

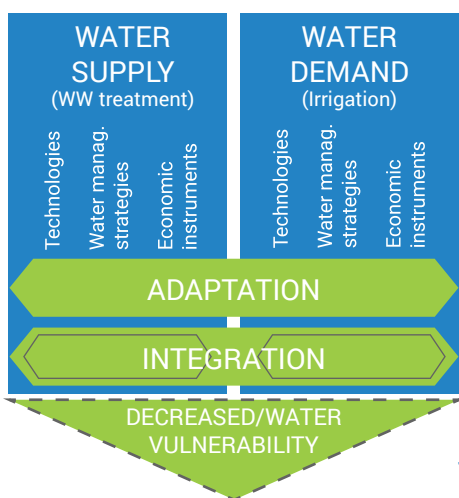
Development and application of integrated technological and management solutions for wastewater treatment and efficient reuse in agriculture tailored to the needs of Mediterranean African Countries: the MADFORWATER project

Why

Mediterranean African Countries (MACs) face a relevant water crisis, due to low water availability per capita, insufficient rate of wastewater treatment, overexploitation of renewable water resources, high demand of water for agriculture and non-optimized irrigation practices.

In the next decades, population and economic growth combined with climate change will make the situation even more dramatic, unless significant and rapid actions are taken.

Aims of MADFORWATER



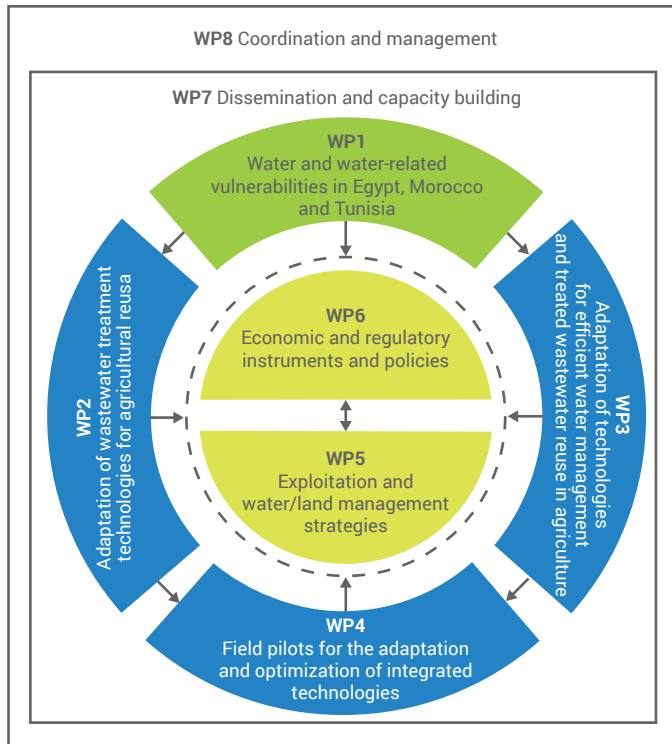
The MADFORWATER concept

- ☑ Madforwater is based on 2 pillars: **water supply (wastewater treatment) and water demand (irrigation)**
- ☑ Transversal key concepts:
 - ✓ **adaptation** to the local conditions of the 3 target MACs
 - ✓ **integration** (i) within each pillar, between technologies, water management strategies and economic instruments; (ii) transversally, between wastewater treatment and wastewater reuse for irrigation

The MADFORWATER technologies

Wastewater treatment technologies		Irrigation technologies
Canalized lagoon with nitrification/denitrification capacity	Phenolic compounds adsorption + anaerobic digestion	Low-pressure micro-sprinklers and calibrated nozzles adapted to treated WW
Nitrifying trickling filters	Aerobic sequenced batch reactor	Re-engineered surface irrigation systems
Constructed wetlands with plant growth promoting bacteria	Granulated sludge bioreactor	Large spectrum soil moisture sensor calibrated for saline water
Enzymatic degradation of emerging pollutants, dyes and fungicides	Flotation + Moving Bed Biological Reactor (integrated)	Supply of plant growth promoting bacteria to increase crop resistance to water scarcity
Catalytic disinfection beds activated by solar UV light	Dyes adsorption with innovative resins	Open source software tool to determine the optimal irrigation amount and schedule

The MADFORWATER strategy



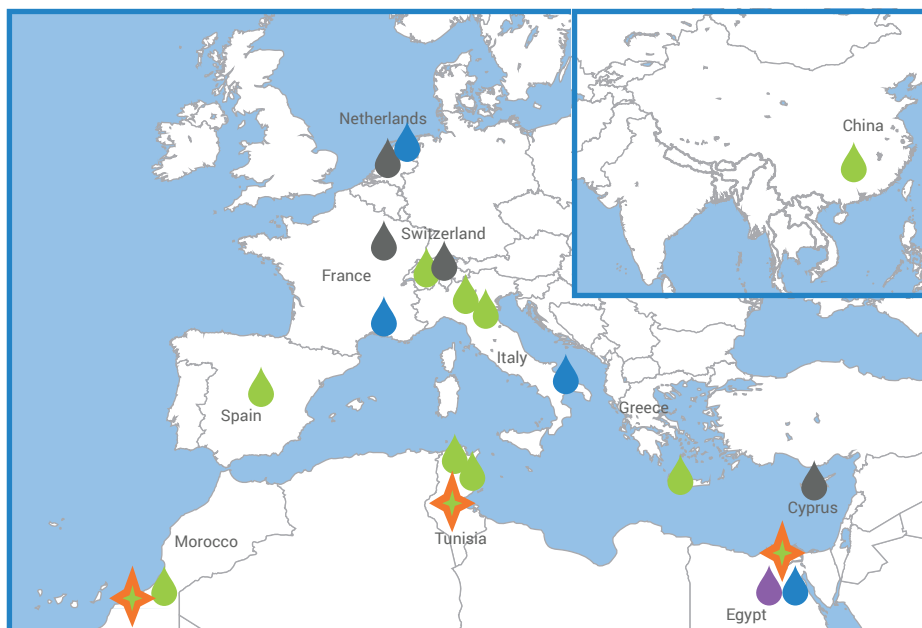
The project is articulated into 3 main phases:

✔ **Analytical phase**
evaluation of the water vulnerabilities in the 3 target countries

✔ **Technological phase**
lab-scale development and adaptation of technologies; implementation of the best technologies in 4 demonstrator plants of wastewater treatment and agricultural reuse

✔ **Implementation phase**
decision support tools, basin-scale water management strategies, policy recommendations, capacity building, industrial exploitation

The MADFORWATER consortium



- University
- Research Institute
- SME
- International Organization
- Location hosting pilot plants

University of Bologna (Italy)
University of Manouba (Tunisia)
Technical University of Crete (Greece)
University of Tunis El Manar (Tunisia)
University of Applied Sciences and Arts Northwestern Switzerland
Agronomic and Veterinary Institute Hassan II (Morocco)
University of Milano (Italy)
Nanjing University (China)
Technical University of Madrid (Spain)

Wageningen Environmental Research (Netherlands)
Mediterranean Agronomic Institute of Bari (Italy)
NWRC - Ministry of Water Resources and Irrigation (Egypt)
IRSTEA (France)

PNO Innovatieadvies (Netherlands)
S.K. Euromarket Ltd (Cyprus)
Krofta Waters International (Switzerland)
ROLLAND Arroseurs Sprinklers (France)

FAO Regional Office for Near East and North Africa

Coordinator: Dario Frascari (dario.frascari@unibo.it); co-coordinator: Giulio Zanaroli (giulio.zanaroli@unibo.it); www.madforwater.eu



The 4-year project MADFORWATER (June 2016 - May 2020) is a Research and Innovation Action of the Horizon 2020 program (GA No 688320).