Unlocking the potential of treated wastewater reuse: The case study of Lisbon

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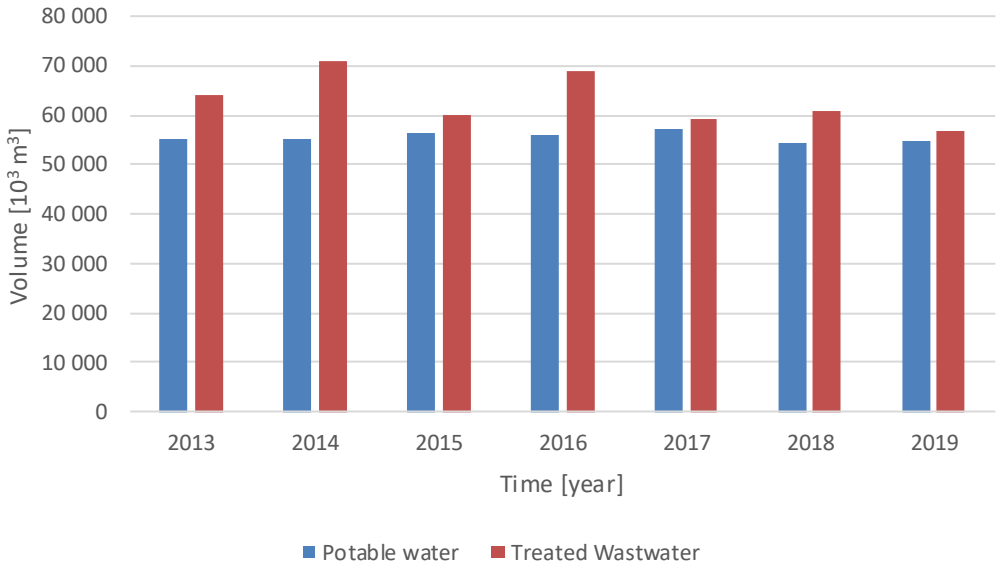
Abstract

Water scarcity is already a reality in many parts of the globe, and climate changes are expected to exacerbate and expand it further. One of the regions of the globe in this situation is the Mediterranean, where some countries (e.g. Portugal, Spain, Italy) already record a decreasing trend in the annual rainfall of more than 20 mm/ 10 years (Caloiero *et al.*, 2018). For Portugal, specifically, the rainfall is expected to decrease further, but with a significant seasonal influence. The rainfall decrease is forecasted to be larger during the dry periods (above 50% decrease in the summer) and less in the wet periods (marginal decrease in the winter) (Soares *et al.*, 2015).

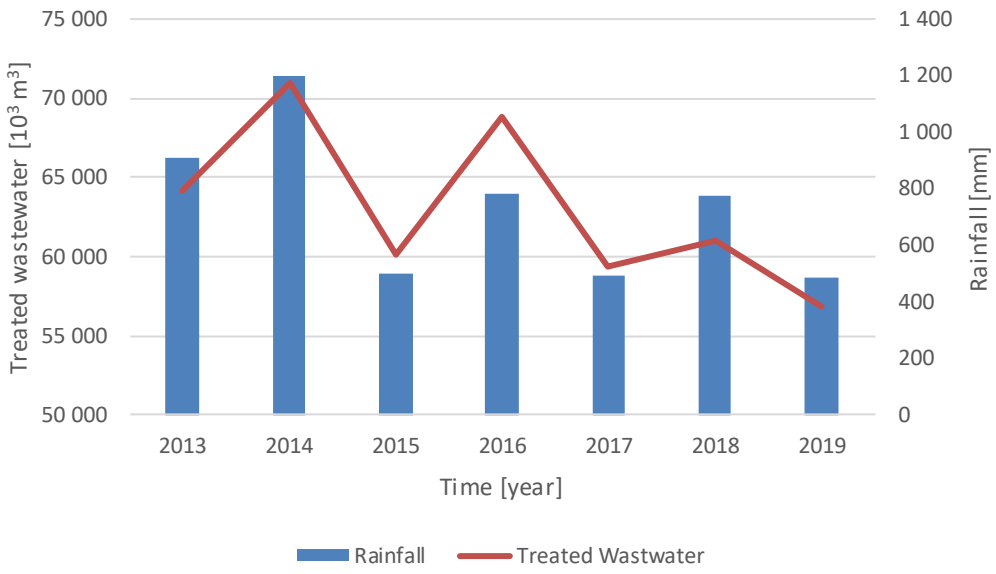
In this context, the urge to adopt a more sustainable water consumption becomes crucial. Despite urban water consumption comprising a small fraction of the total water demand, with agriculture and energy representing the largest shares, there is significant potential for improvement since most of it is not consumptive use and is discharged into the receiving water bodies almost immediately.

One of the options to promote a more sustainable urban water consumption is the use of treated wastewater in non-potable water uses. In Europe, this is a particularly interesting option for medium to large urban areas, since the Urban Waste Water Treatment Directive (Council Directive 91/271/EEC) requires urban areas with over 10 000 people discharging in sensitive areas to implement at least tertiary treatment. Furthermore, the recent revision of the directive proposes making this requirement mandatory for all wastewater treatment plants treating a load equal to or greater than 100 000 p.e., along with the need to implement also quaternary treatment to eliminate micro pollutants.

This context will create a steady and controlled flux of high-quality treated wastewater that will be available, in most cases, close to urban consumers. In Lisbon, the amount of wastewater treated annually even exceeds the water consumption volume due to the existence of combined sewer networks in the oldest parts of the city, along with infiltration and wrong connections (Figure 1).



(a)



(b)

Figure 1 – Relation between treated wastewater and (a) potable water consumption and (b) rainfall in Lisbon

The key limitation for using this resource, in addition to the question of public acceptance, is the disruption that the construction of a non-potable water network entails in a consolidated urban space. However, the ongoing construction of two large flood relief tunnels crossing the city created a unique opportunity of installing a non-potable water main inside one of them (Figure 2), enabling the supply of the treated wastewater from the Alcântara wastewater treatment plant (WWTP) to various points throughout the city.

Figure 2 – Location of the Monsanto-Santa Apolónia flood relief tunnel (yellow)

The present study aims at assessing the potential of using the treated wastewater that will be available for various non-potable water uses, including in non-residential buildings.

References

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