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FATE OF PHOSPHOROUS AND CLOGGING IN SOIL-BASED CONSTRUCTED WETLANDS.

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In France, soil-based constructed wetlands for discharge of treated wastewater have become a popular technique to reduce flow to surface receiving water bodies and to perform complementary treatments. This study focuses on describing (i) the fate of pollutants flowing in and out three different soils and (ii) the development of clogging for a low (6 cm/j) applied hydraulic load as well as for periods of hydraulic overload (12 cm/j; 24 cm/j). Special attention was given on phosphorus and its fate in these soils.

The experimental setup consisted of three lysimeters containing three soils selected to be representative of those that can usually be found near a wastewater treatment plant. Lysimeters are undisturbed soil monoliths (1.5 m^3), which masses are continuously monitored in order to obtain accurate water mass balance. Lysimeters were intermittently fed during 3.5 days and put to rest for 3.5 days. The experiment lasted twenty months and major pollutant (TOC, NH_4N, NO_3N, Nt, PO_4, Pt) fluxes in and out were monitored as well as water content, oxygen content and redox potential at different depths. Phosphorus fractionation in soils was performed to better understand its distribution and to know the proportions adsorbed or precipitated. One of the objectives was to identify which fraction can be mobilized either by plants or during an overload period.

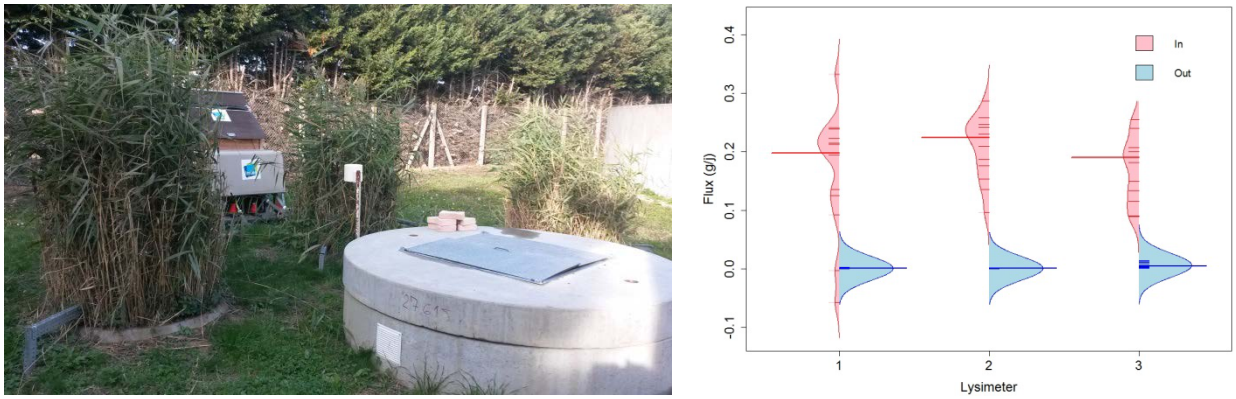

Figure 1: The three lysimeters containing the three soils studied (left); Phosphate fluxes measured at the inlet and outlet of the three lysimeters (right)

The soil which has the thinnest texture and the lowest infiltration capacity clogged rapidly and this clogging could not be easily reversed. The soil drained little during the rest periods limiting oxygen renewal and consequently low nitrification of the adsorbed ammonium was reported.
Low phosphate concentrations were measured at the outlets of all lysimeters highlighting a good phosphorus retention in the three soils (removal efficiencies > 80%). No phosphorus release was observed during overload periods (two weeks).
The presence of preferential flows has been identified in one lysimeter. There result in part of the water by-passing most of the porous media and consequently affect the removal performance, especially of carbon.

BIO: Dr. Ania Morvannou is a scientist with about 10 years of experience researching in the field of wastewater treatment by constructed wetlands. She obtained her doctorate in 2012 and since then she has been working on databases, modeling as well as collecting data through field measurement campaigns.

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