The GeDSeT Project: How to assess the impact of a dredging operation?

Claire Alary[1], Laurence Haouche[2], Sophie Lambert[2], Erwan Simon[1,2], Rodrigue Mackossomouelle[3], Yves Marneffe[2], Bruno Lemière[4], Benoit Hazebrouk[3], Agnès Laboudigue[1]

[1] EMDouai, MPE-GCE, 941 rue Ch Bourseul, BP 10838, 59508 Douai, France ; Univ. Lille Nord de France, 59000 Lille, France. Phone: +33-(0)-327712689
E-mail: **claire.alary**@mines-douai.fr

[2] ISSeP, Zoning A. Schweitzer, Rue de la Platinerie, B-7340 Colfontaine, Belgium

[3] INERIS, Parc Technologie Alata, BP 2, 60550 Verneuil en Halatte, France

[4] BRGM, 3 Avenue Claude Guillemin, 45060 Orléans Cedex 2, France

Introduction: Regions with large waterways system currently promote, through sustainable development, a policy development of fluvial transport. This requires a good running of the waterways, notably involving a common setting up of sediments dredging. As these regions are also characterized by strong industrial and urban surroundings, sediments are often contaminated. So they can become a source of pollutions during a dredging operation, impairing the ecosystem.

The purpose of the study is to assess a potential impact of a dredging operation on surface waters through both the analysis of physico-chemical parameters and the achievement of ecotoxicological bioassays.

Methods: The studied area is the Lens canal, in the North of France, where a dredging operation was carried out to enable the shipping of large barges. In this canal, sediments present high concentrations of metals reaching 20, 55, 900 and 3600 mg/kg for As, Cd, Pb, and Zn respectively.

Surface waters were investigated in 10 points semi-simultaneously (during one day) in the canal, from the dredging digger up to 3 km downstream. At each station, in situ measurements of pH, Eh and turbidity were performed using a multi-parameters probe; velocity was measured with an electromagnetic current meter and waters were collected at 1 meter depth by in situ continuous pumping. Filtrate waters (pore size 0.45µm) were analyzed for metals by ICPMS and for NH_4^+, NO_3^- and SO_4^{2-} by ionic chromatography. Bioassays (*Pseudokirchneriella subcapitata*, *Brachionus calyciflorus and Vibrio fischeri*) were performed on filtrate water samples. Prior to the dredging operation, water column had also been sampled over three campaigns for metals and major ions analyses and for ecotoxicological bioassays.

Results: The area is characterized by a virtually zero velocity. From the dredging workings up to 3km downstream, the decrease of the turbidity is related to an increase of Eh, a decrease of NH_4^+ and a slight increase of pH. Mn and As concentrations in water are higher near the digger than downstream (fig. 1). Conversely Zn concentrations lightly increase at the downstream sampling stations.

Water samples collected during the dredging and during two of the three campaigns carried out before the dredging are toxic for the growth of the green freshwater algae *P. subcapitata*. Conversely, the rotifer *B. calyciflorus* never evidences waters toxicity. As far as the bacteria *V. fischeri* are concerned, no toxicity is observed before dredging, where as, during the operation, the toxicity slightly increases along the studied area.

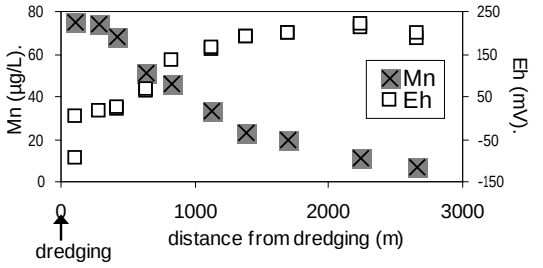

Fig. 1: Evolution of Eh in water and Mn concentrations in the dissolved phase (0.45µm) along the studied area.

Discussion: These results underline the impact of dredging on the alteration of redox conditions in the watercourse, resulting in the modification of the equilibrium of chemical species. In this context, the bioassays response depends on the test species. P. *subcapitata* seems to be sensitive to the medium conditions before dredging as well as during dredging. Conversely, with its graduate responses, *V. fischeri* seems appropriate to emphasize the evolution of the waters quality downstream the dredging operation. Finally, these results will be integrated into the Decision Support Tool of the GeDSeT project [1].

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