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Evaluation of suspended sediments dynamics in a catchment contaminated with PCBs (Samme River – Belgium)

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Understanding river dynamics is essential to the management of sediments in catchments. This research project aims at characterizing river sediment dynamics and associated pollutant transport at the watershed scale. This study focuses on the Samme River, an unnavigable waterway characterized by riverbed sediments with a high contamination in micropollutants (mainly PCBs and Hg). The Samme River flows into the Charleroi-Brussels canal (CEMT Class IV – 1350 t vessels), where it contributes to the contamination of a greater volume of sediment in the canal. The origin of the contamination in the Samme River is still poorly understood. While it is likely that such contaminants originate from historical point-sources, polluted riverbed sediments throughout the catchment currently act as a diffuse secondary source. Without a proper understanding of the dynamics of sediment transport in the Samme River catchment, no remediation action (e.g. installation of sediment traps along the river course) can be undertaken.

The methodology developed in this project is based on (i) a monitoring of bank erosion at different places in the catchment in order to identify and quantify the different sources of sediments; (ii) a monitoring of suspended sediments transport, at the outlet of the catchment, so as to quantify sediment load and understand dynamics of suspended matters during flood events (iii) and a monitoring of fluvial deposits to estimate sedimentation rate in the watershed. Bank erosion monitoring is performed on different erodible sectors with a combination of 3D laser scan surveys and erosion pins. Sediment transport is quantified at an automatic monitoring station, continuously measuring turbidity and automatically sampling river water. The station is installed at the outlet of the catchment. A network of Time Integrated Samplers (TIS) is also distributed throughout the catchment. Fluvial deposit monitoring is performed using bathymetric survey and sedimentation marks.

Data collected from the automatic sampler at the outlet of the catchment allowed one to estimate the global sediment budget over the catchment. It is found that on average 9 tons of contaminated sediments flow each year from the Samme River into the Charleroi-Brussels canal. Turbidity and suspended sediments concentration analysis during flood events (hysteresis phenomenon) are helping to understand the mechanisms involved in the transport of sediments. Measurements of bank erosion, fluvial deposit and sediment transport throughout the catchment are currently being carried out and will assist in the design of a system of sediment management in the Samme watershed.