Guidance Document No: 25 Guidance on chemical monitoring of sediment and biota under the Water Framework Directive

COMMON IMPLEMENTATION STRATEGY FOR THE WATER FRAMEWORK DIRECTIVE (2000/60/EC), **Technical Report - 2010 - 041**

Case study 4

Background information

Title/Name of case study:

Sediment cores for retrospective monitoring of contaminants in lakes.

Type of case study:

Sediment stratigraphy (core) studies to reveal recent history of contaminants to be strongly restricted or phased out (e.g. Priority Hazardous Substances).

Reporting Institution:

Finnish Environment Institute.

Web-Link: http://www.ymparisto.fi

Main sources for further information; literature:

Munthe, J., Wängberg, I., Rognerud, S., Fjeld, E., Verta, M., Porvari, P. and Meili, M. 2007. Mercury in Nordic ecosystems. *IVL Report* B1761, 43pp.

Mannio, J. 2001. Responses of headwater lakes to air pollution changes in Finland. *Monographs of the Boreal Environment Research* 18, 48pp.

Vartiainen, T., Mannio, J., Korhonen, M., Kinnunen, K. & Strandman, T. 1997. Levels of PCDD, PCDF and PCB in dated lake sediments in subarctic Finland. *Chemosphere* 34 (5-7): 1341-1350.

see also: Usenko S, Landers DH, Appleby PG & Simonich S. 2007. Current and Historical Deposition of PBDEs, Pesticides, PCBs, and PAHs to Rocky Mountain National Park. *Environ. Sci. Technol.* 2007, 41, 7235-7241

Objective of case study - background information:

To monitor the progressive reduction in the contamination of priority substances (PS) and phasing out of Priority Hazardous Substances (PHS).

To assess compliance with the no deterioration objective (concentrations of substances are below detection limits, declining or stable and there is no obvious risk of increase) of the WFD.
To assess long-term changes in natural conditions and to assess the long term changes resulting from widespread anthropogenic activity.

Contribution to:

Specific contribution linked to WFD monitoring programmes

Cost-effective method to check the recent history of substances with high affinity to particle phase. The concept is based on short sediment core sampling (ca. 10 to 30 cm), checking the recent history of priority hazardous substances such as HCHs, HCB, HCBD, Hg, PAHs and TBT. This is useful information for the assessment purposes in the first phase of WFD (before 2015). The method is readily applicable to many candidate substances such as PCB, PCDD/F and PFOS.

Description

Short core sediment monitoring/survey to look at the recent history (<30-40 yrs) of contaminants. The top of the sediment is sliced to e.g. 3-6 slices (a´ 0.5-3 cm) and one reference slice from deeper sediment layers (> 20cm) depending on the sedimentation rate.

There is good knowledge of the typical sedimentation rate in Nordic lakes from tens-hundreds of lakes, sampled e.g. for Hg surveys. The sedimentation rate in these lakes can be from 0.5-2.0 mm/yr to more than 10 mm/yr. Sedimentation is not, however, several centimetres per year. Note that these lakes represent a very significant portion of the whole lake population in Europe.

In comparison to a grab or single sample of sediment surface, slicing the sediment reveals the relative timescale of the subsequent samples. Analysing only one top layer does not reveal any timeframe, only the present status of the sediment, at least on the first sampling occasion.