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# Guest Editorial
# Water Supply and Wastewater Management in Modern and Smart Cities

**Xi ZHANG[1], Mohammadreza KAMALI[*1]**

** Corresponding author*

*1 KU Leuven, Department of Chemical Engineering, Process and Environmental Technology Laboratory, Sint-Katelijne-Waver, BELGIUM*

xi.zhang@kuleuven.be 0000-0001-9519-2567

mohammadreza.kamali@kuleuven 0000-0002-1591-9605

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**ABSTRACT**

Water is the basis of modern societies. However, population growth and rapid urbanization on the one hand, and anthropogenic activities, on the other hand, have considerably contributed to the scarcity of clean water resources. Hence, modern and smart cities have to develop sustainable tools and technologies for providing clean water resources and treat the generated effluents from the various industrial and non-industrial origins to satisfy the sustainability and circular economy goals. In this regard, a wide range of interdisciplinary knowledge is needed to investigate various aspects including site selection and designing modern (waste)water treatment facilities. Therefore, studies are welcome to design modern and smart cities or to modify the conventional infrastructures in the existing urban areas.

## 1. INTRODUCTION

Rapid urbanization, population growth and industrialization have caused pressure on various natural resources (Maja and Ayano, 2021). Lifestyle changes of the urban population in modern cities has also increased water consumption, thus, producing more urban wastewater (Abrishamchi et al., 2005). For instance, increased consumption and the release of pharmaceutical compounds and personal care products into the household effluents has resulted in an increase in the environmental concentration of such pollutants with possible ecological and health risks (Arnold et al., 2014). Hence, clean water supply and the efficient treatment of the produced effluents are currently considered as interdisciplinary challenges, covering an array of activities from the treatment of drinking water, designing the urban water supply infrastructures, to the efficient treatment of the generated wastewater. In addition to the implementation of advanced and sustainable technologies for the treatment of polluted (waste)water, such as anaerobic digestion and advanced oxidation processes (AOPs) (Zhang et al., 2021), the selection of the most appropriate sites for setting up treatment facilities is of high importance to ensure the long-term security of the water supply and management. Various techniques have been developed and implemented by the scientific community for the efficient treatment of the produced wastewaters and supplying clean water resources. Geographic

Information System (GIS) has been considered as one of the most appropriate tools, widely implemented for the establishment of such infrastructures (Kamali et al., 2017; Liu et al., 2017). Integration of various logics in GIS (such as Fuzzy methodology) has been of great significance in this regard to support decision-makers in selecting the best alternatives. Inclusion of various sustainability aspects (i.e. technical, environmental, economic, and social) in the screening and weighting the influencing criteria in the selection of the most appropriate sites is also a vital requirement for the future water supply and management infrastructures (Thomas, 2002). On the other hand, sustainable water supply for modern and smart cities implies efficient management of the available water resources (Guo et al., 2020). For instance, rainfall is considered as a source of potable water, especially in tropical regions. Efficient in-situ treatment technologies are required for removing pollutants that can be expected to be detected in this type of water resource, namely air pollutants that were washed out by the rain or those transferred by flooding the rainfall into the water reservoirs. In this case, designing and implementing sustainable urban drainage systems equipped with smart technologies such as online sensing and pollution monitoring are very much welcome for modern and smart cities.

Sustainable urban water management practices also require social awareness on the importance of clean water resources and guidelines to minimize the pollution of urban waters at the source.

Huge research efforts have been made resulting in innovative physic-chemical and biological wastewater treatment methods. The development of the in-situ wastewater treatment systems to treat the produced effluents at the source (household wastewater treatment systems) to reduce the pressure on the urban wastewater treatment facilities has also been subject of research. Furthermore, cutting-edge technologies have also been developed, such as microbial fuel cells (MFCs), which can simultaneously treat wastewater (for instance, in toilets) and generate a sustainable source of electrical energy to provide the electricity needed for some household applications (Guo et al., 2020). In such cases, interdisciplinary knowledge from various scientific areas is required to develop sustainable strategies for future smart cities (Mnkeni and Austin, 2009; Patrick et al., 2021).

In addition to water treatment facilities, their efficient site selection in urban areas is also crucial. Very recently, the application of modern tools such as artificial intelligence has resulted in the efficient prediction of the performance of the urban wastewater treatment facilities. This can potentially aid at enhancement of their performance to accelerate the regeneration of the clean water resources to satisfy the ongoing needs of the urban population (He et al. 2021; Kamali et al. 2021). This can satisfy the fundamentals of the circular economy, especially when combined with environmentally friendly wastewater treatment practices such as those based on the development of efficient biological systems with minimum life-cycle impacts and subsequent environmental effects.

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