MADFORWATER

DevelopMent AnD application of integrated technological and management solutions FOR wasteWATER treatment and efficient reuse in agriculture tailored to the needs of Mediterranean African Countries

www.madforwater.eu

Dear Reader,

welcome to the first newsletter of MADFORWATER, an Horizon 2020 Research and Innovation Action project financed under topic WATER-5c-2015 "Development of water supply and sanitation technology, systems and tools, and/or methodologies". The general goal of MADFORWATER is to develop a set of integrated technological and management solutions to enhance wastewater treatment, treated water reuse for irrigation and water efficiency in agriculture in Egypt, Morocco and Tunisia. MADFORWATER will focus on municipal, agro-industrial and industrial wastewaters, as well as on the drainage canal waters of the Nile Delta. The development and validation of technologies will be combined to the definition of integrated water management strategies, tailored to the local context of selected hydrological basins in Egypt, Morocco and Tunisia. MADFORWATER, started on June 1 2016, has reached its 12th month of activity.

In this newsletter you will find:

1. an update on the MADFORWATER activities (p. 2)
2. a list of the conferences where MADFORWATER has been or will be presented (p. 10)
3. a description of our consortium (p. 13)

Enjoy the reading! And if you would like to receive further information or to set up collaborations, feel free to contact us:

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Water and water-related vulnerabilities in Egypt, Morocco and Tunisia

Wageningen Research is responsible for the assessment of water vulnerability in Egypt, Morocco and Tunisia. The entity and the causes of water stress and water vulnerability in Egypt, Morocco and Tunisia are analyzed, with specific focus on waste water treatment, water reuse and water efficiency in agriculture and their consequences on food security, sustainable agriculture, socio-economic growth and environment protection. In WP1, a country-level analysis will be integrated by more specific evaluations applied to the 3 target basins/sub-basins.

A first task is the analysis of current international cooperation agreements and their implications on the water-related goals in Egypt, Morocco and Tunisia. This task examines current international cooperation activities and international agreements in which the 3 target countries are involved in the field of water resources management at different levels: global initiatives, such as United Nations; Euro-Mediterranean, such as the Union for the Mediterranean; and agreements with neighboring African countries. The output of this task will be used in the following task for the identification of water vulnerabilities associated to lacks of international cooperation.

The second task is about analyzing and mapping water stress, water vulnerability and potential for water reuse in Egypt, Morocco and Tunisia. The analysis is performed at national scale for the countries with specific focus on waste water treatment, water reuse and water efficiency in agriculture. The elements gathered from the evaluation of water stress and vulnerability are used to evaluate the potential for treated waste water reuse in each basin of the target countries. This tasks is articulated into 5 steps:

- Definition of water vulnerability indicators
- Data collection on water stress and vulnerability originating from various sources
- Elaboration of water stress and water vulnerability maps in each country, focusing on water availability, water demand, main water constraints, integral water-land system
- Forecasting maps: 20 year projection of water stress and vulnerability based on different climate change and socio-economic scenarios
- Identification of business opportunities

The third task in WP1 is about Analysis and mapping of water stress effects on food security and socio-economic development in Egypt, Morocco and Tunisia. The effects of the identified water stress and vulnerabilities on different dimensions of food security and socio-economic development are addressed and analyzed through the Driving forces, Pressures, States, Impacts, Responses (DPSIR) framework. The analysis, performed in the 3 target countries at country scale, will lead for each country to the production of a report and of two food security risk maps, referred to the current situation and to a 20-year projection.

The last task is to evaluate in detail water stress and water vulnerability for the three selected basins, to explore strategies for non-conventional water use. The analysis in this task is divided into two steps:

- Development of a regionally adapted water vulnerability assessment framework, based on the DPSIR approach and including the identification of a limited number of water vulnerability indicators
- Identification of the obstacles towards the overcoming of the identified water vulnerabilities and stresses. The examined obstacles will include the following aspects: environmental (e.g. surface water and groundwater low per-capita availability and/or poor quality in the region), technical (quality of treated wastewater, availability of qualified technicians and of efficient waste water treatment plants (WWTP), law requirements for water discharge and reuse, availability of a reliable power supply, proximity of agricultural areas to WWTPs), economical (investment by public and private actors) and societal (perception of treated WW reuse for agriculture).

Adaptation of wastewater treatment technologies for agricultural reuse

MADFORWATER is developing and adapting to the local context of Tunisia, Morocco and Egypt, technologies for the treatment of municipal WW (MWW), textile WW (TWW), agro-industrial WWs, in particular olive mill WW (OMWW) and fruit and vegetable packaging WW (FVPWW), and drainage canal water (DCW) of the Nile Delta (Egypt), with the aim to produce irrigation-quality water.

Eleven WW treatment technologies have been selected for a first, laboratory-scale screening of potential solutions and treatment trains specific for the different WW types (Fig. 1). Energy requirements and/or capital and maintenance costs have been considered in the selection of technologies, bearing in mind that these are the main bottlenecks related to the water technologies utilized in the 3 target MACs. Most of the MADFORWATER WW-treatment technologies are existing marketable technologies currently poorly or not at all applied in MACs, for which innovative features are under development in order to adapt them to the local MAC context and to the production of irrigation-quality water, whereas a few are still at an early stage of development. The proposed technologies are under investigation at laboratory pre-pilot scale units (5-10 L), under conditions (e.g., temperature, solar radiation, etc.) closely mimicking those of the target countries, using synthetic or real wastewater (or drainage water) sampled in the following sites within the 3 target MACs: Manzala Pilot Area, North Eastern Egypt (DCW); Drarga, Agadir, Morocco (MWW); Tiznit, Agadir, Morocco (MWW); University of Manouba, Biotechnology Building, Tunis, Tunisia (MWW); Taroudant, Morocco (FVPWW); Mnihla, Tunisia (OMWW); Nabeul, Tunisia (TWW).

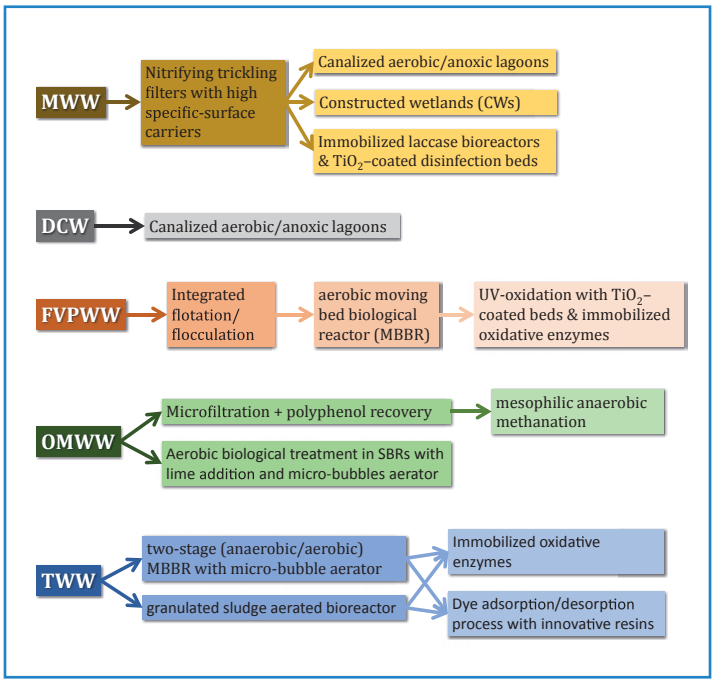


Fig. 1 - Potential treatment trains for each WW type

The following selected technologies are under investigation:

WW treatment technology 1: Canalized lagoon with nitrification/denitrification and disinfection capacity, for the tertiary treatment of municipal WW and for the treatment of drainage canal water. Canalized facultative lagoons are characterized by the alternation of aerobic and anoxic zones, that make them suitable for nitrification / denitrification processes and biological removal of BOD and phosphorous. In North African countries, thanks to the strong solar radiation, they can also perform a very effective disinfection. They can also be used as reservoirs, to store irrigation water to be used during dry seasons. In the Egyptian context, the goal of MADFORWATER is to optimize the use of the existing drainage canals receiving drainage water and local WWs as canalized facultative lagoons, through proper modifications in terms of geometry and fluid dynamics.

WW treatment technology 2: Nitrifying trickling filters filled with innovative high specific-surface carriers, for the secondary treatment of municipal WW. In case of medium and small communities, trickling filters can represent an interesting alternative to activated sludge plants, thanks to the small or null energy consumption required for WW aeration. While traditional trickling filters are characterized by high retention times and poor nitrification/denitrification performances, MADFORWATER is developing filters characterized by innovative high-surface carriers so as (i) to reduce retention times thanks to the attainment of a high biofilm thickness, and (ii) to improve the nitrification/denitrification performances.

WW treatment technology 3: Constructed wetlands with plant growth promoting bacteria, for the tertiary treatment of municipal WW. Constructed wetlands have the potential to remove priority pollutants, nitrogen, phosphorous, heavy metals and residual BOD, thanks to the combined effect of plants and of the rhyzosphere's microbial community. The coexistence of anoxic–aerobic–anaerobic microenvironments favours different removal mechanisms. Plant growth promoting bacteria can play a key role in constructed wetlands by actively cooperating with plants in the degradation process.

WW treatment technology 4: Enzymatic degradation of emerging pollutants, dyes and fungicides with immobilized laccases, for the tertiary treatment of MWW, TWW and FVPWW. Immobilized oxidative enzymes such as laccases are of particular interest for dyes removal from TWW, fungicide removal from FVPWW and micropollutants removal from MWW, because of their extreme selectivity in comparison to other advanced oxidation processes or adsorption. Laccases do not require co-factors, and robustness and reusability of immobilized laccases are demonstrated. They can be produced with simple and cheap fermentation technologies (e.g. solid state fermentation), possibly using cheap agroindustrial residues locally available. Immobilization does not require enzyme purification and is simple, fast and

reproducible. Costs of the WW treatment process may also be reduced by considering packed bed systems rather than membrane bioreactors.

WW treatment technology 5: Catalytic disinfection beds activated by solar UV light, for the treatment of municipal WW. WW disinfection by means of UV-activated catalytic beds is a low-cost, low-environmental impact effective alternative to conventional disinfection systems. They are well adapted to the local conditions of the North African context, where high solar radiation intensity is present. During night time the effluents can be stored in a holding tank and treated during daytime. WW treatment technology 6: Flotation/flocculation integrated process, for the treatment of FVPWW. Flotation represents an interesting alternative to sedimentation, thanks to the reduced treatment volumes and to the increased treatment efficiency. The combined flotation/flocculation process proposed by MADFORWATER allows the attainment of high removal efficiencies not only for suspended solids but also for BOD. It is characterized by a very low HRT (3-4 minutes), a low recycle ratio and a low energetic consumption.

WW treatment technology 7: Membrane filtration + phenolic compounds adsorption with selective resins + anaerobic digestion in biofilm reactor, for the treatment of olive mill WW. Although several types of processes have been proposed in the literature to treat olive mill WW, none of them has been scaled-up to real-scale low-cost applications, so far. The treatment train proposed by MADFORWATER is close to industrial application. It can produce a final effluent suitable for irrigation, and each step leads to a specific OMWW valorisation: olive paté from filtration, polyphenol-rich mixtures with high anti-oxidant properties from adsorption/desorption, electricity and heating from anaerobic digestion. Adsorption/desorption will be characterized by the complete recycling of the desorption solvent. Anaerobic digestion can be performed in possible co-digestion and/or alternation with other wastes typical of the North African context.

WW treatment technology 8: Aerobic sequenced batch reactor (SBR) with lime addition, for the treatment of olive mill WW. The SBR process presents several potential advantages in comparison to traditional aerobic processes. The implementation of an aerobic SBR process for the treatment of OMWW is of particular interest, on the basis of the pilot-scale studies performed by MADFORWATER partners. To minimize the energetic consumption associated to oxygenation, a novel high-efficiency air distribution system based on the production of micro-bubbles will be implemented in this SBR process.

WW treatment technology 9: Granulated sludge bioreactor, for the treatment of textile WW. Aerobic granulated sludge was proposed in recent years as a compact, robust and low energy consuming WW secondary treatment technology for industrial effluents. MADFORWATER addresses the potential weaknesses of granulated sludge aerated bioreactors, by developing stable consortia adapted to the treatment of real textile WW, and by investigating the mechanisms of granular sludge formation and the factors ensuring its stability.

WW treatment technology 10: Moving Bed Biological Reactor, for the treatment of textile WW.

The Moving Bed Biological Reactor (MBBR) is finding increasing applications at industrial scale, for the treatment of high-load WWs. Its application to the treatment of textile WW is innovative, and could potentially lead to a significant reduction of the treatment costs. A two-stage (anaerobic/aerobic) MBBR with the aerobic step aerated by a novel oxygenator of Nanotera Group is under developement.

WW treatment technology 11: Textile WW treatment by adsorption with innovative resins.

The proposed adsorption/desorption process aims at the removal of aromatic amines, brown color and metals. Magnetic polyacrylic microspheres previously developed by the Chinese MADFORWATER partner will be adapted, by modifying pore size and functional groups. An online UV/Fluorescence sensor, designed to monitor aromatic amines and chromophores, will be integrated into the system as a feedback signal, to achieve an automatic optimization of operational parameters. The possibility to re-utilize the desorbed material in the textile industry will be evaluated. The performances will be compared with those obtained with advanced oxidation processes (electrolytic treatment with Boron-doped diamond electrodes), taken as a benchmark technology.

For each technology, the operational conditions (such as hydraulic residence time (HRT), organic loading rate (OLR), recycle ratio were applicable) characterized by the best removal efficiency and rate with regard to the main pollutants of each tested WW will be identified. Effluent quality will be evaluated on the basis of international standards for WW reuse in agriculture. The technologies for municipal WW and drainage water treatment will be also assessed in terms of disinfection efficiency. Life Cycle Analysis (LCA) and Cost Benefit Analysis (CBA) of the technologies will be finally carried out to assess and improve their environmental performance and to evaluate them in terms of projected costs and turnover. The results of these activities will provide the elements for the selection and scale-up of the technologies that will be further tested and adapted in field pilots that will be constructed and operated in the target MACs.

Adaptation of technologies for efficient water management and treated wastewater reuse in agriculture

WP 3 focuses on innovative solutions for an efficient treated wastewater reuse in agriculture adapted to Mediterranean context. During the first year project, investigation about several approaches and technologies was started and activities were carried out in the field of: Plant Growth Promoting (PGP) bacteria to enhance crop resistance to water stress and salinity; generation of tensiometers suitable for high-salinity treated wastewater; modeling tool for optimal irrigation scheduling with different water types; development of low-pressure mini-sprinkler and calibrated nozzles for localized irrigation for the modernization of traditional surface irrigation; development of integrated physical and economic model for land and water optimization. Finally, an LCA and CBA of the tested wastewater reuse technologies have been initiated.

Marocco and Tunisia, in collaboration with the International Center for Advanced Mediterranean Agronomic Studies (IAMB) and Università degli studi di Milano (UMIL), have carried out experiment trials to investigate the effect of Plant-Growth Promoting (PGP) bacteria strains on growth and yield of different crops. Bacteria were isolated using different types of cultivation media well-adapted to drought condition. Several samples of soil and organic matter were collected from Argan and olive trees in Marocco and 400 bacteria were isolated. In Tunisia, a collection of bacterial strains was obtained from the root system of olive (100 isolates), citrus (50 isolates) and fig trees (40 isolates) currently irrigated with treated waste water. Besides, 80 endophytic bacteria were isolated from *Medicago* spp., while 500 strains have been established from *Sorghum* irrigated with treated waste water. In detail, a genotyping and identification were done by means of 16S rRNA gene sequencing on *Argania spinosa* isolates and on a subset of the *Sorghum* isolates to select bacterial strains for further cultivar. Moreover, eight Plant-Growth Promoting (PGP) bacteria, previously isolated at UMIL lab from extremophilic plants such as *Salicornia* sp., have been tested under greenhouse conditions using tomato as reference plant and artificially inducing water stress. So far, positive results have only been observed in the middle of the growing season (increased growth of the inoculated plants compared to non-inoculated control) for some bacteria. For this reason, a further greenhouse experiment is carried out at IAMB to investigate the benefits of bacterial on whole growing cycle of tomato. Five bacterial strains were selected based on their positive effects on survival and/or growth of some drought tolerant plants (e.g. salicornia, mangrove, resurrection plant) cultivated in the countries involved in the project. Bacteria were isolated and identified to exclude pathogens. After seedbed preparation at IAMB, seedlings were transplanted into pots filled with sampled soil at IAMB experimental fields, while the strains of bacteria were inoculated into the soil one week later. Potted tomato plants are grown under three different water regimes, aiming to investigate whether PGP bacteria be reduced the amount of water supplied and increase crop water use efficiency (yield/water applied) of tomato. Soil and crops parameters, and greenhouse micro-climate are monitored during the growing season of the tomato crop.

As for the generation of tensiometers suitable for high-salinity treated wastewater, the work has focused on the selection of the best compromise in terms of material (porous media) to be used and on the development of a testing bench. This bench will be used to check the performance of tensiometers in the production line.

A preliminary version of the software for the optimal irrigation scheduling with different water types and the related manual have been prepared while the module on fertilization management is still in progress.

As for the low-pressure mini-sprinkler, a set of droplet sizing tests have been performed to determine droplet size range according to the type of emitters. Calibrated nozzles for localized irrigation prototypes have been produced and tested for anti-leakage capacity. They are effective around 0.4bar pressure. Numerical modeling of flow and fluid interaction with membrane are being studied. Experimental field to test technologies for modernization and increased efficiency of traditional surface has been equipped in Egypt.

Integrated optimization model related activities started with the collection of economic data in the selected case studies areas: greenhouses and citrus farming system in the Souss and Chtouka Ait Baha Areas of the Souss Massa River Basin (Morocco) and the irrigated farming system in the Kafr-El- Shiekh Region (Egypt).

Finally, a joint questionnaire on LCA-CBA was prepared and send to every partner; analysis of results and compilation of qualitative elements in a report. An inventory of qualitative elements for CBA was performed and finalized.

Life Cycle Assessment (LCA) & Cost Benefit Analysis (CBA)

Life-cycle assessments (LCA) will quantify potential environmental impacts and benefits of Mad4water technologies at early stage. It will be conducted for the wastewater treatment and irrigation technologies following the well-established phases: goal definition & scoping, life cycle inventory, impact assessment and interpretation, as shown in Figure 1 below.

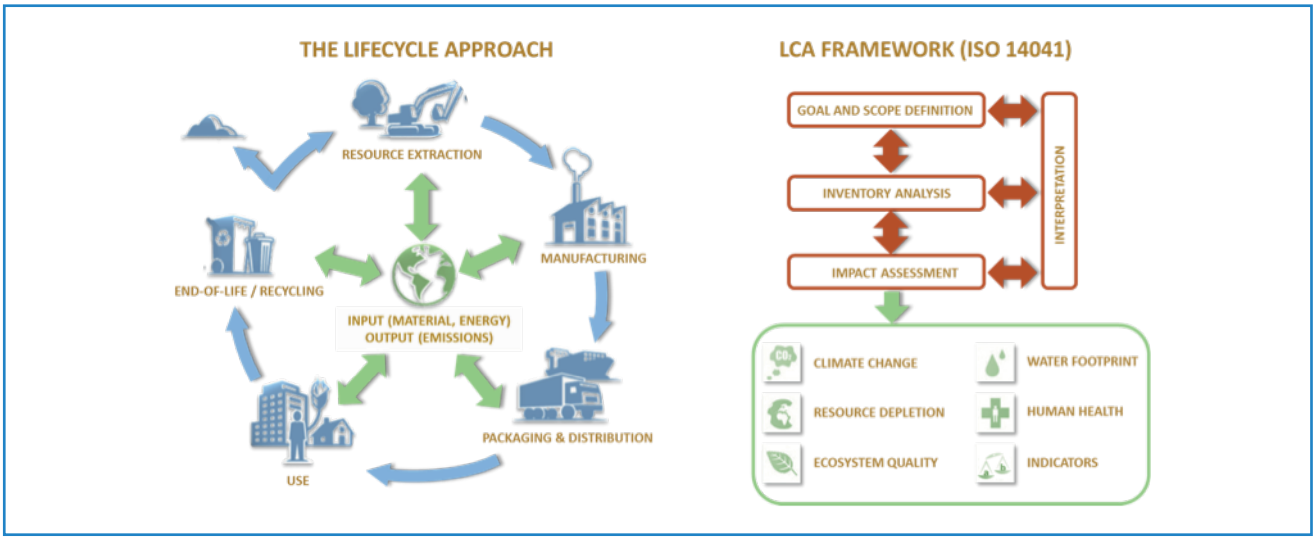


Fig. 2 - Life-cycle assessments (LCA) approach, framework and impact categories.

LCA at an early stage of technology development faces several challenges, as the inventory will be based on technologies still under development and processes might not be well-defined yet. However, an early stage LCA can also directly foster and support the improvement of the environmental performance of the developed technologies by identifying main processes contributing to environmental impacts and help optimize those. As many data estimations will be required for the inventory, the LCA methodology will be streamlined in order to provide relevant information for possible optimization of the technologies' environmental impacts and demonstrate the environmental benefits of the implementation of the developed technologies compared with current situations. University of Applied Sciences and Arts Northwestern Switzerland (FHNW) will conduct the analysis using state-of-the-art software and database. The LCA based on the results of the lab-scale development of the WW treatment technologies, will be updated at a later stage, taking into account the performances of the field pilots.

Cost Benefit Analysis (CBA) will quantify the economic costs and benefits of MADFORWATER technologies at an early stage. CBA is a systematic estimation of all relevant costs and benefits. Evaluation of the developed technologies in terms of projected costs and turnover will be carried out by means of a Cost Benefit Analysis (CBA). In line with the LCA, CBA at an early stage of technology development faces several challenges, as the analysis is based on technologies still under development and processes might not be well-defined yet.

The CBA will be performed in three main steps. In the first step, the framework of the CBA dataset is determined. Most important part of this step is the identification of costs and benefits related to each technology. Examples of costs are: capital, operating, maintenance and additional costs, such as training and overheads, social/environmental costs imposed on third parties by each wastewater treatment technology, such as noise or carbon impacts. Examples of benefits are: health benefits related to irrigation with treated instead of untreated WW, or environmental benefits related to a decreased catchment of freshwater from water bodies. Other part of this step are (1) determining the base case; (2) identifying the planning period for the appraisal of a technology; and (5) determination of a discount rate to convert future values into present values.

In a second step, the costs and benefits of each MADFORWATER technology is quantified. In our to come to a good estimation of the costs and benefits each partner working on a technology will be guided by PNO Innovatieadvies BV (PNO) and Università di Bologna (UNIBO) in the quantification of the elements required for the CBA analysis of each technology, with reference to a standardized size of the WW treatment facility. All costs and benefits will eventually be discounted by using an appropriate discount rate and time horizon.

The final step of the CBA is the economical evaluation and comparison of the different technologies through the application of the CBA model. In addition to making the calculations and comparisons, a sanity check and a sensitivity analysis is performed to ensure the validity of the CBA-model.

At this point, qualitative information regarding the relevant costs and benefits has been collected for the MADFORWATER technologies. PNO is currently developing the computational framework for the CBA and conducting preliminary analysis for some of the technologies that have quantitative information available. In the end, quantitative data will be collected for all technologies and used to provide insight into their economic performance.

Field pilots for the adaptation and integration of technologies

In the 3rd and 4th year of MADFORWATER, selected wastewater treatment and irrigation/water reuse technologies will be the object of pilot-scale experimental testing and demonstration to be performed in selected sites in Egypt, Morocco and Tunisia, so as to improve their adaptation to the local context. Four pilots of integrated wastewater treatment and water reuse/saving in agriculture will be set up, one for each type of studied WW (municipal, drainage canal, agro-industrial, industrial). A SWOT analysis will be implemented in order to select the sites for the four pilots and the technologies to be implemented in each pilot, on the basis of scores assigned to each technology in relation to (i) their technical performances, (ii) their social and technical suitability in relation to the local context and (iii) the outcome of the life cycle assessment and cost-benefit analysis. Each pilot plant will consist in a wastewater treatment section and an irrigation section, where typical crops of the three target countries will be grown. Each plant will be monitored for at least one year.

Integrated water and land management strategies for wastewater and agricultural water management

From technologies to integrated water and land management strategies

MADFORWATER develops and applies several wastewater treatment, water management and irrigation technologies for agricultural reuse, aiming to contribute to efficient water management in Mediterranean African Countries. After demonstrating that the selected technologies can efficiently be adapted to the local conditions, integrated technological and management strategies will be proposed for selected case study river basins in Egypt, Morocco and Tunisia accompanied by the development and application of relevant decision support tools. For example, a typical strategy can include the implementation of an additional wastewater treatment technology to the wastewater effluent of a specific industry in order to attain irrigation quality water to be reused with efficient irrigation technologies suitable to the local conditions.

However, although technological innovation is part of the solution, it is not enough to deal with current and future challenges of water management. The UN Sustainable Development Goals and the Mediterranean Strategy for Sustainable Development emphasise the need to attain sustainable use and management of water resources, which requires stabilising water demands, improving water use efficiency, and enhancing participation and cooperation across sectors and scales. For this, international and national initiatives are concentrated on establishing Integrated Water Resources Management (IWRM) policies and promoting water demand management, including the use of appropriate economic instruments for water management. Such instruments encourage technical and economic efficiency of water use and incentivise the adoption of new technologies and innovative solutions. However, the level of implementation of such approaches in Mediterranean countries varies largely. The diversity of natural, socio-economic and institutional landscapes across Southern and Eastern Mediterranean countries determines different needs and obstacles for water management.

Strategies and economic instruments for basin-scale water resources management

The MADFORWATER project will develop new water and land management strategies. For this, it will build upon the review and assessment of current water management approaches and policies and the use of economic instruments in the three selected case studies in Egypt, Morocco and Tunisia. The elaboration of these water and land management strategies will include the development of Decision Support Tools (DSTs) aimed at integrating the bio-physical and socio-economic dimensions of water use, and the implementation of MADFORWATER technologies at basin-level. Further, economic and regulatory instruments will be identified to enhance the effective implementation of the selected technologies.

Evaluation of the strategies according to local conditions and priorities

Even if certain technologies and management solutions might prove to be efficient on a technical basis, challenges for practical implementation especially in the context of emerging economies are often overwhelming. Such challenges often include the lack of sustainable funding schemes and the required inter-sectoral coordination within river basins.

For this reason each proposed strategy will be evaluated in different ways, including Stakeholder Consultation Workshops, so as to receive feedback from local stakeholders on the technical and social suitability in relation to the local context. A comprehensive evaluation will be performed on how each strategy can potentially reduce the vulnerability to water stress in riverbasins and improve the adaptive capacity of local stakeholders to deal with water challenges, both under the current and expected future conditions considering climatic, policy and economic aspects.

Exploitation and promotion of the most effective strategies

In order to promote and foster the implementation of the developed strategies, exploitation plans will be developed as well as a catalogue of economic instruments, policy recommendations, capacity building activities and other locally-relevant measures.

Exploitation

MADFORWATER aims to tackle the integration of wastewater treatment and water reuse in agriculture to reduce water vulnerability in Egypt, Morocco and Tunisia. Having adopted a participatory and multidisciplinary approach, the consortium partners are strongly focused on realizing the expected impacts. At the end of the project, MADFORWATER will deliver several pilots, integrated water and land management strategies as well as related economic instruments. On the long term the project aims to achieve a number of environmental, social and economic impacts associated to WW treatment and the agricultural sector. Furthermore, MADFORWATER is expected to lead to a strengthened competitiveness and growth of EU and MAC companies.

Exploitation is often mentioned together with the activities of dissemination and communication. Whereas dissemination and communication predominantly aim at broadcasting the project's potential and creating engagement during a project's lifetime, exploitation focuses on creating a lasting impact. Suitable exploitations actions are therefore of great importance to achieve success. To maximize the realization of the impacts of MADFORWATER the partners have adopted a dedicated exploitation strategy which is based on two main pillars, being: a) management of the generated knowledge, and b) a set of actions to strengthen exploitation of the project's results.

The MADFORWATER project is expected to generate up to fourteen results during the project's lifetime, with the majority of results to be delivered in year 3 and 4 of the project. During the project implementation generated knowledge will be continuously monitored and managed, potentially resulting in the application of suitable protection tools and measures. Furthermore, each delivered result will be assessed on its exploitation potential, resulting in a clear view of benefits, user groups, competition and market, establishing an understanding of its market potential. Following these evaluations, appropriate exploitation strategies will be established. The exploitable results are supported with several tailored actions, including business plan development, capacity building workshops and training. In addition to MADFORWATER's exploitation activities a project-internal exploitation seminar is organized as part of the third project consortium meeting in Montpellier. The exploitation seminar will focus on standardization as a suitable mechanism for supporting market entry and will also cover the added value that the lean canvas business model offers in developing business strategies.

Capacity building activities

MADFORWATER will foster the capacity building of local actors in relation to the implementation of the selected technologies, strategies and policies, thanks to a consistent portfolio of training, knowledge transfer and increased social acceptance activities:

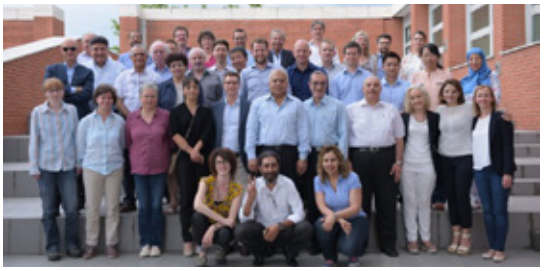
- **2 capacity building workshops (CBWs) on the project technologies, water management strategies and policies:** 1 CBW will be held in a selected MAC country in combination with a scientific conference, and will be directed to different SAB and non-SAB end-user groups such as farmers, water users, WW treatment technicians, WW producing industries; the other will be held in Brussels and will be aimed at informing EU water treatment and irrigation companies, WWTP managers and water authorities on the project outcomes;
- **1 train-the-trainer 5-day course on the irrigation/water reuse technologies and on the WW treatment technologies;** the course will be attended by 4/5 trainers from each target MAC;
- **4 on-field trainings (1 for each pilot plant)** addressed to WW technicians, managers, farmers and PhD students;

- **Post Graduate (MSc and PhD) and early career researcher exchanges between EU and MAC research institutions;**
- **Field visits to water user associations, pilot areas, WWTPs and agricultural areas with innovative irrigation technologies**, organized in parallel to the MAC capacity building workshop and train-the-trainer courses;
- **Promotion of water user associations** in order to increase the acceptance of the proposed solutions and to transfer knowledge for implementation;
- **Interviews and meetings with local water authorities and institutions**, to connect them with the knowledge generation process of the project and to inform them about the potentials and pit falls of the proposed strategies.

Previous Project Meetings

MADFORWATER Project Kick-off meeting

On June 15th and 16th 2016, the MADFORWATER Project consortium partners met in Bologna for the official kick-off meeting. Forty-five representatives of the eighteen partners participated to the meeting and discussed the work plan and timetable that will form the basis of the work that will be carried out in the next four years.



The last project meeting was held in Agadir, Morocco, to analyze the project activities implemented so far and plan the upcoming initiatives.

The next project meeting will be held in Montpellier (France), 3-5 July, where will also take place the exploitation strategy seminar.

M4W advisory board

The adaptation of the project's technologies and management solutions to the actual needs and local context of the target MAC countries represents a crucial aspect of MADFORWATER. To this goal, the project periodically consults an Advisory Board mainly constituted not only by representatives from EIP water, JPI water, UNEP, Water Supply and Sanitation TP and Spanish National Research Council, but also by relevant stakeholders active in the field of water treatment, management and reuse in Egypt, Morocco and Tunisia. These stakehodlers periodically provide feedbacks on the adaptation measures undertaken and the social acceptance of the proposed solutions, in order to minimize barriers to the actual implementation and exploitation of the MADFORWATER technologies and tools.

The first stakeholder consultation workshop took place on 16th December 2016 in Agadir, Morocco, and it focused on the adaptation approach of technologies and non-technological instruments (management , monitoring, training) and on the identification of barriers and drivers to promote the reuse of treated waste water for irrigation. 15 stakeholders from Morocco and 2 from Tunisia participated, in addition to scientists from several MADFORWATER partners. The workshop led to the identification of the following obstacles towards wastewater treatment and agricultural reuse in the 3 target countries: lack of political will to enable coordination and communication

between the institutions involved in the wastewater treatment; difficulty in identifying the institution that takes the responsibility for wastewater reutilization; lack of roles definition; lack of funds to finance wastewater treatment and monitoring of treated water quality; lack of clear legislation on the reuse of treated wastewater for irrigation. The stakeholders generally agreed that a transdisciplinary institution with a new mandate focused on treated wastewater reuse is needed to overcome the fragmentation of responsibility and to coordinate all existing institutions.

MADFORWATER has been presented at…

AfriAlliance CONFERENCE

The project participated in the AfriAlliance conference which took place in South Africa, from 22nd to 24th of March. The AfriAlliance Conference took two and a half days, coinciding with World Water Day. It presented the AfriAlliance Action Groups and their areas of focus; showcase African research, innovation, policy and capacity development initiatives that were looking for European partners and vice versa; and provided the opportunity to obtain inputs and suggestions for further shaping AfriAlliance's activities.

Marrakech COP22 CONFERENCE

In November 2016, the project was also presented in the Marrakech COP22 Conference, an yearly event included among one of the United Nations Climate Change Conferences, organized in the framework of the United Nations Framework Convention on Climate Change (UNFCCC). More in detail, Madforwater participated in the a European Commission side-event "Water-Energy-Food: research and innovation to address the nexus in the Mediterranean", aiming at bringing together institutional actors and research and innovation stakeholders to share insights into challenges and solutions for a low-carbon economy interlinked with sustainable management of resources. The discussion focused specifically on the nexus challenges in the Mediterranean region.

MARRAKECH
COP22ICMP12
UN CLIMATE CHANGE CONFERENCE
2016

252nd ACS National Meeting
organized by American Chemical Society
24 august 2016

GRICU - The 2020 horizons
of chemical engineering
13 September 2016 - Anacapri (Italy)

IWA Flotation Conference
Toulouse - 29 september 2016

1ST TUNISIAN-SOUTH AFRICAN
INTERNATIONAL WORKSHOP
4-7 November 2016 Tunisia

Water Global Expo
Ecomondo 2016 Fair
8 November 2016 - Rimini (Italy)

ICEST 2017
13 - 15 January 2017

WaterHeroes,
Center for Mediterranean Integration
21/22 March 2017 – Marseilles

Conference presentation in 7th
Mikrobiokosmos Conference 2017
7 - 9 April 2017 - Athens, Greece

Industry Water: From Single Use
to Integrated Management
20 April 2017 - Bruxelles

The EGU General Assembly 2017
22-28 April 2017 - Vienna, Austria

Attualità dell'Idraulica Agraria e delle Sistemazioni Idraulico-Forestali al cambiare dei tempi
Università degli Studi di Palermo - 4/5 May 2017

Upcoming events where MADFORWATER will be presented

6th International Symposium
on Biosorption and
Biodegradation
Biobio2017. 25-29 June 2017,
Praga, Czech republic

9th International Conference on
Environmental Engineering and
Management
6 – 9 September 2017
Bologna, Italy

22nd Workshop on the
Developments in the Italian
PhD Research on Food Science,
Technology & Biotechnology.
September 20-22, 2017, LIBERA
UNIVERSITÀ DEGLI STUDI DI BOLZANO

14th International Phytotechnologies Conference

25 - 29 September 2017

Montréal, Canada

10th World Congress of Chemical Engineering.

1-5 October 2017,

Barcelona, Spain

ICIDC 2017, Internationa Commission on Irrigation and Drainage Conference

8-14 October 2017, Mexico

S2SMALL2017 IWA, Sustainable solution for small water and wastewater treatment systems

22-26 October 2017, Nantes, France

4th International Conference on Microbial Diversity 2017

October 24-26, 2017, Bari, Italy

Ecomondo 2017
Green & Circular Economy.

7-10 November 2017, Rimini, Italy

INTERNATIONAL SYMPOSIUM MICROBE-ASSISTED CROP PRODUCTION OPPORTUNITIES, CHALLENGES & NEEDS.

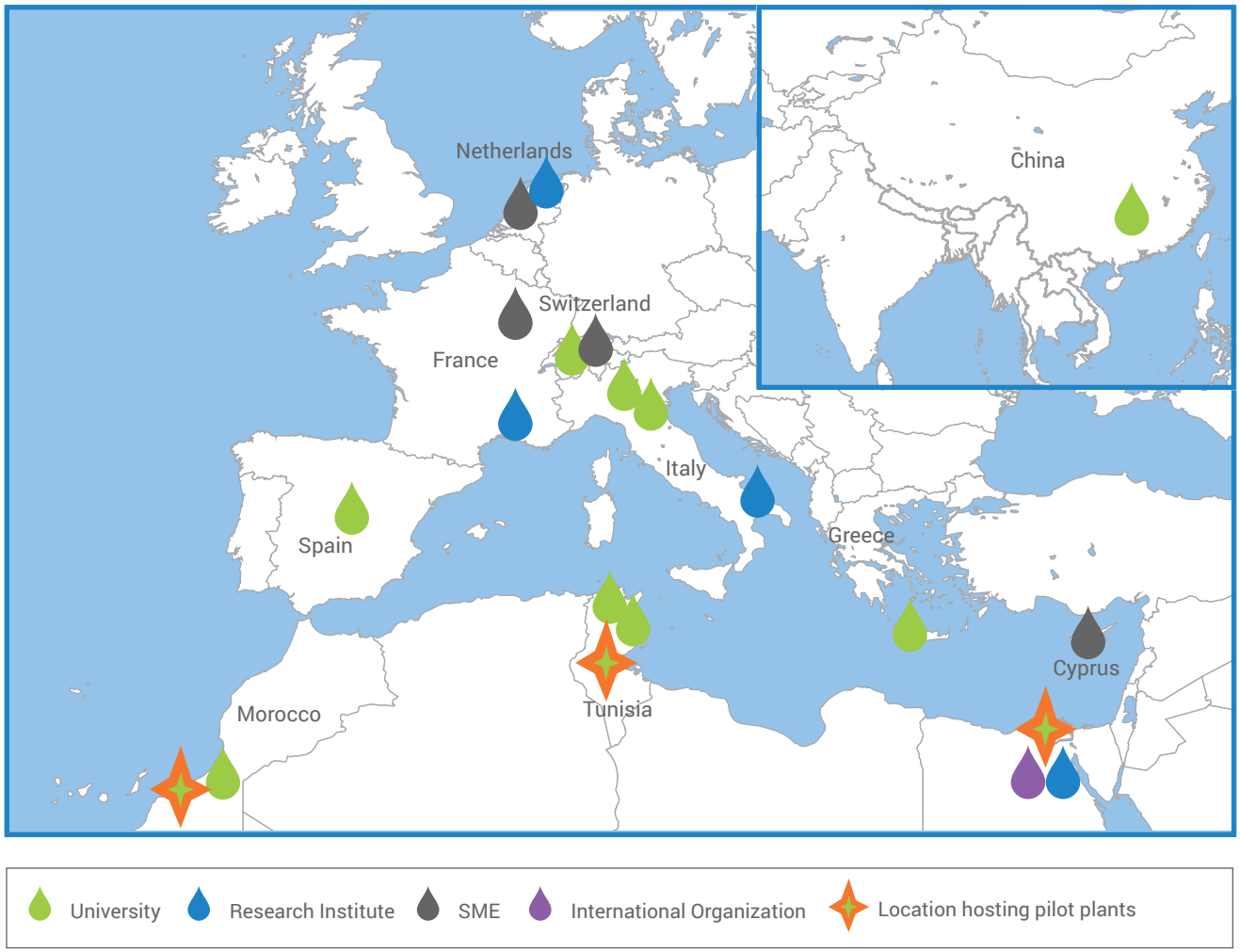
November 21 – 24, 2017 Vienna, Austria

VII Bioremediation Conference.

25-28 June 2018, Chania, Greece

The MADFORWATER consortium

The MADFORWATER consortium consists of 18 partners geographically distributed mainly around the Mediterranean Sea in 7 European countries, 3 MACs and China. It comprises 9 universities, 4 research centers, 1 international non-profit organization (FAO), 1 consultant and SME expert of marketing, business plan development and innovation management and 3 SMEs in the fields of WW treatment and irrigation. The MADFORWATER partners have a multi-disciplinary expertise that includes wastewater treatment, irrigation, life cycle analysis of technologies, cost benefit analysis of technologies, water vulnerability analysis, stakeholder involvement, integrated water management, capacity building, business plan development.



Università di Bologna
www.unibo.it/en

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Founded in 1088, the Alma Mater Studiorum – Università di Bologna (UNIBO) is known as the oldest University of the western world. Nowadays. UNIBO is the first Italian university in the international QS - World University Ranking of the world best universities since 2010 and the second Italian University in access to EU funding. The UNIBO research team in MADFORWATER includes the Bioreactors and chemical processes unit, the Biotechnology unit and the Wastewater treatment unit. These units, that have a long collaboration history, have expertise in the fields of chemical and biochemical process development and modelling, fluid-dynamic characterization of reactors, wastewater treatment processes, cost evaluation, microbial consortia characterization.

Technical University of Crete
www.tuc.gr

The School of Environmental Engineering of the Technical University of Crete (TUC) accepted its first students in October 1997 and quickly became a major centre of environmental engineering research in Greece. Despite the fact that the School is rather new, it has managed to acquire through National and University grants for fostering research and scholarship at the graduate level, all necessary laboratory equipment for undergraduate teaching and graduate research. BEEB Lab of TUC which is the partner in MADFORWATER brings in extensive experience in design and analysis of environmental processes, bioremediation of oil spills, ex-situ bioremediation, phytoremediation, wastewater treatment and in mathematical modelling. The team members are Nicolas Kalogerakis (PI), Danae Venieri (disinfection of treated municipal wastewater), Argyro Lakiotaki (textile wastewater treatment), Eleni Manousaki and Stavros Christofilopoulos (constructed wetlands for municipal wastewater treatment) and Margarita Petoussi (design guidelines).

University of Manouba
www.isbst.rnu.tn/eng

Higher Institute for Biotechnology Sidi Thabet (ISBST) founded in 2004 in the University of Manouba (UMA). Besides the education role, ISBST/UMA includes many research structures which develop the management and use of bioresources methods. The UMA research team in MADFORWATER (Laboratory of Biotechnology and Bio-Geo Resource Valorization) involve

(i) The microbial and molecular resources management for the development of biotechnological processes (use of microorganisms and active molecules) with particular attention to the field of plant growth promotion under abiotic stress, using in vitro, and in vivo applications.

ii) Development of relevant environmental biocontrol combining conventional pollution indicators such as bacteria and unconventional indicators such as enteric viruses and resistance to antibiotics using molecular tools.

University of Tunis El Manar
www.fst.rnu.tn/fr

The University of Tunis El Manar (UTM) was established in 1987 under the name "University of Science, Technology and Medicine of Tunis" and has had its current name in 2000. The UTM research team in MADFORWATER is member of laboratory of Microorganisms and active Biomolecules (LMBA) established since 2003 at the Faculty of Sciences of Tunis. The team is joining competencies of researchers working on water vulnerability, wastewater treatment and valorization and microbial ecology. The UTM team participated to several international projects financed by EU (FP7), NATO and and Bill & Melinda Gates Foundation (USA) in addition to bilateral and national projects.

Food and Agriculture Organization of the United Nations
www.fao.org/neareast

FAO is an agency of the United Nations that leads international efforts to defeat hunger. Serving both developed and developing countries, FAO acts as a neutral forum where all nations meet as equals to negotiate agreements and debate policy. FAO is also a source of knowledge and information, and helps developing countries and countries in transition modernize and improve agriculture, forestry and fisheries practices, ensuring good nutrition and food security for all.

The Regional Office for Near East and North Africa, whose headquarters are located in Cairo, helps Member States work toward sustainable increases in agriculture production, minimize depletion and degradation of already scarce natural resources, boost rural development and reduce food loss and waste; the final objective being to achieve sustainable food security for all and to help vulnerable communities cope with and recover from shocks and crises. The Regional Initiative on Water Scarcity has been formulated to support the countries of the MENA Region to cope with one of their most striking challenges: the pursuit of food and water securities, for a sustainable social and economic development, under an unprecedented severe escalation of water scarcity. The objectives of the initiative are: enhancing policies, investments, governance and best practices to sustainably increase water and land productivity; providing tools for strategic planning of optimal and sustainable allocation of scarce water resources; implementing a regional collaborative strategy for a water-reform agenda.

FHNW
www.fhnw.ch

The core activities of the Institute for Ecopreneurship (IEC) at the School of Life Sciences (HLS) of the University of Applied Sciences Northwestern Switzerland (FHNW) include Environmental Technologies, Environmental Biotechnology and Sustainable Resources Management. It possesses lab facilities such as pilot-scale lab, trace analysis lab and radioisotope lab, which are all equipped with cutting-edge devices. The IEC research team in MADFORWATER covers the whole life cycle of technologies from proof of concept and assessment over implementation to monitoring and evaluation as well as the optimisation of production processes in terms of material and energy saving up to life cycle and risk assessment. Water frameworks and conclusive indicator systems play a crucial role in our daily work of assessments and evaluations in water management and technologies. The institute has extensive experience in leading and collaborating in large research projects and feasibility studies in developing countries in the water sector and adopted technologies.

S.K. EUROMARKET LTD

www.euromarket-cy.com

S.K. Euromarket Ltd (SKE), established in 1990, is a water and wastewater engineering company with almost three decades of experience in the design and construction of complete plants and equipment that cover a wide range of applications in the residential, municipal, industrial and agricultural sector. SKE is a reputable, highly competent, and professional engineering company with international operations in Europe, the Middle East and Africa and has a track record of over 300 successful water and wastewater projects to date. SKE has wide experience in its field guaranteeing successful and trouble-free application in a wide spectrum of operation. It's experienced and highly qualified engineering, scientific and technical personnel have completed more than six hundred varied projects. The SKE team in MADFORWATER includes Engineers (Mechanical and Chemical Engineers) with a long professional experience, excellent knowledge on the design and operation of conventional and advanced wastewater treatment processes, and Production technicians, qualified and trained in welding procedures, usage of production machineries and tools, responsible for the fabrication and assembly of equipment.

Universidad Politécnica de Madrid

www.upm.es

Universidad Politécnica de Madrid (UPM) (Technical University of Madrid) is Spain's largest technological university, placed first in the capture of external resources in a competitive regime and highly committed to innovation. The School of Agricultural, Food and Bio-systems Engineering, as part of the UPM, is a well-known institution for research in the fields of biotechnology, rural engineering, and agricultural economics (among others). UPM team, led by Professor Consuelo Varela-Ortega, has a long experience in socio-economic assessments in the agricultural sector with a special focus on farm level analysis, environmental impacts, resource efficiency, cost-effectiveness and the assessment of agricultural, environmental and natural resources policies, as well as climate change adaptation and mitigation, developed in several UE, national and international research projects. Modelling approaches and assessments performed include participatory techniques for the analysis of environmental measures at farm level (FP6 CROSS-COMPLIANCE), the linkages between agriculture and water resources (FP6 NEWATER and SCENES, FP7 MEDPRO), impacts and adaptation to climate change of agriculture and water resources (FP7 MEDIATION, H2020 MADFORWATER), the link between agriculture, biodiversity and climate change mitigation (FP7 ROBIN), and market analyses of traditional and novel high protein products (H2020 PROTEIN2FOOD).

Alterra

www.wageningenur.nl/en/Expertise-Services/Research-Institutes/Alterra.htm

Stichting Dienst Landbouwkundig Onderzoek (DLO Foundation) consists of a number of specialised institutes for applied research in the domain of living environment. DLO collaborates with one other legal entity – Wageningen University – under the external brand name Wageningen UR (University & Research centre). To realise this aim, the DLO Foundation operates through its research institutes, among which Alterra is involved in this proposal. DLO has a trong track record of multidisciplinary projects and is involved in hundreds of FP6 and FP7 projects and many other large national and international research projects. One of the strengths of Wageningen UR (including DLO) is that its structure facilitates and encourages close cooperation between the approximately 3000 experts from the University and various research institutes, which cover a wide range of expertise including food technology, plant, animal and economic sciences. Alterra belongs to the Environmental Science Group. Alterra employs 450 staff, combining expertise on green economy & biodiversity, soil, water & food security, spatial planning and ecology, and water resources and Climate Change. Alterra engages in strategic and applied research to support policy-making and management at the local, national and international level.

Institute of Agronomy & Veterinary Hassan II

www.iav.ac.ma

The Hassan II Institute of Agronomy and Veterinary Medicine (IAV) is a multidisciplinary polytechnic centre for biological and earth sciences and technologies based on an integrated system for high education, training and scientific research to serve agricultural and rural development. It's composed of several schools (Agronomy, Veterinary school, Agro-food industry, Horticulture, Topography, Rural engineering). The institute is offering engineering, veterinary medicine, master and PhD graduation diploma. More than 700 African students are graduated from IAV Hassan II. It does accounts 320 scientists and faculty members and 180 Technical staff – in 22 departments hosting different laboratories.

IAV scientists are involved in multidisciplinary international networks and collaborative research programs. In addition a large number of research-development projects are implemented in partnerships with European, African, and Mediterranean countries. Participation to the FPs (European programs) is a long tradition for the IAV. Currently, the number of projects involving IAV scientists is 51 from FP1 to FP6. Recently the IAV takes part in more than 13 projects in FP7 with 9 projects in FAB thematic (2011 EC statistics). Among those projects, IAV had a strong participation to MELIA project and actually is starting the Mediterranean INCONET Medspring. The IAV is also involved in national initiatives aiming to structure agricultural research and contribute to the Moroccan and regional development of agriculture. IAV Hassan II has profound expertise in water resources management under severe drought stress and intensive groundwater mining enabling the assessment of the multiple stressors on the economic, social, and environmental impacts of various water resources allocation alternatives at the overall river basin level. IAV is actively involved on integrated water resource management, particularly on the reuse of nonconventional water, and in the economic management model at the river basin scale.

International Center for Advanced Mediterranean Agronomic Studies
www.iamb.it

The Mediterranean Agronomic Institute of Bari (IAMB), established in 1962, is the Italian affiliate of the CIHEAM (Centre International d'Hautes Etudes Agronomiques Mediterraneennes), an inter-governmental institution founded under the auspices of the OECD and of the Council of Europe. The main activities of the Institute are advanced education, training, research, consulting and international cooperation in the domain of irrigated agriculture, integrated pest management, organic farming and sustainable agriculture development mainly in the Mediterranean Region. It promotes and coordinates cooperative research networks with a special focus on the application of new technologies (GIS, Remote Sensing and Modeling) in land and water management. CIHEAM-IAMB was and is involved in projects funded by World Bank, FAO, IFAD, EU, Italian Development Cooperation, German Cooperation. Acronyms of the most relevant and pertinent ones are listed hereafter: ACLIMAS; EcoWater; CLIMAWARE; MEDPRO; DIMAS; ICZM-Port Said; NOSTRUM-DSS; AQUASTRESS; WatNitMED; SCENES; PUER.

The CNR-Water Research Institute (CNR-IRSA) (linked CIHEAM-IAMB third part), plays a key role in the management and protection of water resources and in developing methodologies and technologies for water purification and treatment of wastewater. CNR-IRSA mainly operates through the development of Innovative Research on processes and methodologies related to environmental investigations; Pre-normative Research and Activities to provide institutional users with basic tools for interventions at technical and legislative level; Educational and training activities at different levels (scholarships, PhDs, post-graduate courses) for the growth of culture on water problems.

National research institute of science and technology for environment and agriculture
www.irstea.fr/en

IRSTEA focuses its research on water and environmental quality, risks, regional planning and sustainable development through environmental technologies. Its scientists are specialists in hydrology, geography, biology, chemistry, physics, computer sciences, economics, sociology, environmental sciences. The activities include experimentation, theoretical modeling and technical innovation. They contribute to appraisal and assessment consultancy projects to support public decision-making or carry out collaborative research with industrial companies. The PReSTI team involved in the project focusses its activity on irrigation tech,ologies and practices in an objective of improving efficiency of water use and durability of systems accounting for the quality of water or the environmental constraints.

PNO Innovatieadvies BV
pnoconsultants.com

The PNO Group, established in 1984, is Europe's largest independent Grants and Innovation Management advisory, providing support services to private and public organizations in innovation processes, technology transfer and funding for research, development & innovation. PNO is made up of a pool of around 250 professionals across 6 Member States including scientists, engineers, consultants, a Brussels policy advisory service, as well as financial and legal experts. For dissemination and communication activities, PNO has its own community building, management and dissemination tools, the core one being Innovation Place© (www.innovationplace.eu). PNO manages several open innovation Web portals (www.innovationplace.eu, www.smartransport.eu) serving over 8.000 high-tech companies and organizations in Europe. CIAOTECH S.r.l., a branch of PNO Group, will take part in the MADFORWATER project as a linked third party of PNO Innovatieadvies. CIAOTECH is specialized in Innovation Management, providing support services to private and public organisations in Product and Process Innovation, Technology Transfer, IT solutions and support for research and development projects.

Università degli Studi di Milano
eng.defens.unimi.it/ecm/home

The University of Milan is a public teaching and research university, which - with 8 faculties and 2 schools and a teaching staff of more than 2000 professors - is distinguished by its wide variety of disciplinary fields. A leading institute in Italy and Europe for scientific productivity, the University of Milan is the largest university in the region, with approximately 64,000 students. The UMIL research team in MADFORWATER is part of the environmental microbiology unit of the Department of Food, Environmental and Nutritional Sciences (DeFENS). The team is led by Dr. Sara Borin and includes microbiologists and molecular microbial ecologists with a strong expertise in extreme environments, such as arid lands and contaminated sites, and plant-microbe interactions potentially exploitable to sustain crop production and phytoremediation approaches.

National Water Research Center
www.nwrc-egypt.org

The National Water Research Center (NWRC) is the national institution devoted to water resources applied research in Egypt. NWRC was founded in 1975, as the research body within the Ministry of Water Resources and Irrigation (MWRI). NWRC consists of twelve specialized research institutes comprising the various water engineering disciplines. Besides, NWRC's attached facilities include: a Strategic Research Unit, a Central Laboratory for Environmental Quality Monitoring, a Geographic Information System, Information/ Documentation Center, and a highly specialized Central Library.. The NWRC research team in MADFORWATER includes the DRI team working in the Lake Manzala Research Station for the pilots of the project and the CLEQM team doing the chemical and biological analyses. Both groups have a long collaboration history in the National Water Quality Monitoring Network in Egypt and have expertise in the fields of civil engineering and chemical and biological analyses.

Nanjing University
www.nju.edu.cn/english

Founded in 1902, Nanjing University (NJU) is one of the oldest and most prestigious institutions of higher learning in China. Nanjing University is in the first group of a limited number of high-level research universities for prioritized support by the Central Government of China under the '985 Project.' According to different rankings and in terms of various indexes of academic strength and comprehensive academic performance, Nanjing University is always one of the leading universities in China.

The School of the Environment of Nanjing University has "State Key Laboratory of Pollution Control and Resource Reuse" (Coconstructed with Tongji University). The school has also undertaken numbers of national, provincial, ministerial, and local research projects. Tens of science and research achievements have passed the provincial or ministerial appraisals. Many of these achievements have won varieties of awards and prizes. In the MADFORWATER project, the NJU team led by Dr. Wentao Li and Dr. Yan Li are working on the development of smart water reuse technologies, including online water quality monitoring, advanced oxidation process, automatic control system and etc.

ROLLAND Arroseurs Sprinklers
www.rolland-sprinklers.com

Rolla is leader of the French irrigation sprinkler market. It is exporting in Europe (Belgium, Netherlands, United kingdom, Switzerland, Italy, Germany, Poland, Bulgaria, Romania), Africa (Tunisia, Morocco, Algeria, Senegal), Middle East (Egypt, Iraq) and Oceania (New Zealand, Australia), especially on fruit farming, garden farming, extensive cultivation and horticulture. Rolla also manufactures a full range of pop up sprinklers for green spaces, golf course, and stadium.

Thanks to our know-how, our engineering department assisted by the management and the sales department decided to join the MADEFORWATER program. It corresponds perfectly to our product development axes. All our technical capacities and with the support of our subcontractors we are working on this program.

KROFTA WATERS INTERNATIONAL
www.krofta.ch

KROFTA WATERS INTERNATIONAL (KWI), operates in the field of water treatment and has thousands of systems installed and operating in all regions of the world. Over the years, it is highly specialized in systems based on the principle of flotation known as"DAF" (Dissolved Air Flotation). Based on this principle, KROFTA offers four different types of plants to their own development and manufacturing MINICELL, SUPERCELL, SEDIFLOAT and SANDFLOAT presenting different mechanical and physical characteristics and process suitable for all types of primary and secondary treatment of industrial and municipal waste water as well as in the production of drinking water. The technology, developed by Dr. Milos Krofta in the 60 to recover the cellulose fibers discharged from the process of production of the paper, has been applied in paper mills around the world helping to create a real brand of efficiency and quality highly appreciated by all users. In over 50 years of presence on the market, KROFTA has designed and installed plants for the treatment of water in the following industries, paper, fish, milk and cheese, sugar and candy, metal industries, petroleum, textiles, tanneries, recycling of plastic, and much more.

For more info about the project visit the MADFORWATER website at: www.madforwater.eu

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