**Project Summary Report**

**ECO17: Sediment toxicity testing of organic chemicals in the context of prospective risk assessment**

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Sediments play an important role in the functioning of aquatic ecosystems and they provide crucial resources for many key species and sustaining biodiversity. Man-made chemicals may interfere with these functions and it thus is important to define transparent and targeted regulatory frameworks that assure that where these chemicals enter aquatic sediments, they do not cause unacceptable effects.

The ECO17 project aimed at improving methods to determine effects of contaminated sediments on flora, fauna and micro-organisms in natural waters. An important question was to what extent the numerous marine and freshwater species respond differently to such contamination.

Current approaches in sediment toxicity testing are fragmentary and diverse. A detailed literature review was performed from which it was concluded that a more representative selection of species and test methods will constitute a first step towards a more balanced testing and assessment strategy.

Focusing first on water plants, a computer model was built that tracked the transport of man-made chemicals in the plants. Chemical transport in water, shoots, and roots as well as through the stem appeared to be important. The transport differed for different chemicals and plants, which means that exposure is highly variable in place and time. The model developed, might add to a better understanding of results from future toxicity tests.

Similarly, the chemical uptake by small invertebrate animals living in the sediment was tested and compared. Different animals appeared to have quite different uptake pathways too, for which also a computer model was made. The model helps in understanding the cause of the differences and can also be used for understanding results of toxicity tests.

In toxicity tests, bacteria may play an important role as their functions can be affected by chemicals, but they may also affect the chemicals in turn. Bacteria are very important for some ecological processes and it is important to know whether these processes are disturbed by man-made chemicals. If bacteria are affected in tests with animals and plants, this might also influence outcomes of these tests. We showed that bacterial communities change during toxicity tests due to the conditions in the test, including the presence of man-made chemicals. Nitrogen-fixing bacteria (*nifH* gene), ammonia-oxidizing bacteria (*amoA* gene), denitrifying bacteria (*nosZ* gene), and bacteria capable of hydrolyzing organophosphate compounds (*opd* gene) geneabundance increased as well as bacterial diversity.

Tests for organisms are important but it is also important to understand how effects on individual organisms translate to effects on communities of species. We have further developed a computer model to show how the chemical uptake by small animals in sediment may affect the impact of chemicals on communities of animals in sediment. It appeared that the way of feeding is very important in the eventual impact of chemicals on groups of organisms in sediment.

Finally, there is an urgent need for harmonization of data requirements, test protocols, and risk assessment frameworks, between regulations and directives regarding contaminated sediments. The above results and the recommendations made by others were summarized and discussed, from which several recommendations were made. It is important to clearly define when sediment tests are needed, and suggestions for such criteria were provided. Sediment testing should generally consider the longer term effects. An ecologically relevant assessment requires a wider range of standard methods and species than the present one, and many concrete suggestions for methods and species were provided. However, this also intensifies the data need and cost for sediment assessment. First estimates of potential risk may be obtained from water (i.e. without sediment present) toxicity data and a correction for the presence of sediment. Remaining uncertainties have to be covered by so-called ‘safety factors’ in the risk assessment. In the longer term, use of models to predict the uptake and effects of chemicals in a range of sediment dwelling species may reduce the cost and time needed in assessing the risks of chemicals in aquatic sediments.