Constructed wetlands for the removal of additives from saline industrial waste water

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Motivation

This PhD-research is embedded in the NWO-STW Water Nexus research program. Water Nexus aims to find innovative technical solutions for problems with fresh water scarcity in delta areas. A partial solution is to lower the industrial fresh water footprint. This can be achieved by reusing industrial waste water streams for industrial or agricultural purposes. Challenges for the reuse of this water are the salinity and the presence of industrial additives.

Green infrastructure as constructed wetlands (CWs) have shown to be able to remove harmful components from waste water streams prior to reuse. Within this PhD-research, the optimal CW systems design for the removal of industrial additives from saline industrial waste water will be studied.

Various contaminant removal mechanisms as biodegradation, photodegradation, plant uptake and adsorption occur in CWs simultaneously. The dominating removal mechanism in a CW is determined by the CW design (Fig. 1). Different pilot scale CWs are available outside our laboratories (Fig. 2). In this research, I will start with lab scale removal tests, followed by designing the optimal CW configuration in the outside CWs.

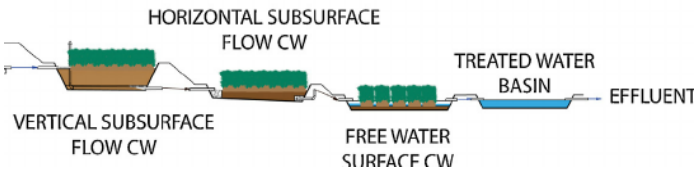
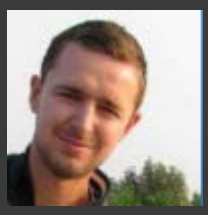


Figure 1. Hybrid CW (Avila et al., 2015)

Figure 2. Pilot scale CW facilities

My future experiments

- Perform various lab scale tests to determine the removal processes for a set of industrial additives
  - Biodegradation
  - Photodegradation
  - Adsorption
- Scale up lab scale tests to bench scale (aquarium) constructed wetland systems.
- Implement obtained knowledge on removal processes into pilot scale constructed wetland configurations (outside, next to the ETE laboratory (Fig. 2)



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