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NUTRIENT REDUCTION IN CONSTRUCTED WETLANDS RECEIVING TREATED WASTEWATER

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Constructed Wetlands receiving treated wastewater (CWtw) are systems downstream of Wastewater Treatment Plants (WWTPs) before the receiving water bodies. They have recently become attractive in France under the perception that they increase water quality of the WWTP effluent. In order to assess the efficiency of these systems, a 6-years project has been conducted on 3 sites (full and pilot scales).

From 1 m² of land-take to 10 000 m², the 3 experimental sites present different shapes. They receive treated wastewater of different qualities. For example, depending on the site, KN may vary from 1 to 40 $mg.L^{-1}$ and Pt from 0.1 to 10 $mg.L^{-1}$.

The three compartments: i) free water and the deposits of organic matter, ii) emerged and floating plants and iii) the soil were analyzed in details in terms of quantity and quality. Thus, all the related instrumentation of the sites makes possible to assess daily water balance. Plant samplings allow to quantify the exportable biomass, and the volume of the deposits is estimated. To the pilot-scale, the masses of requested soil were determined. Moreover, a monitoring of free and pore water, plants, deposits and soil is carried out to understand the fate of conventional pollutants (C, N, P).

For the CWtw systems, various treatment mechanisms allowing nutrient removal can take place simultaneously since they can occur in the three compartments. Among them, can be assumed the sedimentation of suspended solids, nutrient absorption by plants, phosphate adsorption in the soil, denitrification, etc. These mechanisms do not have the same impacts according to nutrients forms (dissolved or particular) and the nutrients degree of oxidation. Moreover, the age of the site is of importance, including potential malfunctions from the WWTP upstream the CWtw.

The results underlines the impact of the sedimentation of the particulate fractions, which seems first positive, then negative over time, subjected to low flow velocities. It also underlines the adsorption of phosphates in the soil and, to a lesser extent, ammonium retention, if maintaining a long-term infiltration. Furthermore, as expected, the plants uptake is a small contribution to nutrients reduction even with long residence times. Thus, if optimizing the CWtw design by emphasizing the predominant mechanisms, it is possible to predict its efficiency according to nutrients that are present in the influent.

BIO (50-word maximum): Catherine BOUTIN is a senior scientist with more than 20 years of wetlands construction projects. She has contributed to elaborate the French line CW used for raw sewage. She currently manages this French research project about the use of CWtw.

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