Innovations in modeling & monitoring to optimize sediment management in Flanders, Belgium

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Introduction: The Flemish administrations responsible for the soil & waterways aim continuously to optimize sediment management in their territories. Together with universities and private companies they are developing and using tools to identify highly erodible regions causing high sediment loads in watercourses, and the sedimentation zones within these watercourses. Hydrological sediment export models have shown to be useful tools to simulate soil transport over land, and in receiving rivers. In this paper, we discuss how these tools are being developed, and how data are collected to support development.

Methods: The hydrological sediment export model Curve Number-WaTEM/SEDEM (CN-WS), based on the spatially distributed erosion and sediment delivery model WaTEM/SEDEM [1] was optimized by KULeuven and Fluves. Different scenarios were calculated to evaluate the effectiveness of erosion control measures, and to assess climate change effects on erosion and sedimentation. To validate the CN-WS model optimizations and to calculate the model scenarios, erosion and sedimentation data were gathered through traditional high-precision surveying, but also with innovative techniques such as fiber optic and other sensor networks.

Results & discussion:
There are already many measurement years available of high-frequency data sediment transport from subcatchments within the Scheldt basin. Erosion data was necessary to complement these sediment transport data. Following data sources will be discussed in the paper:

- Erosion data from small field plots were collected as part of the EU-project 'Triple C'[2]
- Sedimentation data from large field plots were collected to validate the CN-WS model
- River sedimentation data were collected with fiber optic sensor networks [3]

The CN-WS Model was first optimized, a.o. by recalibrating it with high-resolution topographic data. Figure 1 shows the CN-WS model efficiencies for different sets of model parameter values. With optimal parameter values, the model can simulate the total sediment yield with an efficiency of 0.67.

Different scenarios, ran with the optimized model, will be discussed in the paper.

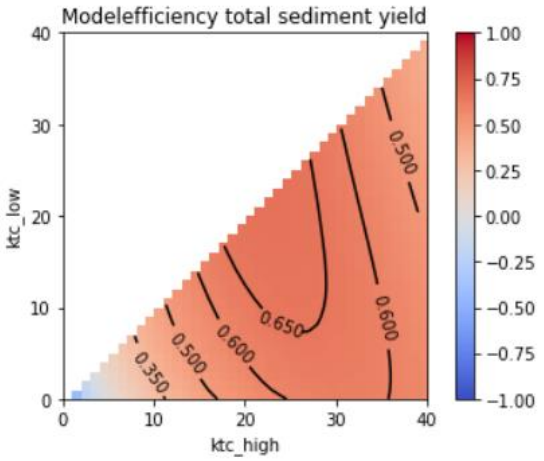

Fig. 1: Model efficiencies of the total sediment yield

References: [1] Verstraeten G, Van Oost K, Van Rompaey A, Poesen J & Govers G, 2002. Evaluating an integrated approach to catchment management to reduce soil loss and sediment pollution through modelling. Soil Use and Management, 18, 386-394.
[2] https://en.vmm.be/projects/water/triple-c
[3] Van Hoestenberghe, T., Vanthillo, R., Dezillie, N. and Van Ransbeeck, N. Continuous distributed sedimentation monitoring based on fiber optics. HydroSenSoft, International Symposium and Exhibition on Hydro-Environment Sensors and Software. 1-3 March 2017, Madrid, Spain