



European Sediment Research Network

Acronym: **SedNet**

EC contract No. EVK1-CT-2001-20002

Key action 1.4.1 *Abatement of water pollution from contaminated land, landfills and sediments*

WORK PACKAGE 2: SEDIMENT MANAGEMENT AT THE RIVER BASIN SCALE

Workshop 2

Sources and transfers of sediment and contaminants in river basins

26th to 28th May 2003, Hamburg Port Authority, Hamburg, Germany



SedNet

SedNet is the acronym for the demand-driven European Sediment Research Network. The SedNet objective is to form inter-disciplinary links between scientist, engineers, sediment managers and those responsible for developing and implementing sediment related policy, at the European scale. The initial focus of SedNet is on understanding how contaminated sediment influences river system functioning and, from there, how contaminated sediment and dredged material can be managed.

The SedNet activities are financially supported for three years by the EC under the FP5 EESD programme and within area 1.4.1 on "Abatement of water pollution from contaminated land, landfills and sediments" (Thematic Network project, EC contract No. EVK1-CT-2001-20002, starting date: 1 January 2002).

All SedNet activities aim to improve networking. In addition, SedNet aims to develop a document that contains recommendations in the form of guidance for integrated and sustainable sediment management, from the local level to the river basin scale.

Introduction

The second workshop of SedNet Work Package 2 was held at Hamburg Port Authority, Germany, on 26th to 28th May 2003. Fifteen participants from five countries attended, representing sediment interests in policy, practice and research. The workshop took the form of a discussion forum with keynote presentations at intervals throughout the meeting to focus thought and catalyse debate in order to satisfy specific objectives. Prior to the workshop, discussion papers outlining the key topic areas were distributed to all participants to inform and allow preparation for the discussions. These discussion papers and the full minutes of this workshop can be found on the SedNet website: www.sednet.org.

This workshop focussed on the identification of the sources and transfers (pathways and processes) of sediment and contaminants in river basins. The identification and mapping of sources and transfers is central to sediment (clean and contaminated) management as source control is often the best way to deal with sediment issues in river basins, both qualitatively and quantitatively. The objective of this workshop was to assemble some of Europe's leading scientists and stakeholders in order to:

- Identify and map the main sources of both sediment and associated contaminants;
- Review available techniques for measuring and monitoring these sources; and
- Examine the management approaches and options available for controlling these sources.

Workshop participants

Name	Affiliation	Country	Representation	Role at workshop
Ramon Batalla	University of Lleida	Spain	Scientist	Participant WP2 core group
Jos Brils	TNO	The Netherlands	Scientist	SedNet coordinator
Julie Carter	IWE, Cranfield University at Silsoe	UK	Scientist	Participant
Alison Collins	NSRI, Cranfield University at Silsoe	UK	Scientist	Coorganiser WP2 core group
Marc Eisma	Rotterdam Municipal Port Management	The Netherlands	Stakeholder	Discussion paper Oral presentation WP2 core group
Heinz Glindemann	Department of Port and River Engineering, Hamburg Port Authority	Germany	Stakeholder	Coorganiser Oral presentation WP2 core group
Harro Heyer	Federal Waterways Engineering Research Institute, Hamburg	Germany	Stakeholder Scientist	Oral presentation
Harald Köthe	Federal Institute of Hydrology	Germany	Scientist	Participant WP2 core group
Phil Owens	NSRI, Cranfield University at Silsoe	UK	Scientist	Coorganiser WP2 core group
Heinrich Reincke	ARGE-Elbe, Wassergutestelle, Hamburg	Germany	Scientist Stakeholder	SedNet Stakeholders Panel Oral presentation
Davina Robertson	Manchester Metropolitan University	UK	Scientist	Participant
Kevin Taylor	Manchester Metropolitan University	UK	Scientist	Discussion paper Oral presentation WP2 core group
Gert Verstraeten	University of Leuven	Belgium	Scientist	Discussion paper Oral presentation
Bernhard Westrich	IWS, Institute of Hydraulics, University of Stuttgart	Germany	Scientist	Participant WP2 core group
Helen Wilkinson	Environment Agency	UK	Stakeholder	Participant WP2 core group

Summary of workshop issues and perspectives

Sediment and associated contaminant sources may take one of two general forms, point sources and non-point sources, each of which poses specific problems regarding identification and management. Point sources of sediment and pollution are those sources originating from a single location, and as such are often readily identified. Furthermore, such sources are generally easily controlled and monitored. For example, point sources of contaminants relevant to sediment management include:

- Mines and mine waste, landfill sites, factories, sewage treatment works (STWs), combined storm overflows (CSOs), bedrock mineralization

Non-point (diffuse) sources of sediment and contaminants are those originating from a wide area. As a result the identification, and in particular the control, of these sources presents much more of a challenge to sediment management. However, given the high level of success in controlling point sources of sediment and pollution, these non-point sources are now recognised as requiring the most effort for identification and control. For example, non-point sources of pollution relevant to sediments in rivers include:

- Urban and agricultural runoff and erosion, floodplain reworking, background geology

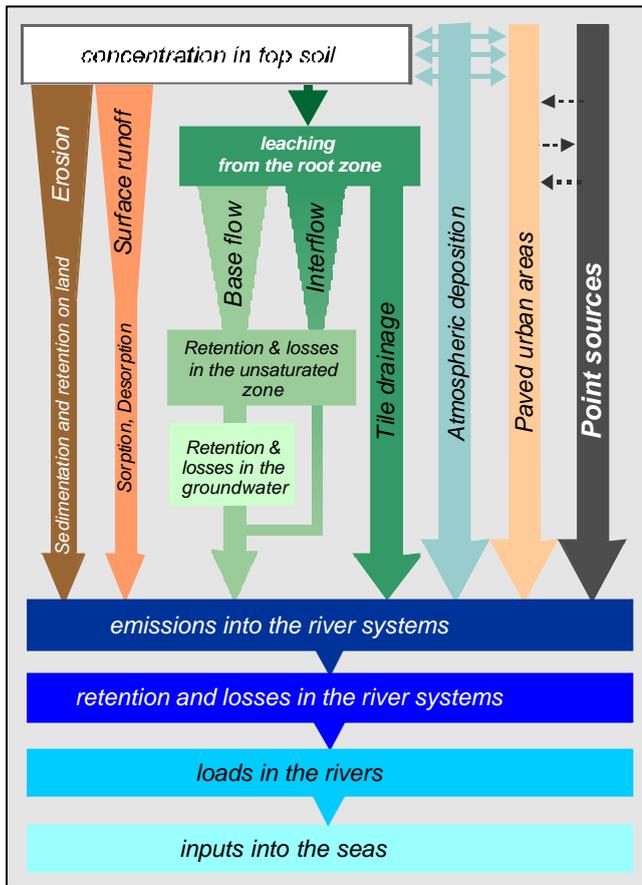


Figure 1 – Main sediment and contaminant pathways (point and diffuse)

Figure 1 identifies the main pathways by which sediments and contaminants are delivered to rivers. Table 1 lists some of the main types and sources of contaminants often associated with sediments.

Table 1 – Examples of sources of sediment and associated contaminants to river basins

Material	Sources
Sediment (organic and inorganic)	Erosion from rural, agricultural and forested land, channel banks, urban road dust, STW solids, atmospheric deposition, inputs from tidal areas and coastal zone (during flood and ebb tidal cycle)
Metals (Ag, Cd, Cu, Co, Cr, Hg, Ni, Pb, Sb, Sn, Zn, As)	Geology, mining, industry, acid rock drainage, sewage treatment, urban runoff.
Nutrients (P, N)	Agricultural and urban runoff, wastewater and sewage treatment.
Organic compounds (pesticides, herbicides, hydrocarbons)	Agriculture, industry, sewage, landfill, urban runoff.
Xenobiotica and antibiotics	Sewage treatment works, industry, agriculture
Radionuclides (^{137}Cs , ^{129}I , ^{239}Pu , ^{230}Th , ^{99}Tc).	Nuclear power industry, military, geology, agriculture (secondary source).

There are a variety of measurement and monitoring techniques for determining the sources of sediment and contaminants in river systems. These can be broadly grouped into two main types:

- Direct; and
- In-direct.

Table 2 – Methods to identify and quantify sediment and contaminant sources and transfers

Direct	In-direct
River gauging	Tracers and fingerprinting techniques (including magnetic, radionuclide, geochemical properties)
Sediment/turbidity monitors	Remote sensing
Chemical monitoring	Biological assessment
Sampling and analysis	Historical data and surveys
Bank erosion pins/stakes/PEEPs	Sediment in depositional environments (reservoirs, lakes, floodplains, river dead zones)
Temporal observation of landscape changes	Modelling

Sediment and contaminant management options include:

- Source control measures ;
- Removal of sediment (clean and contaminated);
- Capping of contaminated sediment;
- Dredging (although this could cause a new problem);
- Leave in place;
- Improve river flow conditions;
- Phyto-remediation approaches;
- Environmental impact assessment; and
- Clean the sediments if contaminated.

Management options should follow a risk assessment to establishment the urgency in removing contaminants and the risks associated with various options (see also Figure 2).

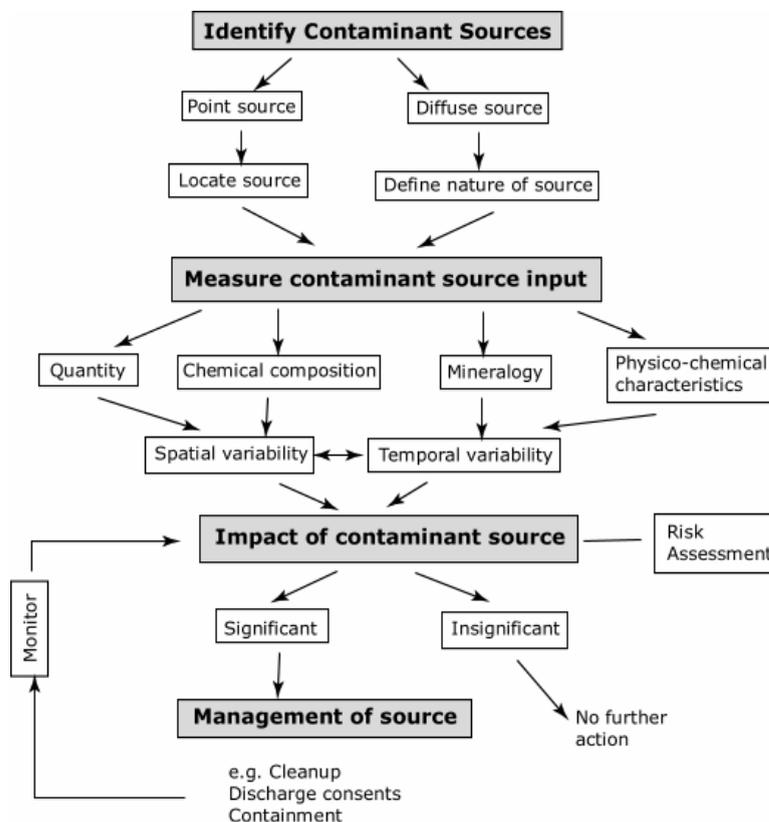


Figure 2 – Suggested steps for the management of contaminant sources to river basin sediments

There are various strategies for the control of clean and contaminated sediments and these can be grouped to the part of the system they primarily target:

- Source control;
- Middle system; and
- End point control.

Key messages and recommendations

- There are a variety of different point and diffuse sources and transfer pathways of sediment and sediment-associated contaminants in river systems. The sources and transfer processes associated with sediment are often different to those associated with contaminants (especially those initially introduced into river systems in dissolved form).
- It is important to recognise that there are many natural sources of contaminants (both point and diffuse) that generally relate to bedrock and surficial (drift) geology, in addition to sources associated with human activity. In this respect it is important to realise that there are natural background level of contaminants.
- There is a need for comprehensive basin-scale monitoring programmes at both the national and European levels in order to identify and quantify the main sources of sediment and associated contaminants, and their movement within river systems.
- If rivers and water bodies are to achieve good chemical and ecological status, it is necessary for national and European policies (in particular the EU Water Framework Directive and the Soil Thematic Strategy) to address sediment and associated contaminants in river basins.

Main outputs from the workshop

- We have identified and conceptually mapped the main sources of sediment and contaminants at the river basin scale.
- We have assembled information on existing techniques to identify sediment and contaminant sources and transfers.
- We have evaluated the positive and negative aspects of the EU Water Framework Directive and other EU policies, in terms of identifying and quantifying sources and transfers, and identified gaps that need addressing.

Associated material

Several WP2 Discussion Papers were produced and these can be found at the SedNet website: www.sednet.org, along with the minutes of this workshop. In addition, at the time of writing, several papers directly or in-directly resulting from this workshop were in stages of production and/or had been submitted to journals. Furthermore, ideas and concepts discussed at this workshop have been presented to the EU Soil Thematic Strategy Working Group on Soil Erosion at technical meetings and in reports.

This Work Package 2 report

The contents of this workshop report have been evaluated and approved by the workshop participants (identified above) and the WP2 Core Group (see below). Cover photo: sediment dredger, Hamburg Port, Germany (by Phil Owens).

Information on SedNet

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