Monitoring the downstream effects of dredging in a small lowland river polluted with heavy metals

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Introduction:
The Scheppelijke Nete is a small lowland river in the Nete catchment, situated in the north east of Belgium. Although the discharge in the river is not very high, stream velocities are quite high, which results in a high transport capacity of the river. The downstream part of the river is characterized by sedimentation of the sediments, resulting in a reduced conveyance of the river.

Next to the conveyance problem, the sediment is also polluted by heavy metals, mainly Zn and Cd. This is due to historical pollution from surrounding non-ferro industry [1].

To improve the hydraulic capacity of the river and as a remediation for the polluted sediment of the river bed, the river was dredged over a stretch of more than 2 km. The downstream effects, more exactly the quantity and chemical quality of the resulting sediment plume, of these intervention works were monitored.

Methods:
In a preparatory phase the general topography (slope, cross sections) of the river were measured using a Total Station. Additionally, sediment samples were taken and analysed for heavy metal concentrations of the upper bed of the river.

During the following up of the dredging works, which lasted for one week, daily measurements of the discharge were performed. Water heights are continuously measured using divers.

Downstream the dredging works, ISCO autosamplers were placed on regular distances, to monitor the amount and the grain size distribution of sediments transported in suspension. Using sediment bottles, the bedload transport is monitored. As such, the total sediment transport due to the works can be calculated.

To analyse the concentration of heavy metals, samples of both the water and sediments were taken during the dredging activities.

Fig. 1: *Dredging in the Scheppelijke Nete.*

Results:
From the preliminary results we can conclude that the water level, just upstream the start of the dredging works, is lowered for more than 25 cm. The turbidity during dredging of the river increases over the total measuring distance of 1.5 km after the works, with a clear downstream gradient. Peak concentrations during the working day flatten out to standard values after 6 – 8 hours after work. The results indicate that small scale dredging activities result in an enhanced downstream transport of fine polluted sediments, despite the fact that the dredging activities were planned to remove these from the river.

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References: [1] Department of Public Works, Energy and Environment (2006) Actie Cadmium.(in Dutch)