEMED	ICA3-CT-2002-10014	INCO 2	01/01/2003	31/12/2006
63	WAter supply watersheD planning and	WADI	ICA3-CT-	INCO 2	01/04/2001	31/07/2004

N°	Title	Acronym		Programme	Starting	Ending
	management: an Integrated approach		2000-30007			
64	Water Resources Management under Drought Conditions: Criteria and Tools for Conjunctive Use of Conventional and Marginal Waters in Mediterranean Regions	WAM-ME	lCA3-CT-1999-00014	INCO 2	01/04/2000	31/03/2003
65	Water Saving in Mediterranean agriculture	WASAMED	ICA3-CT-2002-00013	INCO 2	01/01/2003	31/12/2006
66	WATer use Efficiency in natural vegetation and agricultural areas by Remote sensing in the MEDiterranean basin	WATERMED	ICA3-CT-1999-00015	INCO 2	01/02/2000	01/02/2004
67	Management improvements of WUE and NUE of Mediterranean strategic crops (wheat and barley)	WatNitMED	INCO-CT2004-509107	FP6-INCO	01/01/2005	31/12/2008
68	Wastewater recycling of olive mills in Med countries - Demonstration and sustainable reuse of residuals	WAWAROMED	ICA3-CT-1999-00011	INCO 2	01/03/2000	31/05/2003

Appendix 2: SOWAMED Website: User cases scenarios, General functional requirements, Security and access control.

User cases senarios

User case 1: Super administrator

The super administrator can view all project's information, enter new projects, edit or delete them from the database via the web interfaces. He has the same privileges for the experts, e-forum and website content.

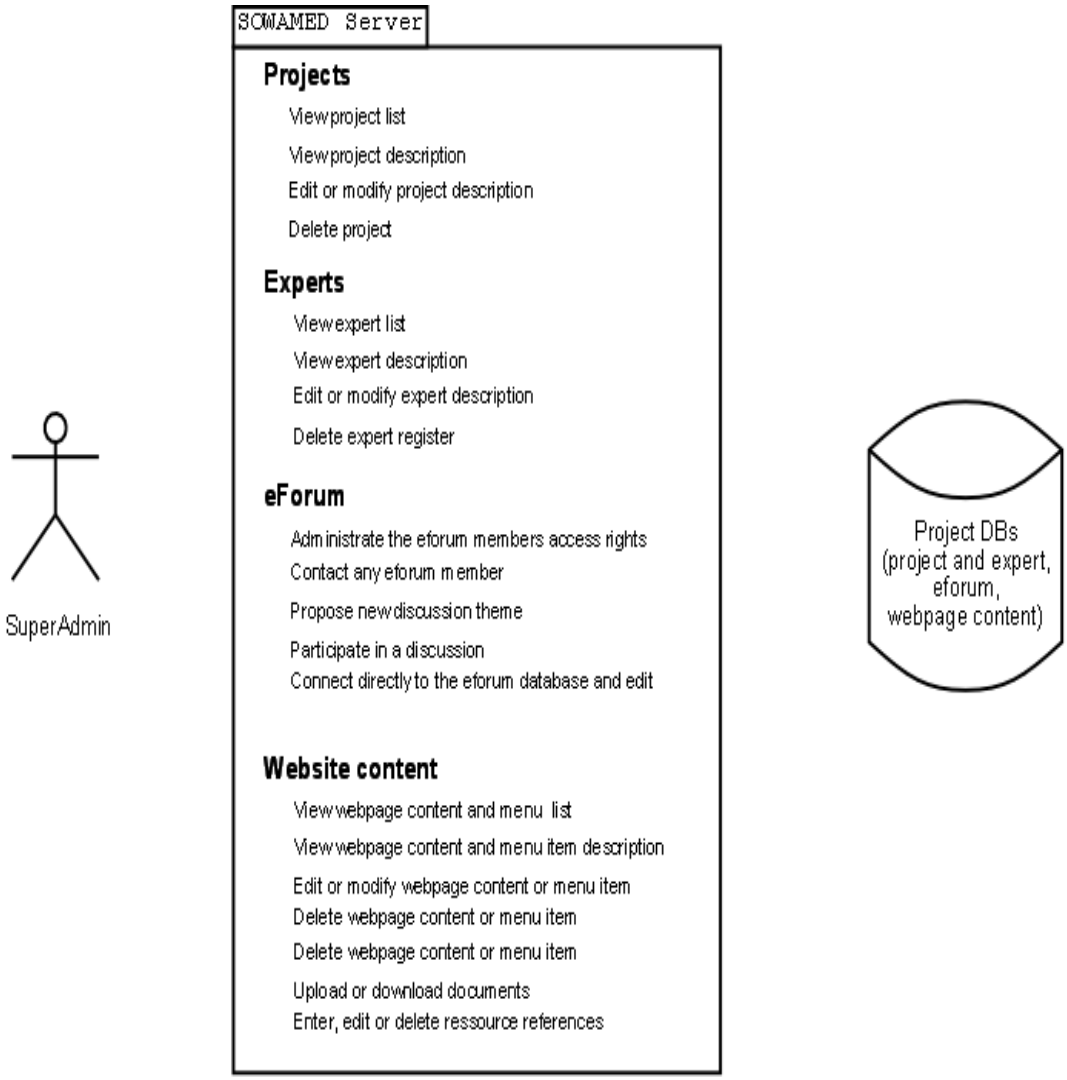


Figure 1 : User case 1 – Super administrator of the Internet / Intranet Platform

User case 2: Administrator

All management board members of SOWAMED project are administrators. The administrator can access all informations concerning the projects and enter new ones, view the experts network registers, view and edit an expert profile he entered to the database, participate in the e-forum and propose new themes, upload or download resources. The administrator can not change the website content unless he or she is authorised to do so (controlled by his status).

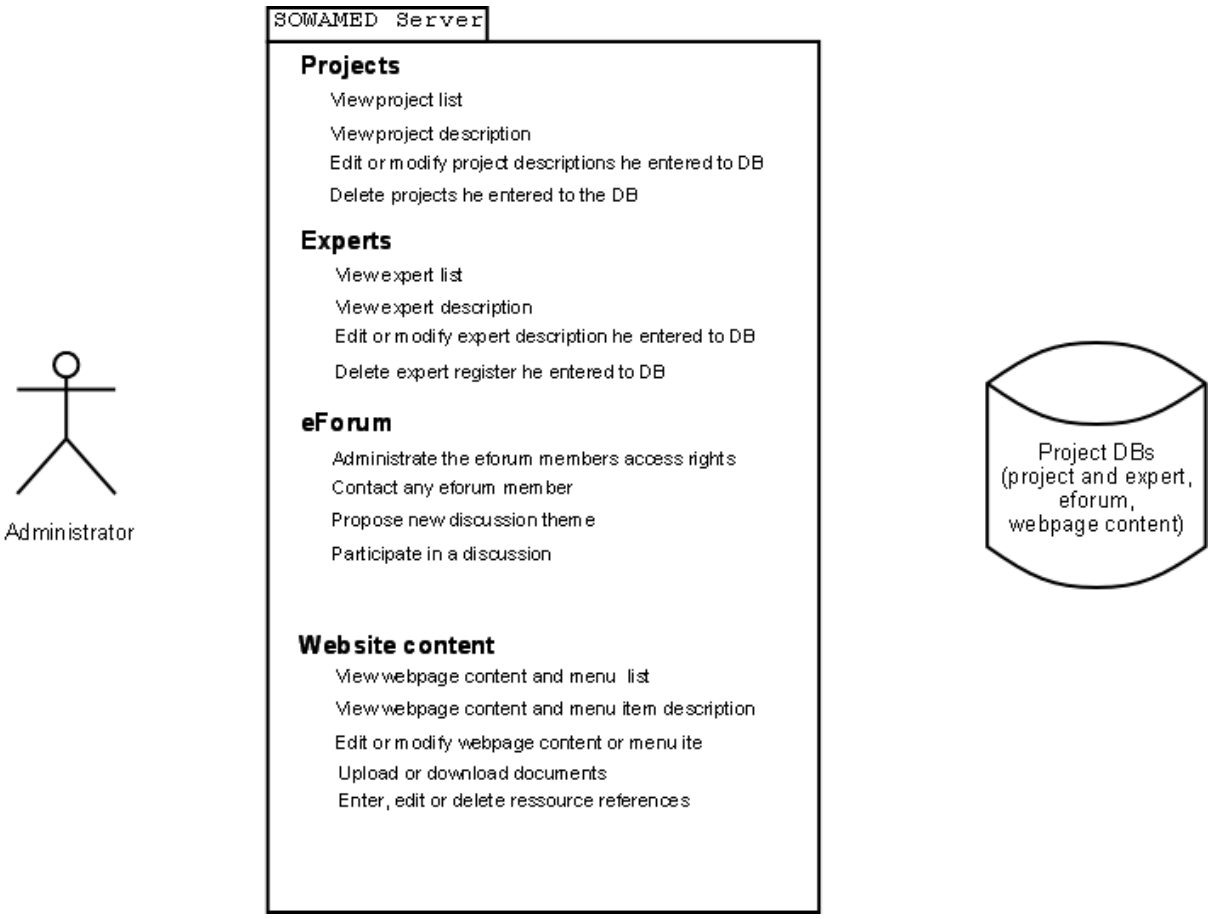


Figure 2: User case 2 - the administrator of the Internet / Intranet web platform

User case 3: External expert member – not a partner of SOWAMED

This case includes all those who subscribe as conformed or young experts to the Network. An External expert member becomes one by creating an account (need of a form) which must be confirmed by an administrator. Afterwards, he can edit or delete his profile. He can contact other experts and consult the Expert Network database. As any other user he can consult freely the referenced project's database by the web interfaces and propose new projects (by describing them). He can upload or download any relevant resource and enriched the documentary references (e.g. bibliographie).

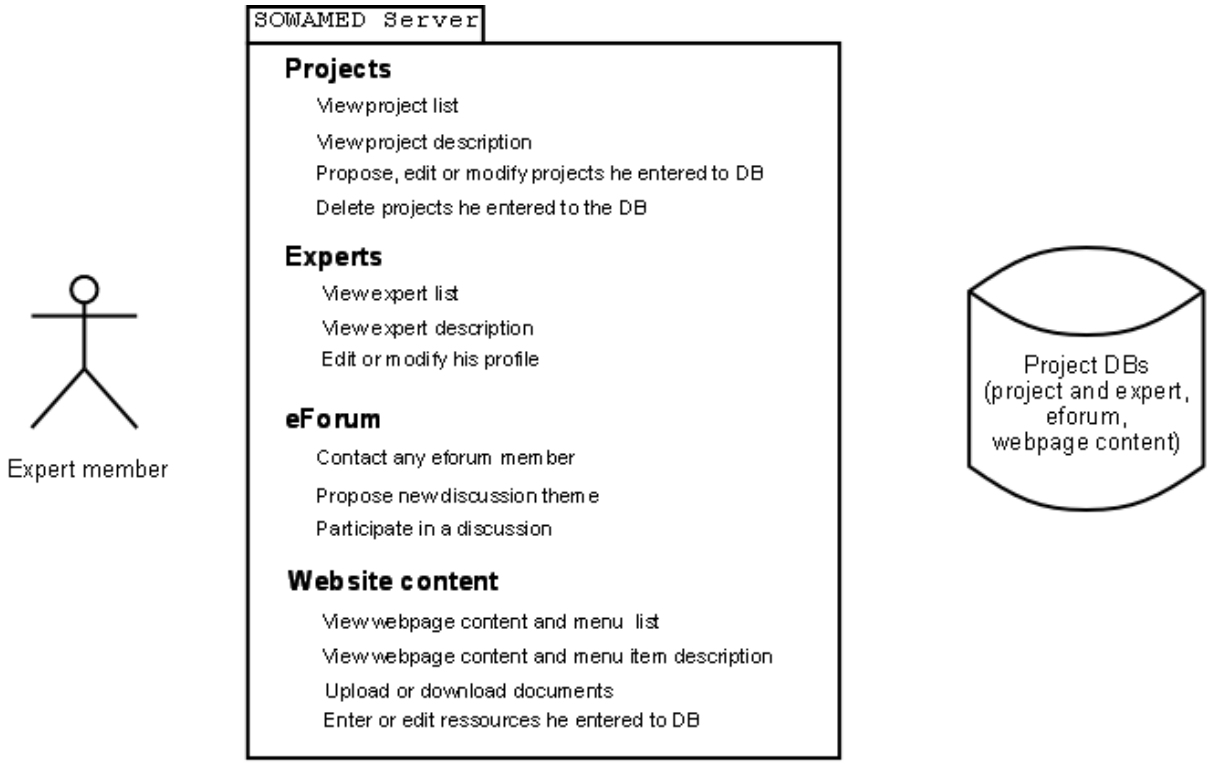


Figure 3: User case 3 - The Internet / Intranet platform services proposed to an expert, member of the network.

User case 4: Development agent

A development agent or decider is the targeted public of SOWAMED. He needs expertise advise or accurate information on methodologies and expertise on sustainable and land management in the Mediterranean.

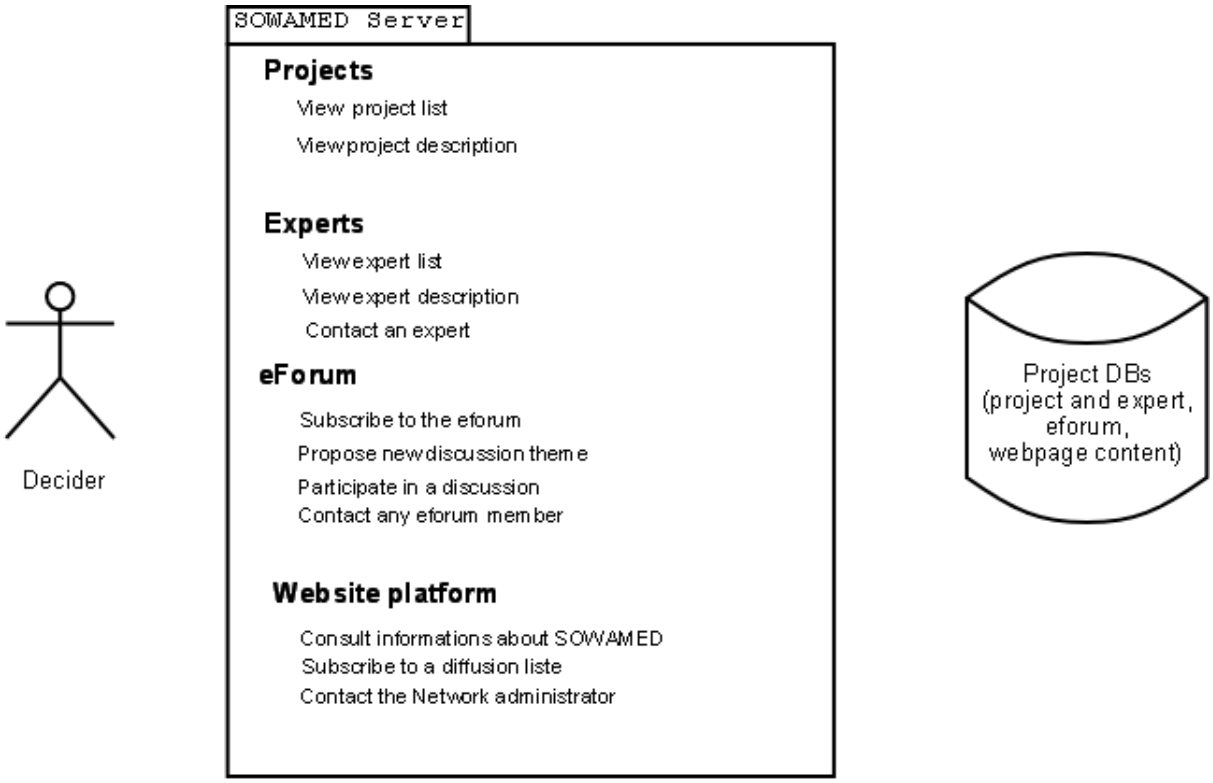


Figure 4: User case 3 - The Internet / Intranet platform services proposed to a decider

User case 5: Everybody

Anyone that wants to have more information about SOWAMED must have access to the entire website and the project reference database. Consulting the network is more delicate because the network member must authorise it.

The purpose of this section if to provide a clear statement of what the user requires so that the design and implementation stages can follow and admit to verification.

General functional requirements

SOWAMED information services include the creation an complete description of INCO-MED projects, or other relevant project, with its methods, models and data used, contacts and participants. Project information can be manually or automatically integrated in the reference database. SOWAMED information services must permit to enter an expert profile by the administrator or the register expert.

List of general functional requirements

R1 The information model should facilitate consistent integration of the project description in the reference database.
R2 The interface should permit the integration, edition and deletion of a project.
R3 The interface should permit the integration, edition and deletion of an expert profile.
R4 The public interface should be capable of supporting requests for parts or a whole project description.
R5 The server should be capable of accepting and responding requests for a single project or a collection of projects
R6 The server should be capable of accepting downloading and uploading of documents (linked or not to projects)
R7 The server must be capable of collecting, structuring and providing information from and to other servers describing the projects (e.g. EMWIS/SEMIDE)
R8 The server should be capable of generating an output to the end-user application corresponding to the original request.
R9 The server should make information accessible to end users in a safe and secure way

Security and access control requirements

Personal information held in a computerised form must be secure. The network members must authorised agents to request or consult their profiles. At least two levels of access are required. Access for the administrators of the system and access for the members: experts, doctoral and development agent. Only authorised users can enter new project information in the reference database or in the experts Network database. Authorised users must be registered and each time they have to identify themselves when they wish to edit any information.

R10 The information model should contain the necessary features to enable the identification of the agents
R12 The information model should contain the necessary features to facilitate safe exchange of personal data among agents
R13 The information model should contain the necessary features to allow levels of authorisation to exist. These levels determine what the identified agent can or cannot do, what he can or cannot consult or request. This status must be transparent for the agent
R14 The interface should be capable of supporting the connexion and de-connexion of an agent to the system

Representation of the projects and expert profile

The structure and content of the records used to contain the project information is very important if such records are to be recognisable and comprehensible between organisations, and understandable across national and cultural boundaries[1].

R14 The information model should permit the representation of any kind of information used in recording project information (e.g. models, methods, persons)

R15 The information model should contain necessary features to facilitate exchange of records (specially project) between information sources holding relevant project information (e.g. EMWIS, EC programmes)

Preservation of meaning

Project representation and expert profiles are representations or abstractions of reality. The information model and system requirements must satisfy the main themes of SOWAMED who give the general meaning to the structure. Projects and expert recorded should be relevant for the needs of the project and the global strategy which is to improve water planning and management for enhancing water supplies, with sensitivity to local, physical, and cultural conditions in the MPC.

Status of agents and its privileges

Status	**Status**	**Privileges**
Super administrator	4	Complete access to all sections of the web platform (Internet / Intranet) and right to enter, edit or delete information.
Administrator	3	Complete access to the web platform with partial right to edit access to enter, edit or delete information under his or her responsibility. Example, he can enter and edit the catalogues He must be registered and his access controlled by login and password.
Coordinator	2	Access to the network website by login. He can edit or delete his profile, upload resources, consult the catalogues, contact any member of the network. He must be registered and his access controlled by login and password. The super administrator and the administrators are network members by default
Network member	1	Anyone who is registered or has an account. His access is controlled. He or she can access all sections of the *Internet* platform and a limited access to the Intranet or network

[1] Enterprise Viewpoint. Health Telematics Programme. Part 2 page 78. Synapses HC 1046

Status	Status	Privileges
		website. He can consult and contact any member of the network. He can consult the catalogues.
Everybody	0	Access to all sections of the Internet platform.

Information needs

This section describes the information needs of SOWAMED project: information models, information structures, information flows, information manipulation. These needs will be identified based on the information communities mentioned in the precedent section: project members, experts' network and those who search expert advice to make decisions.

We remind that the main goals of SOWAMED are to:

- *Create the INCO-MED projects Reference Database*
- *Establish an Expertise Network*
- *Implement a network web platform*

From the project goals we can identified three important features: the projects to be referenced, the profiles of the expertise network members and the outputs of SOWAMED generated by its activities. The projects must be described in a structured frame (DBMS) to be exploitable and request possible (e.g. by country, name, identifier, model). For the expertise network we need also a structured model to enter the experts' profiles if possible with a short CV. Another important information needs are the partners'points of views. SOWAMED activities should motivate discussion between the partners as a need for the implementation of above mentioned materials. Interfaces must be developed to request and access the referenced projects, the expertise network profiles and any other resource.

The general procedure to gather and diffuse information is:

1. Selection of projects to be analysed and synthesised from the INCO-MED program
2. To collect the information from projects publications and final reports (each participant will contribute in collecting all information available in their countries including works and application achieved in continuation of EU projects.) Information can be gathered personally with the project responsibles (during workshops, meeting, telephone, mail)
3. Create an Internet Platform structuring gathered information
4. Create and manage an e-Forum to discuss about the project activities

Information sources

Sources for the INCO-MED projects reference database

Two important sources identified for the selection and description of the INCO-MED projects are:

1. EMWIS (Euro-Mediterranean Information System on know how in the water sector) project database. http://vague.eurecom.fr/initiatives/fol060732
2. The EU database of the Water initiative projects which includes the INCO-MED program. Use one or several search criteria and you will access a list of projects matching your search criteria. http://ec.europa.eu/research/water-initiative/index2_en.cfm

For the exchange of information with EMWIS we will use the XML schema for water related projects in the Euro-Med area. For the EU Water Initiative Projects we will try to recuperate or import project descriptions from the mentioned. Our goal is to insert specific information on methods, models, publications, experts, participants.

Another important information source are personal contacts: persons who participate or participated in the selected projects. This can be done by mail, phone, meeting, workshop.

For the expert profiles repertoire the sources are partners existing networks. Another source will be the INCO-MED project catalogue, articles, documents, reports, websites.

Reference data models

SOWAMED data model is based on the following existing European data models:

- **CRIS (Current Research Information Systems)** [2], the CERIF (Common European Research Information Format)[3] data model actually in the hands of EuroCRIS (the European Current Research Information Systems)[4].
- **XML project structure schema** built by EMWIS (Euro-Mediterranean Information System on know-how in the Water sector)[5] model created also for exchange purposes.

The main entities of our model are the projects, the persons (participating or not in a project or registered as expert), the organisations (e.g. partners) and the results (publications, models, databases). Each project implements or uses *methods* and *models* to achieve their goals. Many persons can participate during the project's lifetime assuming different roles: project head, general coordinator, national coordinator, experts, beneficiary. Persons may belong or represent one or several organisations. Projects generate results of different nature (articles, reports, databases, models, methods, etc.) in different supports and formats (images, videos). SOWAMED pretends to capitalises this outputs or results. The experts are persons with special skills in some domain(s). These skills can be attached to a region (e.g. Mediterranean).

Relationships exist between instances of the main instances or between instances of the same entity. Projects can be linked by programme, country, region or participants. The used methods and models can also be criteria for classification and indexation. Figure 1 shows a first level of abstraction diagram proposed by CRIS with the three basic entities implicated in any project: the project itself, the organisations, the persons. Annex 1 gives an overview of the CRIS model.

The CRIS Model - 1st Level of abstraction – main entities

The main entities as we can see in the CRIS model are PERSON, PROJECT and ORGUNIT (ORGanisation UNIT) which are linked by N-N relations. RESULTS as entity is attached to the PERSON unit who produces this results (e.g. publications, patents).

[2] http://cordis.europa.eu/cerif/
[3] http://cordis.europa.eu/cerif/
[4] http://www.eurocris.org
[5] http://vague.eurecom.fr/initiatives/fol060732

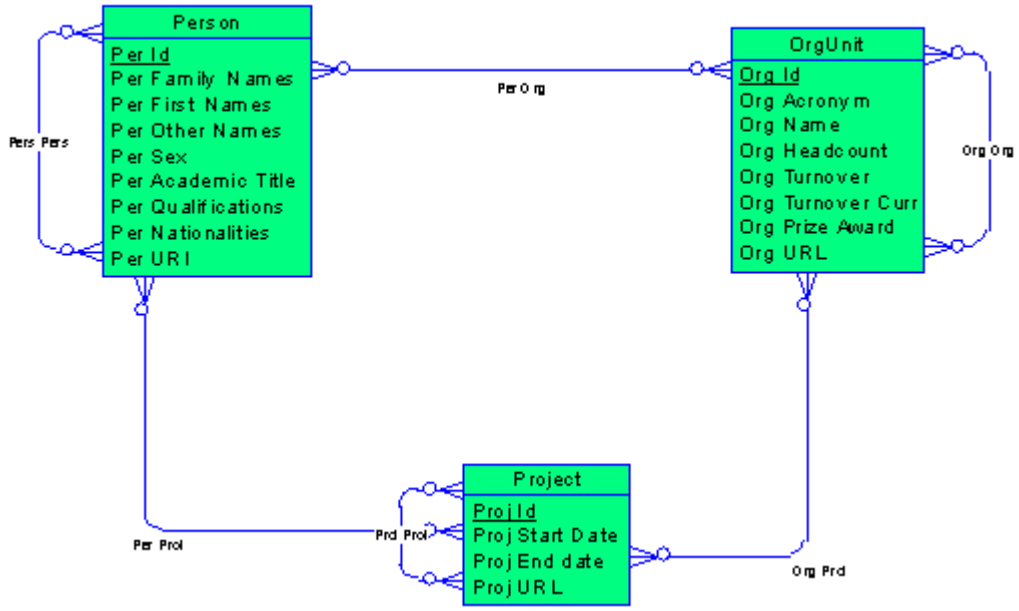


Figure 5: Main entities of the CORDIS-CRIS data model

A 2nd level of abstraction of the CRIS data model (see Annex 1) gives us more details for the PERSON entity. This level of abstraction is interesting mainly for the Expert Repertoire in the Arab region. We will keep also the 2nd level entities: CV, contact, expertise skills and results (publications, patents, product). One or many persons can participate to one or more projects for a stipulated period of time. A project can include other projects.

For the needs of SOWAMED we have to create a PROGRAMME entity and probably also a MODEL entity. This last one will be a repertoire of techniques, methods and/or identified models and their descriptions.

Appendix 3: Agenda of the workshop «development of cultivated watersheds in hills and mountains»

Programme du workshop

Atelier régional sur l'échange de méthodologie pour

"le développement des bassins versants cultivés sur les collines et les terrains montagneux"

Journée 1 : le 28 février 2008

Session 1 : Ouverture du workshop et Présentation du projet SOWAMED

08h30–09h00	Ouverture officielle :	Nejib Rejeb et Antoine Cornet
09h00–09h15	Tour de table pour présentation de personnes qui n'ont pas participé au Kick Of Meeting	Jacques Claude
09h15–09h30	Présentation du projet et de sa philosophie	Jean Albergel
09h30–09h45	Etat d'avancement, nouveau dispatching et rappel des attendus	Sergio Vallejo
09h45–10h00	Présentation du site Web	Sergio Vallejo

10h00-10h20 : Pause café

Session 2 : Présentation des projets (1ère partie)

10h20–10h40	Projets Inco retrouvés à partir du site Web	**Nasri Slah et Sergio Vallejo**
10h40–11h00	Mediterranean Drought Preparedness and Mitigation Planning. (MEDROPLAN)	**Lebdi Fethi**
11h00–11h20	Deficit irrigation for Mediterranean agricultural system (DIMAS)	**Netij Ben Mechlia**
11h20–11h40	Water demand management knowledge base in the Mediterranean (WADEMED)	**Bachta Mohamed Salah**
11h40–12h00	Gestion intégrée de l'eau dans les bassins miniers méditerranéens et les systèmes locaux d'agricultures (ELMAA)	**Jamila Tarhouni**
12h00–12h20	Mainstreaming gender dimensions into water resources development and management in the Mediterranean region. (GEWAMED)	**Khadouja Mellouli**
12h20–12h40	Mediterranean Dialogue on Integrated Water Management (MELIA)	**Mohamed Oussar**
12h40–13h00	Discussion	

13h0015h00 : Déjeuner

Session 3 : Présentation des projets (2ème partie)

15h00–15h20	Research on lakes in hilly areas in the semi-arid Mediterranean (Hydromed)	Jean Albergel et Slah Nasri
15h20–15h40	"Mitigation of Water Stress through new Approaches to integrating Management, Technical, Economic and Institutional Instruments" (Aquastress)	INRGREF-IRD
15h40–16h00		

16h00-16h20 : Pause café

Session 4 : les acquis de la recherche en matière de conservation des eaux et du sol

16h20-16h40	Ruissellement et Erosion sur les terres cultivées en pente	Hamadi Habaieb
16h40-17h00	Gestion des eaux pluviales et des sols sur les terres cultivées en pente	Damien Raclot
17h00-17h20	Les aménagements de CES : type d'aménagement et impacts sur le cycle de l'eau et les cycles associés)	Slah Nasri
17h20-17h40	La modélisation du ruissellement et de l'érosion sur les terres cultivées en pente	Roger Moussa

17h40-18h00 : Discussion générale

Journée 2 : le 29 février 2008

Session 5 : la formation

08h30-09h00	Quelles formations dans les projets	Ronny Berndtsson
09h00-09h20	Liste des doctorants et des masters formés	Jacques Claude

Session 6 : les grands projets d'aménagements et de conservation des sols en pentes

09h20-09h40	Action du FIDA en Tunisie	Ghoudi Zine El Abidine
09h40-10h00	Action de l'ICARDA en Tunisie	Mohamed El Mourid
10h00-10h20	International Assessment of Agricultural Science and Technology for Development (IAASTD): definitions and objectives	Mustapha Guellouz

10h20-10h40 : Pause café

Session 7 : les grands projets d'aménagements et de conservation des sols en pentes

10h40-11h00	Stratégie de la DGACTA en Tunisie	Ali Debabria (DGACTA)
11h00-11h20	Programme au Maroc	Stakeholders from Morocco
10h20-11h40	Programme en Syrie	Stakeholders from Syria
11h40-12h00	Programme en Jordanie	Stakeholders from Jordan
12h00-12h20	Programme en Algérie	Stakeholders from Algeria

Session 8 : table ronde quels besoins en recherche pour les Stakeholders (1ère partie)

12h20-12h40	Programmes prioritaires de recherche en matière de conservation des eaux et du sol	Anis Ben Rayana (IRESA)
12h40-13h00	Quels besoins en recherche pour les Directions techniques	Mohamed Boufaroua (DGACTA)
13h00-13h30	Discussion quels besoins de recherche pour le développement	Habib Farhat (DG/ACTA)

13h30-15h00 : Déjeuner

Session 9 : table ronde quels besoins en recherche pour les Stakeholders (2ème partie)

15h00-16h00	Discussion quels besoins de recherche pour le développement	Habib Farhat (DG/ACTA)
16h00-17h00	Préparation des rapports scientifiques et financiers du projet SOWAMED Programmation future du projet SOWAMED (prochains workshop et atelier de formation)	Jean Albergel
17h40-18h00	Clôture du workshop	Nejib Rejeb et Antoine Cornet

Journée 3 : le 01er mars 2008 visite de terrain :

Visite du site de l'Observatoire Méditerranéen de l'Environnement Rural et de l'Eau : Bassins versants de Kamech (IRD+INRGREF)

Appendix 4: Agenda of Regional workshop on methodology exchanges « management of irrigated perimeters »

Methodology Exchange: management of irrigated perimeters
1-2 June, 2008, Amman, Jordan

Day 1: Sunday, June 1st, 2008		
08:30-9:00	Registration of participants	
09:00-9:30	Official opening of workshop	Muhammad Shatanawi, Jordan
9:30-10:00	SOWAMED state and future activities	Jean Albergel, France Jacques Claude, France
10:00-10:30	The Results of the first workshop in Tunisia	Jean Albergel, France Jacques Claude, France
10:30-11:00	Coffee break	
11:00-11:30	SOWAMED Website	Sergio Vallejo, France
11:30-12:30	Country progress during the period 1/4/2007-31/3/2008	Tunis, Morocco, Syria, Algeria, Jordan, Sweden, France
12:30-01:00	Deficit irrigation on Lemon in Jordan	Ayman Suleiman, Jordan
01:00-02:30	Lunch break	
02:30-03:00	Deficit irrigation on Orange in Jordan	Nabil Bani Hani, Jordan
03:00-03:30	Water Resources in Morocco	Mejjati Alami Mohammed, Morocco
03:30-04:00	Coffee break	
04:00-04:30	Water irrigation management in Tassaut and perimeter	Ghayour Abdelmajed, Morocco
04:30-05:00	Management of cultivated and irrigated areas around and upstream hill reservation in semi arid regions of Tunisia.	Slah NASRI, Tunis

Day 2: Monday, June 2nd, 2008		
09:00-09:30	Application of WMS in flood management studies with case study from Lebanon	Ihab Jnad, Syria
9:30-10:00	Jordan presentation	Muhammad Shatanawi, Jordan
10:00-10:30	Combining ground and satellite information for irrigation management in Jordan.	Mohammed Jitan, Jordan
10:30-11:00	Coffee break	
11:00-11:30	Algeria presentation	
11:30-12:30	Conclusion and next millstone	Jean Albergel, France
12:30-01:00	Closing	
01:00-06:00	Lunch and field trip	

Appendix 5: Agenda of Regional workshop on methodology exchanges « Regional workshop on water and land use planning »

Regional Workshop on water and land use planning

October 27th – 28th, 2008, Rabat, Morocco

Day 1: Monday October 27th 2008

Session 1
Theme: Progress on activities of SOWAMED
9H00-9H20: SOWAMED state and future activities – J.Albergel & J. Claude

9H20-9H40: SOWAMED website news - S.Vallejo and ACSAD

9H40- 10H: Progress activities of SOWAMED in Jordan - M. Shammout

10H-10H15: Coffee break

Session 2:
Theme: Soil and water conservation planning

10H15-10H35: Management of water resources - A. Ziyad

10H35-10H55: Soil and water conservation strategies - A. Omerani

10H55-11H15: Implementation of GIS and RS for land use planning in Jordan- J. Al Bakri

11H15-12H15: Small discussion groups

Working group 1: Soil and water conservation planning

Moderator: J. Albergel - Rapporteur: S. Nasri
Working group 2: Water Resources planning
Moderator: J. Al Bakri - Rapporteur: M. Shammout
12H15-13H: Reporting on the working group results

Discussion
13H15: Lunch

Day 1: Monday October 27th 2008

Session 3
Theme : Sustainable Management of Water for Agriculture

15H-15H30: Water quality management in agriculture (Bellouti-Cherkaoui)

15H30-16H Plenary discussion (Rapporteur: Hasnaoui)

16H30-16H45 Coffee break

16H45-18H Small discussion groups

Working group 3: ***Water economy***
Moderator : K. Belabbes
Rapporteur: Bellouti - Dakak

Working group 4: ***Water quality***
Moderator: B. Soudi
Rapporteur: J. Claude

18H-18H30 Reporting on the working group results
Discussion

Day 2: Tuesday October 28th 2008

9H: visit to the dam and the water treatment plant (ONEP, Rabat)

13 H: Lunch

Session 4
Theme : WATER MANAGEMENT AND PLANNING BETWEEN URBAN AND RURAL

15H-15H30: ONEP strategy in controlling water quality (A. Outair)

ONEP experience in the cleaning and reuse of treated wastewater and sludge recovery. (M. Mahi)

15H30-16H Plenary discussion
Rapporteur: O. Alshihabi

16H30-16H45 Coffee break

16H45-18H Small discussion groups

Working group 5: ***Water reuse***
Moderator : M. Benmoussa
Rapporteur: M. Mahi

Working group 6 : ***Water use competition***
Moderator: A. Outair
Rapporteur: O. Al Shihabi

18H-18H30 Reporting on the working group results

Discussion