

## 16<sup>th</sup> SETAC Europe Annual Meeting

### Sediment-related Discussions at the 16<sup>th</sup> SETAC Europe Annual Meeting

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A total of 4 sessions were organized with a focus on issues related to sediments through activity by the SETAC Europe / SedNet Sediment Advisory Group. The programme for Wednesday 10<sup>th</sup> May, covered three of these platform sessions and a related poster area was allocated which generated much discussion. The order of sessions and presentations had been given structure, and the overall theme on Wednesday was 'Sediment Ecotoxicology: from testing methods to quality standards', chaired by Marc Scrimshaw, Henner Hollert, Werner Manz and Susanne Heise. The first session focussed on methodology, both chemical and biological, for assessing sediment quality. After the second and after the third session, a 20 minute time slot had been deliberately reserved in order to extend the time for discussion on the topics on 'ecosystem structure and function' (session 2) and their importance to assess sediment quality, and 'on sediment quality criteria' (session 3), respectively. Final discussion related to issues on the apparent desire by the European Commission to set pass / fail sediment quality standards rather than guidelines on how to derive quality criteria. The fourth session 'Chemical processes and interactions in sediments and suspended matter' was scheduled for Thursday morning and chaired by Sue White and Wolfgang Ahlf.

For the topics covered by platform and poster presentations, the possibility for publication in IEAM – Integrated Environmental Assessment and Management and in a special issue of JSS – Journal of Soils and Sediments (February 2007) was pointed out. Papers for the JSS-special issue should be submitted by October 2006.

#### Session 1. Methods in Sediment Ecotoxicology

This session highlighted different approaches for the classification of sediment quality based on biological (toxicological) or chemical assessment. A technique based on fuzzy classification of data was presented and the importance of standardised tests, with a large database, highlighted. The importance of the biogeochemistry was highlighted, which, along with challenges introduced by variability in data, leads to statistical requirements in the area of interpretation of data. However, examples of application of results as a management tool for determining changes in sediment quality as a result of transport during storm events was shown. Chemical measures of bioavailability, using available concentrations of metals and organic contaminants were shown to be useful measures in relation to bioconcentration factors (BCF) in the following presentation. There is broad consensus that whole-sediment exposure protocols represent the most realistic scenario to simulate *in-situ* exposure conditions. The importance of defining reference conditions for such sediment contact toxicity testing was discussed and issues related to defining standard materials highlighted. Subsequently, a newly

developed sediment contact assay was presented which allows for the assessment of genotoxicity utilising sediment-exposed zebra fish embryos.

Since only 4 of the 23 papers submitted as oral presentations for this session studies could be presented as platform presentations, a poster spotlight and a poster corner were developed to highlight several aspects in method development. A poster spotlight session (5 very brief presentations from those with posters set up in the social area) was held to reflect the number of people looking to present on this topic. Work presented covered extraction methods which related to assessing the bioavailable fraction, the significance of unresolved complex mixtures of hydrocarbons, which may be present in relatively high concentrations, in relation to toxicity and a complimentary view on hydrocarbons, evaluating the risk posed by heterocyclics and their metabolites, which presumably make up a much smaller proportion of total hydrocarbons. In a poster corner, possible extensions of the triad approach were presented, which have potential to be used as additional lines of evidence (LOE) beside the classical three LOE of sediment chemistry, sediment toxicity, and benthic community structure (cf, <http://www.scientificjournals.com/sj/jss/abstract/ArtikelId/7933>). Bacterial community structure analyses as an additional measure of alteration, analyses of the bioavailable fraction of toxicants and applications of several biomarkers and mechanism-specific bioassays as additional measures of exposure were presented.

#### Session 2. Ecosystem Structure and Function

To build on the previous session, a focus on structure of ecosystems and function was programmed, however, a last minute change brought in a presentation which described utilising community structure as part of a risk based strategy for setting primary remediation goals at contaminated sites. This linked into following presentations which discussed how the latest legislation is more focussed on sectoral (e.g. marine) rather than site specific (e.g. shell fisheries) health, status and function, which included an overview of a project on approaches of determining the structure and functioning of marine ecosystems (<http://www.cobo.org.uk/>). Information on the resilience and resistance of ecosystems to stresses will be important in informing management decisions as will how, and if, systems recover to previous states. Micro-organisms (bacteria) were the focus of the next presentation, where population diversity and measures of metabolic and physiological function were described as tools for determining site specific traits of the communities. The requirement of developing an index of some sort, to categorise sites according to the demands of the EU-WFD was highlighted as the fingerprint data

generated are complex and end users and regulators frequently require that results are processed into a simplified format for decision making. Discussion following this session focussed on the end-user relevance of these measures and how the data could feed into a weight of evidence assessment. How the information on resilience of an ecosystem could be utilised and how relevant end-points are measured were also raised. The need to know what measure of function could best inform when a system became severely impacted, in particular with reference to inherent 'noise' in the data, was raised as a further research need. The term eco-epidemiology was used in the discussion, as there is a requirement to separate effects caused by a large number of variables in a multi-stressor environment.

The lively discussion on this topic had to be terminated with the end of this session. Due to the big interest and the obvious importance of this topic with regard to the European environmental regulations and the drawbacks of currently applied methods, it was decided to form a discussion group on the topic of diversity as an ecological criterion.

This discussion group will continue to exchange ideas and information by email and aims at publishing a commentary on that topic at some stage. Email addresses were collected and anybody who wants to join the e-mail discussion group should contact Susanne Heise ([s.heise@tuhh.de](mailto:s.heise@tuhh.de)).

### Session 3. Sediment Quality Criteria

The lead into this session was delivered during the previous session, with a presentation which utilised field based species sensitivity distributions to derive sediment quality criteria. This approach is reliant upon having large datasets from the field which include both chemical and ecological data. Analysis of data by the nonparametric bootstrap method was described and it was suggested that the field-data-derived sediment quality guidelines (SQGs) could be used as site-specific guidelines or integrated into current SQGs. Further examples which focussed on particular case studies (the Netherlands, Venice lagoon, Flemish monitoring data and an approach utilised in Italy) demonstrated that a number of approaches are presently utilised across Europe to derive sediment quality criteria. Much of the work is being undertaken in an attempt to determine when sediment quality may be impacting on water quality and ecological status, and is being driven by the requirement to implement the Water Framework Directive (WFD) throughout the European Union. Objectives of the work in the Netherlands was to look for trigger values to indicate when sediment quality may be impacting on the receptors, which were identified as the ecosystem, human health, surface and groundwater quality. Within the Venice lagoon, the objective was to prioritise areas where action may be required and to identify the scale of any issues. Flemish data on three lines of evidence (chemical, ecological and toxicological) was used to derive a set of quality criteria although it was highlighted that sediment characteristics are important at a site specific level, setting priorities is difficult and that the scale of contamination, and associated costs relating to management decisions, were important factors to be considered. Work in Italy was specifically driven by the WFD and the use of quality criteria to act as a value when intervention should be considered was discussed. The need for a 'toolbox' on how to deal with contaminated sites and inform management decisions built on previous comments about the difficulties encountered in setting priorities. In an additional poster corner, successes, failures and challenges of SQC applications were presented.

Following the presentation, discussion focussed on how the SETAC Europe Sediment Advisory Group and SedNet (<http://www.sednet.org>) could give input to the European Commission with regard to development of sediment quality criteria and their integration into the WFD. This was considered to be particularly relevant due to comments made by the EU Commissioner for the Environment that "It is currently not possible to set quality standards for sediments". The focus of the following discussion was the use of the term 'quality standards' by the Commissioner, and contributions from the audience on the North American experience of attempts to use prescriptive standards (pass / fail) when working with sediments were of particular relevance. Description of case sensitive quality criteria instead of fixed quality standards were seen as a more purposeful approach with regard to the site-specific conditions in different river catchment areas.

### Session 4. Chemical processes and interactions in sediments and suspended matter (by Sue White)

In dynamic aquatic systems a range of environmental pressures such as inundation, floods, droughts or temperature change may significantly affect the stability of soils and sediments. Mobilisation of soils and sediments, changing redox conditions, or dessication of sediments may alter the bio-availability, exposure and risks of soil and sediment-associated pollutants. This depends on the stability/erosion properties of sediments, as well as on the geochemical processes involved. This session included a total of 5 oral presentations and 23 poster presentations addressing this range of subjects.

The presentations included contributions on a range of environments (wetland, river, lake, estuarine and marine) and contaminants. Subject areas ranged from re-mobilisation of sediment and contaminants in riverine floods and marine ecosystems, bioavailability of a range of contaminants and the use of plants in bio-remediation, contaminant transfer through soil/sediment systems, coupled eco-toxicological tests and a range of methodological papers for screening biodegradation, evaluation of metal contamination in flood plains and environmental estrogens.

Studies on new contaminants were also considered in a paper and poster about flame retardants, which in various forms act as endocrine disruptors, in Swiss lake sediments, whilst the historic problems of mercury contamination in the NY/NJ harbour were considered via a new modelling study.

Overall the convenors were pleased with the range of papers presented and hope to continue to develop the area of environmental controls, sediment dynamics and toxicology in future years.

### Conclusions

If the session chairs were to conclude some 'priorities' in the discussion on sediments in these sessions, they would suggest the following ones:

- The necessity to define appropriate biological indices
- The need to address and communicate uncertainties in the assessment of impacts of contaminated sediments
- The usefulness of sediment standards can be doubted. Thoughts should be given to the question, whether a combination of site-specific sediment criteria with river-basin relevance can be developed.