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

Research and Innovation Action: Grant Agreement n° 688320

Introduction to the project
Madforwater at a glance

- **Societal Challenge:** Climate Action, Environment, Resource Efficiency and Raw Materials (SC5)
- **Topic:** WATER-5c-2014/2015 - Strengthening international R&I cooperation in the field of water. Development of water supply and sanitation technology, systems and tools, and/or methodologies
- **Starting date:** 1 June 2016.
- **Duration:** 4 years
- **Total cost:** 4,039,419 €
- **EU funding:** 2,914,419 €
- **Coordinator:** Dr. Dario Frascari, University of Bologna
- **Co-coordinator:** Dr. Giulio Zanaroli, University of Bologna
The Madforwater consortium

- 18 partners: 13 research insitutions, 4 SMEs, 1 international organization (FAO)
- 11 countries
- 5 partners from MACs
To develop an integrated set of technological and management instruments for the enhancement of wastewater treatment, treated wastewater reuse for irrigation and water efficiency in agriculture, with the final aim to reduce water vulnerability in selected basins in Egypt, Morocco and Tunisia.
The selected basins

- Souss-Massa
- Cap-Bon and Miliane
- North Eastern Nile Delta
- Morocco
- Tunisia
- Egypt
The Madforwater concept

- Madforwater is based on 2 main pillars: water supply (wastewater treatment) and water demand (irrigation).
- The actions related to these 2 pillars will be transversally characterized by the concepts of
  - adaptation to the local conditions of the 3 target MACs
  - integration (i) within each pillar, between technologies, water management strategies and economic instruments; and (ii) transversally, between WW treatment and WW reuse for irrigation
Specific objectives and expected results

**EXPECTED RESULTS:**

- Report on the international cooperation agreements related to water management in the target MACs
- Country-wide GIS maps describing water stress, water vulnerability and water reuse potential in the target countries
- Technical description of the effects of water vulnerabilities on food security and socio-economic development in the target MACs
- Basin-scale water vulnerability assessment framework for the evaluation of the effectiveness of integrated water management strategies
Specific objectives and expected results

DEVELOPMENT, ADAPTATION AND INTEGRATION OF TECHNOLOGIES FOR WW TREATMENT AND WATER EFFICIENT USE IN AGRICULTURE

EXPECTED RESULTS:
- 11 wastewater treatment technologies, tailored to the 3 selected basins and validated at laboratory scale
- 6 technologies for increasing water efficiency and reuse in agriculture, tailored to 3 selected basins and validated at laboratory scale
- 4 field pilot plants of integrated wastewater treatment and water reuse in agriculture, operated in the 3 selected basins
Specific objectives and expected results

**DEVELOPMENT, ADAPTATION AND INTEGRATION OF TECHNOLOGIES FOR WW TREATMENT AND WATER EFFICIENT USE IN AGRICULTURE** - SO2

**DEVELOPMENT OF INTEGRATED WATER AND LAND MANAGEMENT STRATEGIES** - SO3

**EXPECTED RESULTS:**

- **2 Decision Support Tools (DSTs)** for the integration of the project technologies for WW treatment and agricultural water & land management.

- A set of integrated strategies for WW treatment and agricultural water management, with the associated economic instruments, targeted to the 3 selected basins.

- **Policy recommendations** for the effective implementation of the proposed water management solutions in the 3 target MACs.
Specific objectives and expected results

- **SO1**: Improved identification of water vulnerabilities
- **SO2**: Development, adaptation and integration of technologies for WW treatment and water efficient use in agriculture
- **SO3**: Development of integrated water and land management strategies
- **SO4**: Increased capacity building in MACS

**Expected Results:**

- A technical booklet and a set of technical videos on the MADFORWATER WW treatment, efficient irrigation and water reuse technologies
- 3 Stakeholder Consultation Workshops, 2 Capacity Building Workshops, 1 train-the-trainer course, 4 on-field trainings at the project pilots, exchange of scientists, field visits, technical and dissemination videos, 1 final project conference.
Specific objectives and expected results

DEVELOPMENT, ADAPTATION AND INTEGRATION OF TECHNOLOGIES FOR WW TREATMENT AND WATER EFFICIENT USE IN AGRICULTURE

SO2

DEVELOPMENT OF INTEGRATED WATER AND LAND MANAGEMENT STRATEGIES

SO1

INCREASED CAPACITY BUILDING IN MACS

SO4

EXPECTED RESULTS:
An exploitation plan, including
(i) business plans to foster the market penetration in the target MACs of the MADFORWATER SMEs thanks to the developed technologies
(ii) strategies for the market expansion in the target countries of EU and MAC water and irrigation enterprises beyond the consortium
Specific objectives and expected results

**SO1** Imposed Identification of Water Vulnerabilities

**SO2** Development, Adaptation and Integration of Technologies for WW Treatment and Water Efficient Use in Agriculture

**SO3** Increased Capacity Building in MACs

**SO4** Development of Integrated Water and Land Management Strategies

**SO5** Promotion of Business Opportunities for EU and MAC Companies

**SO6** Adaptation of Technologies and Strategies to Other MENA Countries

**Expected Results:**
Guidelines and training packages for the adaptation to other basins in the target MACs and in other MENA countries of the MADFORWATER water vulnerability tools, technologies and water management strategies.
The Madforwater strategy

WATER VULNERABILITY ANALYSIS (WP 1)
- Phase I: country scale
- Phase II: basin scale

Tools for the assessment of water management strategies

Data for adaptation to local context

TECHNOLOGIES
- Phase III: lab-scale → selection →
- Phase IV: integrated pilots of WW treatment and reuse (WP 2, 3, 4)

IMPLEMENTATION (Phase V; WP 5, 6, 7)
- Decision Support Tools
- Industrial exploitation
- Policy recommendations
- Water management strategies
- Capacity building

Validated technologies
The Madforwater integration strategy

ANALYTICAL PHASES (WP 1)
- WW-related water vulnerability
- Agriculture-related water vulnerability
  - Integrated tools
    - Integrated water vulnerability assessment framework

TECHNOLOGICAL PHASES (WP 2, 3, 4)
- WW treatment technologies
- Irrigation technologies
  - Pilot plants
    - Integrated technologies
      - WW treatment SMEs business plans
      - Irrigation SMEs business plans

IMPLEMENTATION PHASES (WP 5, 6, 7)
- Economic & regulatory instruments
  - DSTs
  - Integrated water and land management strategies
- Cross-sectorial market access
- B2B
The expected impact

**WW treatment technologies**

- IRRIGATION QUALITY TREATED WW (27% of produced WW)
  - Increased turnover for WW treatment companies (9.4 b€)

**Irrigation technologies**

- LAND IRRIGATED WITH EFFICIENT TECHNOLOGIES (10% of irrigated land)
  - Increase of WW reused in agriculture (from 7% to 28%)
  - Reduction of water consumption in agriculture
  - Increased income for 6 million farmers; increased turnover for irrigation companies (1.4 b€)

- LAND IRRIGATED WITH HIGH QUALITY TREATED WW
  - Increase of available water (6.3% of the water currently consumed in agriculture)

- Scenario 1
  - Increased irrigated land (4% of current irrigated land)
  - Increased food production (1.3 Mt wheat / year)

- Scenario 2
  - Reduced cost associated to water over-exploitation (3.9 b€ saved)
  - To decrease of groundwater cathment
  - To agriculture

**Other uses**

- Increase of available water

➢ Estimated impacts referred to 10 years after the end of the project (2030)
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

Research and Innovation Action: Grant Agreement n° 688320

For more information on the project, visit www.madforwater.eu or contact us:

Project coordinator: Dr. Dario Frascari, dario.frascari@unibo.it
Project co-coordinator: Dr. Giulio Zanaroli, giulio.zanaroli@unibo.it
Exploitation & communication: Marijn Mulder, marijn.mulder@pnoconsultants.com