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

Berichterstattung

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Dieses Projekt findet Erwähnung in ...
Periodic Reporting for period 2 - 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)

Berichtszeitraum: 2017-12-01 bis 2019-05-31

Mediterranean African Countries (MACs) are characterized by a major water crisis. MADFORWATER focuses on 3 MACs - Egypt, Morocco and Tunisia - representative of the Mediterranean African Region in relation to their population, GDP and produced wastewater.

MADFORWATER aims at developing technological and management instruments for the enhancement of wastewater (WW) treatment, treated WW reuse for irrigation and water efficiency in agriculture in Egypt, Morocco and Tunisia.

This overall goal is translated into the following specific objectives:
1. improving the analysis of water and food security in the 3 target countries;
2. developing and adapting to the local contexts technologies for WW treatment and treated WW reuse for irrigation;
3. promoting business opportunities in the target countries for the project SMEs and for water & irrigation enterprises;
4. developing basin-scale water and land management strategies;
5. increasing the level of capacity building in the target countries in relation to the proposed solutions and the social acceptance of treated WW reuse in agriculture;
6. enabling the adaptation of the project outcomes to other basins of the target MACs.

The MADFORWATER concept is represented in Fig. 1.
Egypt, Morocco and Tunisia. In relation to this, in WP1 for the first time the 2016 Asian Water Development Outlook (AWDO) for quantifying economic water security was applied to Morocco, Tunisia and Egypt. Several water security maps were produced. A mapping of wastewater reuse potential in the target MACs was elaborated. The economic water security approach was applied also to the analysis of food security. This led to the production of two maps showing food security risk in Mediterranean countries, one referred to the current situation and one to a 20-year projection. WP1 allowed the identification of measures potentially useful to enhance water and food security in the 3 target countries.

The second specific objective is to develop a technological toolbox for wastewater (WW) treatment, irrigation efficiency and treated WW reuse in agriculture. In relation to this, WP2 set up and adapted to the local context of Tunisia, Morocco and Egypt, technologies for the treatment of different WW types. The targeted WWs are: municipal WW, water of drainage canals in the Nile delta, agro-industrial WWs and textile WW. The most promising treatment train was identified for each WW. WP3 developed and adapted to the 3 target countries 6 technologies suitable for irrigation with treated WW: plant growth promoting bacteria, new-generation tensiometer, low-pressure mini-sprinkler, calibrated nozzle, replacement of open irrigation canals with gated pipes and decision support system to optimize irrigation scheduling and nutrient supply. The Life Cycle Assessment (LCA) and Cost Benefit Analysis (CBA) of the proposed WW treatment and irrigation technologies was completed. In WP4, a SWOT analysis based on technical performances, LCA, CBA and stakeholder feedback led to the selection of the WW and irrigation technologies to be scaled up in 4 demonstrator plants of integrated WW treatment and agricultural efficient reuse. At the end of the second reporting period, the construction of these plants has been completed, whereas their installation and start-up are in progress. Two plants (in Tunisia and Morocco) are dedicated to the treatment and reuse of municipal WW, one (in Tunisia) to textile WW and one (in Egypt) to drainage canal water.

In order to promote business opportunities in the target countries for the MADFORWATER SMEs as well as for EU and North African water and irrigation companies in general, a preliminary Exploitation Plan was developed, a business plan for each SME was drafted and a dedicated exploitation seminar was organized.

The fourth objective of MADFORWATER is to decrease water vulnerabilities in Egypt, Morocco and Tunisia through the development of integrated water & land management strategies. The development of two model-based decision support tools – dedicated to WW management and to agricultural water management - is in progress, to integrate technologies and economic instruments into basin-scale water management strategies. These tools are adapted to the 3 hydrological (sub)basins targeted by the project: Souss-Massa in Morocco, Cap-Bon and Miliane in Tunisia, North-Eastern Nile Delta in Egypt. A review on the policies and economic instruments applied in water management in the target MACs was completed.

The fifth objective of the project is to increase the level of capacity building in the target countries in the field of water management and social acceptance of treated WW reuse. A stakeholder analysis was conducted; several stakeholder consultation workshops, 1 capacity building workshop and 3 train-the-trainer courses were organized in Morocco, Tunisia and Egypt. The dissemination activities performed so far include the project website (www.madforwater.eu) a promotional video, a project’s
poster and leaflet, 3 newsletters, 15 scientific articles and the participation to 80 scientific conferences and dissemination

MADFORWATER reached during the first and second reporting period a relevant advancement beyond the state of the art in several fields: for the first time, the AWDO 2016 framework to assess economic water security was applied to North Africa; innovative technologies for treating several WWs and for an efficient reuse of treated WW were adapted to the MAC context; an innovative approach for the production of water management strategies was applied to the MAC context.

MADFORWATER is expected to achieve until the end of the project the following results:
• a set maps on water and food security in the target MACs;
• a framework to assess the effectiveness of integrated water management strategies;
• identification and optimization of an optimal treatment train for each targeted WW type and of locally-adapted technologies for increasing water reuse in agriculture;
• design, construction, operation and optimization of 4 field pilot plants of integrated WW treatment and reuse in agriculture;
• an increased capacity building in the target countries in the field of water;
• integrated strategies for WW treatment and agricultural water management, targeted to Egypt, Morocco and Tunisia;
• policy recommendations for the effective implementation of the proposed water management solutions in the 3 target MACs.

The expected MADFORWATER impact is graphically illustrated in Fig. 2. The project is expected to lead, 10 years after its conclusion, to the following impacts in the 3 target countries:
- consistent increase of WW treatment and treated WW reused for irrigation;
- relevant increase of land irrigated with efficient technologies suitable for WW reuse;
- strong water saving in agriculture;
- increase in agricultural production and food security;
- increased income and employment potential of the water treatment and agricultural sectors;
- decrease of the overall costs associated to water vulnerability.
**Fig. 1 - The MADFORWATER concept**

**Fig. 2 - The MADFORWATER Impact**

**WW treatment technologies**

**IRRIGATION QUALITY**

**TREATED WW**

- Increased turnover for WW treatment companies

**Scenario 2**

Reduced cost associated to water over-exploitation

**LAND IRRIGATION QUALITY TREATED WW**

- Increase of WW reuse in agriculture

- Increase of availability to decrease of groundwater catchment

**reused in agric.**