Water resource recovery modelling 2021 (WRRmod2021 conference)

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Editorial: Water resource recovery modelling 2021 (WRRmod2021 conference)

Our society is transitioning fast into the digital age, spurred by development of cheap and new sensing technology, breakthroughs in computing, and development of efficient algorithms for optimization. This transition is also visible in the field of wastewater treatment and is driving new model developments, especially by exploiting the large data sets available with many utilities. Not surprisingly, WRRmod2021 had featured a strong session on 'data-driven models and digitalization' focused on this hot topic. At the same time, engineering practice calls for more robust models for performance evaluation and optimization of both conventional facilities and innovative processes. As a result, the WRRmod2021 program also exhibited sessions on modelling of new process units (e.g., aerobic granular sludge), modelling of the nitrogen cycle, and integrated/plant-wide modelling.

In this issue on the Water Resource Recovery modelling published in *Water Science & Technology* journal, six relevant studies that highlight recent promising model developments were selected.

Three of the selected papers focused on 'data-driven models and digitalization'. Schneider *et al.* (2022) first present an overview of hybrid modelling methodologies applied to wastewater resource recovery facilities (WRRFs), and discuss challenges and research needs for the design and architecture development of such models, good modelling practice, etc. Torfs *et al.* (2022) discuss the use of digital twins, presented as an innovative and powerful technology that has the potential to harness the power of digitalization. Finally, Li & Vanrolleghem (2022) present their work on the development of influent generators, to produce an input time series required for dynamic simulation of WRRF. Together, these studies show early signs of data maturity at the utility level, where sensor data and models can be used online in a synchronized manner.

Two other selected papers presented new models of innovative process units: the aerobic granular sludge process and the short-cut processes for nitrogen removal (i.e., deammonification and nitrite-shunt). Derlon *et al.* (2022) presented a new model of an aerobic granular sludge system that integrates both microbial and hydraulic selection of granules (based on plug-flow feeding, selective removal, etc.). Kirim *et al.* (2022) provided an overview of the state-of-the-art in modelling of the short-cut processes for nitrogen removal in mainstream wastewater treatment and presented future perspectives for directing research efforts in line with the needs of practice.

Finally, a paper by Brouckaert *et al.* (2022) presented a modelling study for the upgrade of a wastewater treatment plant (WWTP), using an incomplete influent data set. In their study, Brouckaert *et al.* thus demonstrate how the application of a pair of modelling tools, a probabilistic influent fractionator, and a simplified steady-state plant-wide model, can help re-combining the influent fractionation, thus offering the best available information by reconciling available data with the firmly established process knowledge.

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