

DEVELOPMENT OF TOOLS AND GUIDELINES  
FOR THE PROMOTION OF THE SUSTAINABLE  
URBAN WASTEWATER TREATMENT AND REUSE  
IN THE AGRICULTURAL PRODUCTION IN THE  
MEDITERRANEAN COUNTRIES

**MEDAWARE**

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# EU-Partners

- Greece

1. National Technical University of Athens, (NTUA)

2. Prospect Systems, Civil Non Profit Corporation

- Spain

CARTIF, Centro de Automatizacion, Robotica y Tecnologias de la Informacion y de la Fabricacion

# Med-Partners

- **Cyprus** Agriculture Research Institute
- **Jordan** University of Sciences and Technology
- **Lebanon** American University of Beirut
- **Morocco** Chouaib Doukkali University
- **Palestinian Authority** Ministry of Environmental Affairs
- **Turkey**
  1. Middle East Technical University
  2. Istanbul Technical University

# Project's Objective

- The identification of:
  - The existing situation prevailed in the participating countries in regards to water and wastewater management policy
  - the existing situation related to the operation of the urban wastewater plants and the effluent disposal methods and practices applied
  - the potential negative impacts caused by the non sustainable operation of the wastewater treatment and disposal methods applied with emphasis given to wastewater reuse in agriculture

# Project's Objective

- The development of specifications for the **urban wastewater treatment technologies** and systems and also for the **wastewater agricultural reuse methods**, the aim being the presentation of those, including innovative ones, where the effluent can be safely reused and easily adapted in the regional context.
- The development of the appropriate tools and a database for the **effective control and monitoring** of the operation of the wastewater treatment plants and to develop relevant **guidelines** to ensure the safe operation of the wastewater treatment plants.

# Project's Objective

- The development of a **multi-criteria analysis user friendly software** that will guide the responsible authorities to the most efficient solutions in terms of health and safety for the agricultural reuse of the produced effluent as well as in terms of sustainable operation of the treatment unit
- Organization of a series of **training workshops**, conferences, pilot studies, etc., aiming at capacity building, information and know-how transfer and raise of awareness
- Establishment of a **network** between the authorities of the Med. Countries for the exchange of information and intra regional transfer of experience

# Description of Activities

- Duration: 42 months
- 7 Tasks
- Plus one task for  
Coordination/management

# Task : Project coordination (1/4)

## Objectives

- To have at any time a global view on the project and the main problems raised
- To ascertain the overall progress of the work
- To secure the optimum flow of information through the partners and the maximum exploitation of existing synergies
- To establish a continuous and effective communication channel between the participants

# Task : Project coordination (2/4)

- To consolidate the obtained results and their quality and prepare the reports described in the project
- To manage the dissemination activities
- To communicate with the Commission
- To contact third parties directly or indirectly in order to participate in the Conferences, the training courses and other project dissemination activities
- Reporting

# Task : Project coordination (3/4)

- UES is responsible for the meetings that are planned to take place during the project implementation and prepares all necessary documents for these meetings.
- UES has set up a project web page, which provides access to information on the project and its activities. This website will also host the final training and dissemination material.

# Task : Project coordination (4/4)

- NTUA prepares the periodic, interim and final reports.
- NTUA performs the financial coordination including financial transactions, continuous assessment of expenditure/resources, continuous communication and reporting to all partners and the Commission.
- All these activities are carried out with continuous cooperation with the phase leaders.
- A scientific committee has been established including representatives from all participating organizations in order to ensure that the project progress is in line with the time schedule and that all deliverables are of high quality and in accordance to the targets set.

# Deliverables of Project Coordination

- Project Website  
<http://147.102.83.100/projects/meda/meda.htm>
- Progress reports every six months (2 up to now)
- Interim reports
- Final report (including all required deliverables and financial documents)

# Task 1: Determination of the countries profile (M 1-6)

- **Subtask 1.1:** *Climate, Population, Water Potential/Use and Agriculture (Months 1-4)*
- **Subtask 1.2:** *Water Policy and Institutional Framework (Months 1-6)*

# Subtask 1.1

- Collection, analysis and presentation of data and information concerning climate, population, geographical distribution of population (urban, rural), population density and economic growth in each participating country (**Completed**)
- Evaluation of water balances in each country with respect to water potential (surface, ground, total) and water use (agricultural, domestic, industrial, total) in each participating country (**Completed**)
- Collection of data concerning agricultural areas in each participating country, cultivable areas and types of crops cultivated (**Completed**)

# Subtask 1.2

- Identification of policies relevant to urban wastewater treatment and reuse applied to each country on national, regional and local level (Completed)
- Collection of information and analysis of data on relevant policies implemented in EU countries the aim being the transfer of experience related to success stories (Completed)
- Identification of the standing socio-economic instruments, which aim at the sustainable treatment, disposal and reuse of the urban wastewater in the participating countries and other EU countries (Completed)

# Subtask 1.2

- Identification of the institutional framework (legislative framework, competent licensing, control and monitoring authorities) (Completed)
- Determination of the standards, limits and criteria (both qualitative and quantitative) that are applied in each country concerning urban wastewater effluents disposal and reuse (Completed)
- Identification of all actors involved in the field of urban wastewater and reuse (Completed)
- Investigation and presentation of all available national, regional, European and international funds available for the promotion of the sustainable treatment and reuse of urban wastewater in the participating countries (Completed)

# Deliverables of Task 1 (Completed, available at the project's

website, disseminated to actors involved in each country participating )

- An indicator-based report containing information related to population density, economic growth, water potential and consumption, agriculture etc, in order to illustrate the existing situation in the participating countries.
- A concise report containing:
  - analysis of the water planning and wastewater management policies, socio-economic instruments and legislation applied in the participating countries
  - presentation of the competent authorities and all actors involved in the relevant field
  - presentation of the available funding programs for the Mediterranean countries.

## Task 2: Evaluation of the Existing Situation related to the operation of Urban Wastewater Treatment Plants and the Effluent Disposal Practices with emphasis on the Reuse in the agricultural production (M 5-10)

- Collection of data concerning the number and location of wastewater treatment plants in each participating country (Completed)
- Identification of the population served by wastewater treatment plants in each country (Completed)
- Presentation of the technologies applied in the wastewater treatment plants in each country (Completed)
- Collection of data of the existing effluent quantity and quality in selected plants in each country (Completed)

## **Task 2: Evaluation of the Existing Situation related to the operation of Urban Wastewater Treatment Plants and the Effluent Disposal Practices with emphasis on the Reuse in the agricultural production (M 5-10)**

- Determination of the prevailed effluent disposal methods and practices with emphasis on wastewater reuse in the agricultural production **(Completed)**
- Identification of the impacts caused by the operation of the wastewater treatment plants and the disposal practices applied with respect to the environment, the employees, farmers and public health **(Completed)**
- Determination of pollutant removal efficiencies of selected wastewater treatment facilities of each country **(Completed)**

# Deliverables of Task 2 (Completed, available at the

project's website, disseminated to actors involved in each country participating)

- A report containing an overview and assessment of the information collected.
- The report contains the identification of the existing situation with respect to the aforementioned subjects in order to get a clear view of the actual needs and problems prevailed in each country.

# Task 3: Analysis of Best Practices and Success Stories (M7-11)

- This task includes the analysis of a series of examples of successful wastewater schemes, which incorporate sustainable treated wastewater reuse (**Completed, available at the project's website**)
  - The criterion for selecting these best practices was the contribution of the system under examination into the overall increase of wastewater reuse in the country implemented.
  - The necessary data were acquired through extensive literature review, search in the Internet, review of relevant projects, communication with experts from all over the world as well as with operators of relevant systems and schemes
- Visits to selected areas where successful systems and schemes are being applied will take place between **12-18 July** the aim being the in-depth understanding of these sustainable practices (Vitoria-Basque Countries, Tenerife)

# Deliverables of Task 3

- Report on best practices, (Completed)
  - Acquisition and dissemination of knowledge and experience of scientifically sound and effective practices on urban wastewater treatment and wastewater reuse
  - The data collected will enable the development of a design methodology for treatment of wastewaters satisfying the needs for reuse under specific climatic and other Mediterranean conditions
  - Motivation of all operators involved in water planning to implement such systems and schemes

## Task 4: Development of Specifications for Innovative Urban Wastewater Treatment Technologies and Systems (M 11-21) (Under Development)

**Subtask 4.1:** *Review of the urban wastewater treatment technologies/systems, and technical standards (Months 11-15)*

**Subtask 4.2:** *Development of technical specifications for urban wastewater treatment technologies and systems (Months 15-20)*

**Subtask 4.3:** *Training on the urban wastewater treatment technologies and systems (Months 20-21)*

# Subtask 4.1

- Review of all urban wastewater technologies, methods and systems currently applied tailored to the special characteristics of the participating countries. All alternative technologies will be analyzed in respect to the following issues: technical, technological, economical, social, energy, safety, health, etc.
- Review of the effluent treatment standards that are currently accepted in order to protect public health and ensure safety. The effectiveness of any treatment technology must be directly correlated to the end–use and the associated water requirements with emphasis on agricultural reuse.

# Subtask 4.2

- **Development of specifications and information sheets for those urban wastewater treatment technologies and systems that can be adapted to the regional context of the Mediterranean countries.**
- **Presentation of indicative economic data for the relevant wastewater technologies and systems**

# Subtask 4.3

- Two-day training workshops will be organized in each participating country where all actors involved will be invited to attend seminar lectures on various issues related to urban wastewater treatment technologies and systems. (back to back with activity 5.3)

# Deliverables of Task 4

- Specifications and information sheets for the urban wastewater treatment technologies and systems that can be adapted to the regional context of the Mediterranean countries
- Through the training activities that will be organized the actors involved will be equipped with the necessary knowledge and information in order to promote the appropriate technologies and systems in their territories
- These specifications and all other relevant information will be uploaded at the project's website, presented in forum discussions that will also be organized in the framework of the project website.

# Task 5: Development of Specifications for urban wastewater utilization (M 21-26)

- Subtask 5.1: Review of the urban wastewater reuse systems focusing on the reuse in agricultural production (Months 21-22)
- Subtask 5.2: Development of specifications for the urban utilization focusing on the reuse in agricultural production (Months 22-25)
- Subtask 5.3: Training on the urban wastewater reuse technologies and systems (Months 25-26)

# Subtask 5.1

- Review of all urban wastewater reuse technologies, methods and systems currently applied tailored to the special characteristics of the participating countries. All alternative methods will be analyzed in respect to the following issues: technical, technological, economical, social, energy, safety, health, etc.
- Review of the wastewater reuse standards that are currently accepted in order to protect public health and safety.

# Subtask 5.2

- Development of specifications for the urban wastewater utilization and reuse.
- Development of specifications for the storage conditions for water reservoirs to be employed for wet seasons where irrigation is not possible (including specifications for hygienic aspects, storage criteria, etc.)
- Examination of all limitations and constraints that might hinder sustainable reuse such as economic issues, siting, land availability, special disinfection requirements, irrigation systems, etc.

# Subtask 5.3

- Two-day training workshops will be organized in each participating country where all actors involved will be invited to attend seminar lectures on various issues related to urban wastewater reuse with emphasis given to reuse in the agriculture production.
- These workshops will be organized back to back with those related to the wastewater treatment technologies and systems, organized in the framework of Task 4.

# Deliverables of Task 5

- Specifications and guidelines for the safe and sustainable reuse of urban wastewater in the agricultural production, (in hard copy for dissemination to actors involved, uploaded at the website, presented in forum discussions and in the conferences that will be organized).
- Through the training activities that will be organized the actors involved will be equipped with the necessary knowledge and information in order to promote the sustainable reuse of wastewater in agriculture and promote the utilization of non conventional water resources.

## Task 6: Development of a methodology and a database for the control and monitoring of the urban wastewater treatment plants (M 26-30)

- **Subtask 6.1:** *Development of a methodology for the dynamic control and monitoring of the wastewater treatment plants (Months 26-28)*
- **Subtask 6.2:** *Development of guidelines for sampling/analyses/equipment (Months 26-28)*
- **Subtask 6.3:** *Development of a software database for the control and monitoring of wastewater treatment plants (Months 26-30)*

# Subtask 6.1

Development of guidelines for:

- Continuous and regular monitoring of the operation
- Setting and regular review of internal targets or programs for continuous environmental improvement
- Quality control methods, used as 'trouble shooters' when an existing treatment process runs out of control or cannot fulfill set requirements

# Subtask 6.2

- Development of guidelines, which will describe the techniques, the exact sampling points and the frequency of sampling, the necessary personnel, the means of samples preservation.
- Development of analytical guidelines for carrying out the chemical measurements and analyses. The demand in personnel for the execution of the measurements and analyses shall be determined.

# Subtask 6.2

- Determination of equipment needed for the application of the chemical measurements and analyses. This equipment shall include instruments for the continual monitoring of the parameters, mobile measurement instruments and permanent laboratory equipment. The operation, use and maintenance of the equipment will be described.
- Development of standard protocols for the storing of data produced from the samplings and measurements

# Subtask 6.3

- Development of appropriate forms for the complete illustration of the operation of a wastewater treatment unit.
- Moreover, an appropriate datasheet shall be developed (calculation spreadsheets), where all the results from the elaboration and statistical analysis of the collected data will be recorded.
- An appropriate form shall be prepared, for the submission of reports to the competent authorities, with respect to the operation of each treatment unit.
- Design and development of appropriate software (database) for recording information data for the operators use, based on the forms developed previously.

# Deliverables of Task 6 (1/2)

- A methodology for the dynamic control and monitoring of the wastewater treatment plants
- Guidelines for sampling/analyses/equipment
- Standard protocols for the storing of data produced from the samplings and measurements
- Calculation spreadsheets for the analysis and elaboration of data gathered during measurements

# Deliverables of Task 6 (2/2)

- Appropriate forms for the complete illustration of the operation of a wastewater treatment unit
- An appropriate form containing information that needs to be submitted to the competent authority for control and monitoring
- A software for recording information data for the operators use
- Operators and competent authorities will possess various tools for the effective management, control and monitoring of the treatment units and also tools to facilitate them in their reporting obligations.

## Task 7: Development of a multi-criteria / guiding support software tool for the assessment and valuation of safe wastewater agricultural reuse (M 31-42)

- Development of the specifications of the tool, including the structure of the input and output data of the tool, the structure of the databases, the criteria that will be taken into account in order to rank the wastewater treatment technologies and the performance of a plant, (Months 31-33)
- The development of the tool will be based on the information collected in Task 1, Task 4, Task 5 and Task 6

# Task 7

- Development of the mask of the tool software design and compilation including the development of the appropriate databases containing data on wastewater treatment technologies, standards and limits for safe use of the final effluent, wastewater reuse technologies, etc, (Months 33-36). More specifically:
  - Software requirements analysis: construction of the information domain for the software, description of the required functions, performance and interfacing
  - Software design: translation of requirements into a representation of the software and software configuration
  - Implementation: development of the software tool

# Task 7

- Testing and validation of the software among the partners aiming at its improvement, (Months 37-39)
- Training on the use of the tool during pilot studies in each country, (Months 39-42)

# Deliverables of Task 7

- The English final version of the software tool.
- A practical manual for the easy use of the software tool
- The competent authorities will possess a practical and easy to use software tool that will facilitate them to absorb technology transfer and adapt appropriate feasible solutions.

# Task 8: Dissemination Activities

- An advisory group was formed in order to involve local policy makers (involves actors in all participating countries)
- Two International conferences (Morocco, 9/2004)
- Publications in national and international journals
- Training workshops
- Website describing the project and its outcome
- Printed material describing the project and its results
- Personal meetings of the working groups with those interested in being informed on the project

# Publications

1. D. Hidalgo Barrio, R. Irusta, D. Fatta, A. Papadopoulos, A. Mentzis, M. Loizidou, "Effective practices on treated wastewater reuse - disinfection systems", International Workshop on the Implementation and Operation of Municipal Wastewater Reuse Plants, Thessaloniki, Greece - 11/12 March 2004.
2. Aysegül Akşoy, Celal F. Gökçay, Erkan Sahinkaya, Umay G. Özkan, Kahraman Ünlü, Gülerman Sürücü, "Best Practice Examples for Reuse of Wastewaters in Agricultural Irrigation in the World", International Workshop on the Implementation and Operation of Municipal Wastewater Reuse Plants, Thessaloniki, Greece - 11/12 March 2004.
3. I. Imamoglu, S. Girgin, F.D. Sanin, F.B. Dilek, Ü. Yeti , H. Yükseler, C.F. Gökçay, "Municipal Wastewater Management in Turkey: Impacts & Reuse", International Workshop on the Implementation and Operation of Municipal Wastewater Reuse Plants, Thessaloniki, Greece - 11/12 March 2004.

# Publications

4. D. Fatta, I. A. Alaton, C. Gokcay, I. Skoula, A. Papadopoulos, A. Mentzis and M. Loizidou, "The status of urban wastewater treatment and the challenge of wastewater reuse in the Mediterranean Basin", EWRA Symposium - Water Resources Management: Risks and Challenges for the 21st Century, Izmir, Turkey, 2-4 September 2004, (accepted).
5. D. Fatta, G. Ayoub, M. Mountadar, O. Assobhei, A. Papadopoulos and M. Loizidou, "Assessment of the existing situation regarding the urban wastewater treatment and reuse in Cyprus, Morocco, and Lebanon", 5th National Conference of EEDYP for the Integrated Management of Water Resources based on river basins, Xanthi, Greece, 6-9 April, 2005, (accepted).
6. D. Fatta, A. Papadopoulos, A. Mentzis, M. Loizidou, R. Irusta, A. Sandovar, and D. Hidalgo Barrio, "The Urgent Need for Sustainable Urban Wastewater Treatment and Reuse in the Agricultural Production in the Mediterranean Countries - The MEDAWARE Project", IWA, World Water Congress and Exhibition, Marrakech, 19-24 September 2004.

# Publications

7. D. Hidalgo Barrio, R. Irusta, D. Fatta, "Sustainable and cost-effective municipal wastewater reclamation: treated effluent reuse in the agricultural production", International Journal Environmental Pollution (submitted).
8. I.Arslan Alaton, G. Eremektar, P. Ongan Torunoglu, M. Gurel, S. Ovez, A. Tanik and D. Orhon, **Situation of urban wastewater treatment plants in Turkey - A step towards promoting sustainable wastewater management**, IWA, World Water Congress and Exhibition, Marrakech, 19-24 September 2004.
9. D. Fatta, I. Skoula, C. Moustakas, A. Mentzis, A. Papadopoulos, M. Loizidou, Z. Salem, K. Hameed, **Existing Situation, Plans and Policies for the Wastewater Reuse in Agriculture in Cyprus, Jordan and Palestine**, International Conference for the Protection and Restoration of the Environment VII, Mykonos, Greece, June 28 to July 1, 2004.
10. Presentation of the MEDAWARE project at the INCOMED Conf, Amman, Jordan, 14-15/6/2004
11. Other under preparation or submission