**Is it Vertical Flow Constructed Wetland a suitable polishing treatment for micropollutant removal in medium-sized WWTPs? A case of study**

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**Abstract**

The present study focus in the development of soil-filter installations namely Constructed Wetlands as tertiary treatment for micropollutant removal in medium-sized WWTPs (i.e. less than 100 000 PE). The investigation is part of a multidisciplinary project that coordinates the activities of multiple researchers, expert in different areas, into a multi-pronged approach to the topic.

Being geographically the border between Luxembourg and Germany, the Sure river is here considered as case of study and possible scenarios to mitigate urban emission are evaluated.

For this, 27 compounds have been selected taking into account those known to be excreted in the highest amount (in the case of pharmaceuticals: antibiotics, beta blocker, cytostatics etc), those known with the highest eco-toxicity (i.e. cytostatics), those known to be under observation (i.e. Glyphosate, Erythromycin) or with legal obligations (i.e. Diclofenac, Isoproturon, Diuron).

The investigation is developed in two phases. An attempt has been made to initially select a suitable substrate among traditional granulates (i.e. sand and zeolite) and more innovative material such as biochar (activated and not). Six planted (i.e. Phragmites australis and Iris pseudacorus) lysimeters have been fed with synthetic wastewater three times a day with a relaxation time of 7.5 hrs, resulting in an hydraulic load of 100 L/m2d. After reaching steady-state conditions, the downward wetlands were spiked with target micropollutants over five months. Influent and Effluent samples were regularly taken, concentrated using Solid-Phase Extraction (SPE) and then analyzed with Liquid Chromatography coupled with Mass Spectrometry (LC/MS). Removal rates of the individual compounds have been evaluated with respect to substrate and its physical parameters, together with operational conditions (i.e. hydraulic load, time of operation and treated wastewater). The established nitrification process and the acclimatization of bacteria has been observed by the measurement of macropollutants (i.e. NH4, TN, NO3) and consumed dissolve oxygen. Most favorable mechanism of removals of individual compounds were hypothesized: as example, Propanolol appeared to be predestinated towards Photodegradation by UV light while Carbendazin towards Phytodegradation by plant uptake. Those assumptions will be then validated with experimental data. Once selected the most promising adsorbing material, an intermediate test will be performed in the treatment plant of Reisdorf, Luxembourg (i.e. 4000 PE) in order to see the effect of real matrix.

The knowledge gained from these lab scale studies together will be then used to design and dimension a full scale wetland to be installed in the WWTP of Eschternach, Luxembourg (i.e. 20000 PE) and subsequently for decision policy support in the Greater Region.