



Summary report SedNet conference 2011

Session: Monitoring and Modelling

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Sediment management requires monitoring of sediment quality and quantity, for trend identification a. o., and modelling of contaminant fate is a major objective to reach for linking geochemistry and biology for instance. The Monitoring and Modelling session included 9 platform presentations.

Sebastian Höss presented a metric based on nematodes SPEcies At Risk (SPEAR) to assess pollution in soft sediments of freshwaters. Soft sediments, because of their ability to accumulate chemicals, are of particular interest in ecological functioning of water bodies and hold abundant and species-rich communities of meiobenthic invertebrates such as nematodes. Very good correlations are observed between the toxic potential (heavy metals and organic contaminants) of the sediments and the NemaSPEAR index (9 year study, 165 river sediments, 43 lake sediments), including for data sets not used to classify the species in the development phase of the index.

The monitoring of sediments contamination by PCBs has become all the more important since the EU revised its 2006 legislation on dioxins and related compounds in food stuff. However, most available Sediment Quality Guidelines (SQG) deal with the protection of benthic invertebrates, not fish nor fish consumers. The team led by Marc Babut calculated Biota-Sediment Accumulation Factors (BSAF) for 11 freshwater fish species in the Rhône River. BSAFs are higher at sites where the threshold for fish consumption is exceeded. Variability in BSAFs (role of bioavailability?) presently hampers the derivation of SQG that would ensure compliance with regulatory thresholds for PCBs in fish.

The impact on biota of the re-suspension of sediments as a result of dredging or floods is widely recognized as a challenging issue that requires interdisciplinary work to fill the gap between engineering and natural sciences. Catrina Cofalla presented a unique experimental set-up designed for that purpose. An annular flume has been equipped with probes to monitor major physico-chemical parameters, suspended particular matter, and water composition during sediment resuspension. Effect biomarkers will be analysed in rainbow trouts to assess the impact of toxic substances (PAH, heavy metals) during sediment remobilization.

Climate change is expected to lead to more intense and more frequent extreme water discharges. Since the impact of such events on toxicity to aquatic organisms is not sufficiently documented, Susanne Heise presented the first results of a project specifically addressing this issue in the case of the Elbe estuary. The wadden areas in the tidal Elbe show a toxic response which could be attributed to historical contaminants in sediments remobilized by flood events. Such type of field work is extremely difficult to conduct, for logistic reasons and because of the unpredictability of the events that will occur during the project. Catchments with temporary rivers will also be affected by extreme dry periods resulting from climate change. Stefano Polesello addressed this question in the case of Celone stream (Italy) where PAHs and alkylphenols are an issue. Lower PAH concentrations are observed in dry sediments but the causes for the decrease are yet to be identified. The monitoring of suspended particulate matter is of great importance to quantify the export of organic substances during the peaks of flow rates.

One of the management options for contaminated sediments is under water deposit in depots or sandpits. The origin of the sediment, terrestrial or aquatic, influences the immobilization of heavy metals as demonstrated in the work of Jos Vink. For depots containing flood plain soils, the mechanisms involved in reduction may not necessarily result in efficient metal trapping. Addition of gypsum helps controlling dissolved organic carbon coagulation and sulfide formation.



The economic benefits of understanding the biogeochemical cycles of contaminants such as mercury in sediments have been illustrated by Stefano Covelli in the MIRACLE project conducted in Maranao & Gardo Lagoon. Because of high Hg content in sediments, clam farming was at risk, and additional farming sectors were prospected. Several Hg-resistant bacteria were identified and their active detoxification most likely plays a role in the fact that seeded clams do not exceed the concentration limits for their commercialization, even when farmed in highly contaminated sectors.

Trend monitoring is a key component of the Water Framework Directive and port authorities pay much attention to this question as it can greatly influence their sediments managing options. Within the Port of Antwerp, sediments samples from 122 locations have been monitored between 1996 and 2010 (operational difficulties are encountered when trying to core very silty material). The presentation by Agnes Heylen showed that, overall, sediment quality has improved, but chloride, sulfate, and mineral oil concentrations as well as antimony leaching still constitute a bottleneck for sediment management as inert waste.

When dealing with non-contaminated sediments, fluidizing mud may avoid costly dredging. Stijn Claeys offered a presentation on a platform (16 meters long, 3 meters high, 0.5 m wide) for nautical bottom rheology research to optimize in-situ measurements tools and reduce dredging activities. The platform is equipped with sampling ports and can accommodate a wide range of sensors for real time physical and chemical analysis, instruments testing and validation, and biological analyses.