

Title MSc project: Water supply and demand in an industrial perspective

Assignment number:
25-23

External project

Head graduation committee
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Daily supervision
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Recommended courses: Sustainable Engineering, Water Footprint Assessment, Water Quality

Involved organisations:
KWR (Nieuwegein, the Netherlands)

Start of the project:
To be discussed

Short description project aim and motive:

Water scarcity (related to both, quantity and quality) is a severe problem at global level (Mekonnen and Hoekstra, 2016, van Vliet et al., 2021). Hence, a sustainable water allocation for the different purposes is essential. Especially for industrial water use, treatment technologies to allow for water re-use are discussed as options to reduce water consumption (Meese et al., 2022, Salgot and Folch, 2018). Besides the discourse on reducing consumptive water use, there is a line of thought that not every water use requires the best water quality (O'Connor et al., 2008). Ideas cover a cascading water use (Guo et al., 2022) or concepts such as using sweet water when required and salt water whenever possible (Lassiter, 2021). Each of these strategies has its own implications on the resulting water footprint of an industry. Moreover, these strategies might have other environmental footprints (besides water), (practical) requirements and trade-offs. Only by understanding these, industries can make informed decisions about their water management practices to become more (environmentally) sustainable (Berger and Thiede, 2023). However, currently we lack insight on how these strategies compare in terms of sustainability performance. Two common methods to assess water-related sustainability are the water footprint (WF) (Hoekstra et al., 2011) and life cycle assessment (LCA) (Kounina et al., 2013). Both methodologies have their strengths and limitations, but these have not been systematically assessed in the context of different industrial water management strategies and it is unclear if results would lead to identical recommendations.

Research objective

This project contains a two-fold objective: 1) assess the water-related environmental sustainability of different industrial water management strategies; 2) compare two methods (WF and LCA) to assess water-related sustainability.

Method

Therefore the following steps should be considered:

- Scope definition (selection of industrial water management strategies [at least two], geographical context, spatial resolution, potential case study)
- Developing a comprehensive understanding of WF and LCA method
- Selection of relevant water indicators (groundwater level, drinking water, industrial flow etc), including quantity and quality to assess water-related environmental sustainability
- Conduct a WF assessment and an LCA for selected water management strategies
- Compare and interpret results of the two assessments
- Reflect and evaluate regarding: i) What are recommendations for industry based on each of the methods; ii) what are strength and weaknesses of each method (quantitatively and qualitatively); iii) first steps to work towards an industrial-waterfootprint-model.

Expected result

Results cover a WF and an LCA study for chosen industrial water management strategies. Based on results from this study, recommendations to increase the water-related environmental sustainability can be provided to industries. Moreover, results will quantitatively and qualitatively show differences of the two methods WF and LCA. Ideally, justified recommendations for methodological choices towards an industrial-waterfootprint-model can be provided by this project. Such model could be used to evaluate the water allocation within a region and to visualize the effects of certain interventions from industry. For ambitious students it is well-possible that the thesis report will later on result in a journal publication.

References

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