

**Rafael Casielles** gives a preview of developments in treating wastewater and reusing it for tailor-made irrigation

**A**S with many other regions in the world, Spain is facing the consequences of increasing stress on water resources. Uneven climate conditions, with areas of low rainfall and long periods of drought, have forced Spain to rationalise and optimise its water management strategies.

This situation, along with the increasing water demand in urban areas, requires innovative combinations of technologies to fulfill the current demand for domestic potable water and from agriculture and industry. Irrigated agriculture is the main activity in terms of water consumption using around 80%, so it is crucial to propose solutions which take this demanding sector into account in order to ensure greater sustainability of overall water resources.

In recent years, reusing reclaimed water (ie treated wastewater) has increased as an alternative water resource for agriculture in Europe. Indeed the EU's Water Framework Directive 2000/60/EC incorporates the concept and definition of reclaimed water and states that wastewater should be re-used wherever appropriate.

**Reclaimed water is a strategic resource of particular value in water-stressed areas, providing a constant source of water which, unlike fresh water, is not so dependent on climate.**

Reusing reclaimed water has an extraordinary potential in ensuring water sustainability since it addresses both water supply by reducing the net demand on fresh water, and water pollution control by reducing the volume of wastewater discharged into the environment. Likewise, reclaimed water is a strategic resource of particular value in water-stressed areas, providing a constant source of water which, unlike fresh water, is not so dependent on climate.

Even with the Water Framework Directive in place, use of reclaimed water in Europe is not significant. Quantitative information on

# Wastewater: back to the land

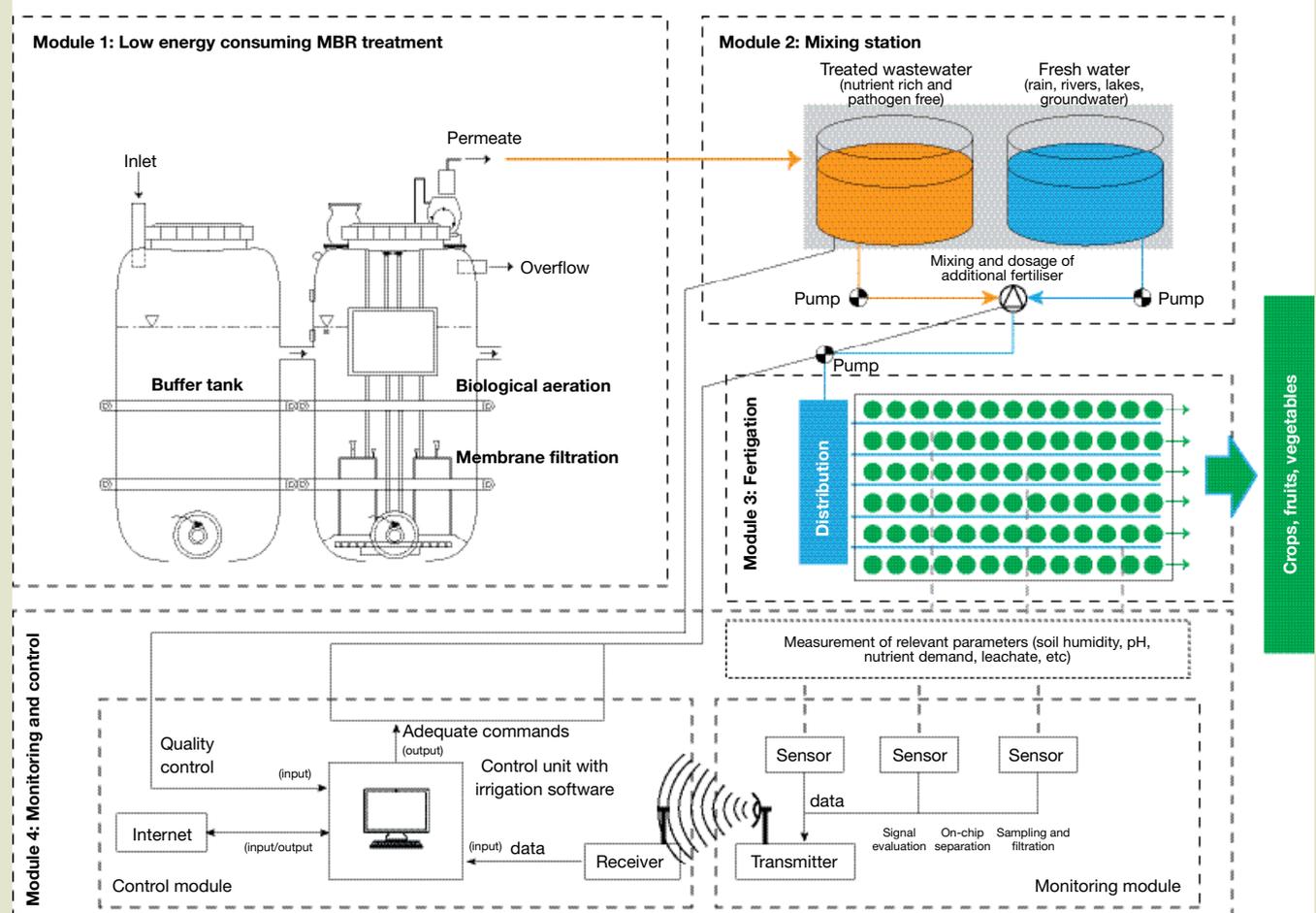


[www.treatanduse.eu](http://www.treatanduse.eu)

The EC-funded Treat & Use project comprises scientists from six European technical SMEs and one research centre. Together, they are developing an innovative proof-of-concept system to re-use reclaimed water for irrigation in Southern Spain.

The main objective is to construct a pre-commercial prototype which combines water treatment with membranes and an adapted irrigation system so that the overall process is completely automated with minimum requirements for operation and maintenance.

The project is co-ordinated by Spanish company BIOAZUL, with participation from TTZ-Bremerhaven, HYDRO-AIR, ISITEC, PESSL, Soil Moisture Sense, and GUADECOL.



The Treat & Use system is designed so that the soil 'talks' to the mixing station, telling it how to optimise the nutrient content of the water supplied for irrigation while avoiding contamination of the land

wastewater treatment and reuse is difficult to obtain; however, according to a survey conducted within the AQUAREC project, in 2004 the total volume of reused treated wastewater in Europe was 964 Mm<sup>3</sup>, which accounted for 2.4% of the treated effluent. Spain accounted for the largest proportion of this (347 Mm<sup>3</sup>), while Italy used another 233 Mm<sup>3</sup>. In both countries, agriculture absorbed most of the reused treated wastewater. Israel is another large user of treated wastewater, (280 Mm<sup>3</sup> in 2004, around 83% of the total treated wastewater). The highest treated wastewater reuse rates are found in Cyprus (100%) and Malta (just under 60%).

In Spain, there have been encouraging signs of uptake in this area - in 2010, 491

Hm<sup>3</sup> of reclaimed water was re-used, 10% of the total treated flow, and that trend is growing, according to INE, the National Institute of Statistics of Spain (see Figure 1 overleaf).

The importance of reclaimed re-use has been backed by the European Commission (EC) with support from numerous research projects, including the Treat & Use initiative (see box) - a 30 month project with around E1m in EC funding.

### the technology

The TREAT&USE system comprises four modules (see Figure 1):

- a water treatment module;
- a mixing station;
- a fertigation (fertilisation via irrigation)

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There is a considerable potential for wastewater re-use in those agricultural areas where water scarcity is an important constraint for development. Southern Europe, North Africa and the Middle East are good examples.

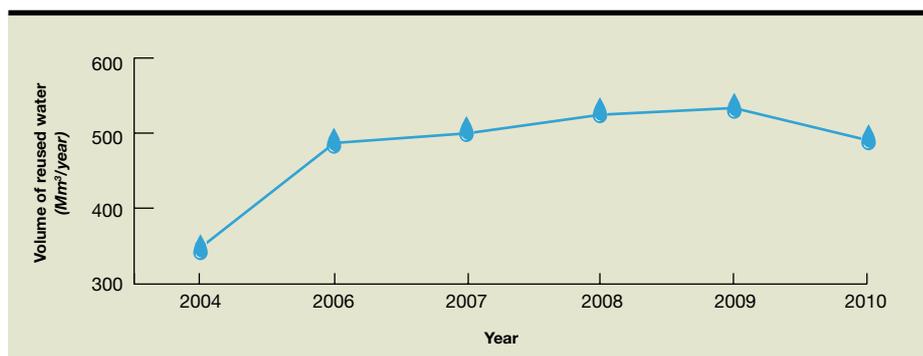


Figure 1: Re-use of treated wastewater in Spain

module; and

- a control and monitoring module.

A membrane bioreactor (MBR) has been designed for the water treatment module in a way that plant nutrients contained in wastewater (mainly nitrogen and phosphorus) are maintained after the treatment while pathogens are killed. The mixing station mixes the appropriate proportion of fresh water and the treated wastewater coming from the MBR, which is then fed into the fertigation module. The appropriate level is determined by monitoring the level of nutrient content in the soil via sensors; this information is sent by remote control to the control and monitoring unit which will translate the signals received into specific orders to the valves of the mixing unit.

The individual technologies (MBR, sensors, monitoring and control system, etc) are not new. However, the innovation here is their assembly to build a single compact system which could be easy to use by end-users. With little technical expertise, farmers could use this automated system to identify the required nutrients in the soil through sensors and tailor the dose of treated wastewater accordingly in real time. The benefits to a community are clear – treated wastewater could be used for fertigation of crops, while at the same time avoiding the contamination of soil or groundwater.

The system is designed for the use of individual farmers or farmers associations and its compact design makes it highly appropriate for small agglomerations such as rural areas. However, it can also be used in urban areas where wastewater is treated centrally, with transportation to areas of need.

### progress

The project, which started in June 2012, has recently recently completed the design phase. All partners are now coordinating the construction and assembly of the different prototype components which will be installed during April and May 2013.

The system prototype will be placed in the town of Cartama in Malaga, Spain, in a 2,700 m<sup>2</sup> field for the irrigation of 2,000 tomatoes. After the necessary primary functioning tests, the TREAT&USE system will start functioning at the end of May and up to the end of the irrigation season of tomatoes (September-October). A second optimisation phase will be carried out during the irrigation season in 2014.

### the vision

There is a considerable potential for wastewater re-use in those agricultural areas where water scarcity is an important constraint for development. Southern Europe, North Africa and the Middle East are good examples of this but they are not alone. Water is the most strategic resource on earth and climate change is leading many countries to consider wastewater as a valuable resource instead of a waste to be discharged. In Europe, the water reuse sector is in a transitional phase, moving towards greater sustainability, and there are unique opportunities for implementation on a larger scale. [tce](#)

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### further reading

1. A. Lorenzo, A. Vega, G. Schories, J. Hernandez, A. Crisuoli, A. Figoli, E. Drioli, R. Al-Sa'ed, Z. Mimi, S. Sayadi, A. J. Ghata, F. Atallah, H. Abdel-Shafy. (2011). Membrane Technology in Water Treatment in the Mediterranean Region (PROMEMBRANE). A. Lorenzo und A. Vega (Editoren), IWA Publishing, London.
2. UNEP. (2011). UNEP - Freshwater in Europe. Retrieved November 01, 2011, from [http://www.grid.unep.ch/product/publication/freshwater\\_europe/consumption.php](http://www.grid.unep.ch/product/publication/freshwater_europe/consumption.php)



In Spain and Italy, agriculture absorbs most of the reused treated wastewater.