Editorial

Sediments – Resource or Waste?

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In his book *Rubbish Theory* [1], Michael Thompson noted that 'things' may have quite different values depending on the view of the owner, such as in the example of inherited books, which can either be antiques, obligatory heirlooms, or simply waste. With regard to sediments, the spectrum of opinions is even wider. While press and public, especially after flood events, prefer the term 'toxic mud', some sediment researchers and managers point out to the positive aspects, i.e. the ecological, social and economic values, which are, among others, the useful content of quartz minerals and clay-sand-gravel, and the supply of nutrients to soil. They even classify sediments as 'life support' due to their function as a habitat for organisms and because of favourable conditions for biodiversity.

Can the 'resource approach' play a major role within a European sediment strategy? Probably not. The value of today's river sediments is concealed by several negative factors:

Firstly, even without direct and hard dumps, sediments function as a sink for ongoing releases from many leaks; these include wet and dry fallout from air emissions, runoff from farms, solid and dissolved inputs from mines, discharges from landfills, industrial plants, and sewage-treatment plants. Restoration of the quasi-natural state will be a longlasting process.

Secondly, subsequent to natural erosive processes, sediment-bound contaminants are dispersed, in a hardly predictable manner, on flood plains, dike foreshores, and polder areas. Even moderately polluted solids and pore waters are secondary sources of toxic chemicals, and further accumulation of these substances can then take place in the food chain. Therefore, monitoring and assessment of adverse effects will persist as a priority task in sediment management in the coming decades.

Thirdly, and most important, treatment of sediments is much more difficult than of a well-defined industrial waste, due to the widely diverse contamination sources in a river basin. Considering the energy input which is needed for the separation of contaminants from their valuable matrices and for the purification of gaseous, liquid and solid emissions, sediment conditioning for reuse – as pushed by waste legislation – will rarely conform with the principles of sustainability. In addition, dubious modes of utilization, e.g. filling of depressions, etc., are often justified by data from test procedures which do not relate to characteristic sediment properties such as the content of redox-sensitive compounds. Thus, emphasizing the resource aspects of sediments seem to be a mere reaction to inconsistent legal concepts and unspecific regulations for sediments.

At this point, it becomes obvious that sustainable sediment management must find its own pragmatic way between 'resource' and 'waste'. For example, there is an emerging science-based technology for the final storage of sediments – called 'sub-aquatic depot'. The EU Landfill Directive [2] does not refer to waste disposal below the groundwater level, and here the two most promising conditions for a sediment depot can be found: (i) a permanent anoxic milieu to guarantee extremely low solubility of metals, (ii) base layers of compacted fine-grained sediments which prevent the advective transport of contaminants to the groundwater [3]. Together with advanced geochemical and transport modelling, such deposits offer the most cost-effective and sustainable problem solutions for dredged sediments.

In the convoy of this technology – flagship is the Dutch 'De Slufter' depot – innovative sediment-specific applications can develop, for example, techniques for active capping to safeguarde both depot and in-situ contamination against pollutant release into the surface water.

Different from the management of dredged sediments, problem solutions for large-scale, complex contamination of floodplains are still in the early stage of development. In the 'intrinsic barrier' concept – presumably one of the very few realistic approaches to deal with contaminated soils and sediments in floodplains – soil and sediment components do not only act as substrates ('habitats') for organisms to biodegrade substances, but also as media supporting chemical and mechanical stability.

Secondary source, intrinsic barrier, final storage – these are examples of sediment functions which refer to key issues of actual and future strategies for water, soil and waste management. Sediment-related concepts and methods will not only contribute to the expertise within these areas, but could also take a 'bridging function' between the different policy domains [4].

References

[1] Thompson M (1979): Rubbish Theory: The Creation and Destruction of Value. Oxford University Press, Oxford UK

[2] Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste

[3] DEPOTEC, Amersfoort, and Strom- & Hafenbau, Hamburg (2002): Die subaquatische Unterbringung von Baggergut in den Niederlanden (Sub-aquatic Depots of Dredged Material in The Netherlands). Report. January 2002, Hamburg

[4] Brils J, Salomons W, Van Veen J (editors, 2003): Preliminary SedNet Recommendations for Research Priorities Related to Sediment. 9 pp. November 2003. Den Helder