

# Sediment balance disturbed: so what and what next?

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**Introduction:** Sediment is an essential, integral and dynamic part of our river-sea-systems. Natural river hydrodynamics maintain a dynamic equilibrium, regulating small variations in water-flow and sedimentation by re-suspension and resettlement. [1]. Worldwide natural sediment equilibriums are seriously obstructed by human interventions (Fig. 1). As a consequence, some sites are overloaded with, while others are dramatically short of, sediment. This impacts ecology, the economy as well as public safety, worldwide [2, 3, 4].



**Fig. 1:** Worldwide natural sediment equilibriums are seriously obstructed by human interventions [5].

**Methods:** At 4 October 2016 Deltares and Rijkswaterstaat organized a national sediment balance workshop in Utrecht, the Netherlands. Workshop participants were regional and national water managers, dredgers, sand and gravel miners, representatives of navigation, port authority, agricultural and NGO organisations, researchers and consultants. The objective of the workshop was to learn more on the disturbed sediment balance situation in the Netherlands, its consequences and ongoing and planned mitigation or restoration activities, to generate national attention for the topic and to initiate complementary, national as well as international sediment balance activities.

**Results:** The presentations during the workshop as well as the contributions from the participants clearly pointed out that the sediment balance is disturbed in all major Dutch river-sea-systems: Rhine/Meuse-North-Sea, Scheldt-North Sea as well as Ems-North Sea. A key-statement, however, was that this is not

per definition 'bad'. It relates to the function(s) we desire for a specific site. At some sites we as humans simply have to intervene in the natural system to facilitate navigation or for water safety reasons (e.g. flood protection).

However, the upstream hindrance of sediment transport has in general resulted in a downstream shortage of sediment which consequently at several sites in the Netherlands leads to riverbed incision and/or erosion pits. If not managed, this may indeed dramatically impact navigation (low water tables, hard obstacles) but also impact nature (drained floodplains) as well as impact shore and dike stability and thus flood safety.

A lot of projects are on-going that already address these problems. However, it was also confirmed that the establishment of a sediment balance is extremely complicated, hugely due to a lack of (sharing of) data. Furthermore, it appeared that there is also a need for a more long-term and integrated system approach: 'from the 'mountains to the sea'. Only by taking such an approach we will be able to achieve a step-change in our fundamental understanding of highly complex and dynamic river-sea-systems and specifically of the role of sediment balance therein. That understanding is the basis for creating 'operational perspective', i.e. to suggest effective sediment balance restoration measures (Fig. 2).



**Fig. 2:** From data to operational perspective.

**Discussion:** A key-suggestion resulting from the workshop outcome is to *kick-off a SedNet Sediment Balance Working Group (WG)*. Such a WG could significantly facilitate international knowledge exchange as well as try to influence international R&I agenda's (H2020, JPI Water & Ocean) to include sediment balance. We would like to present the outcomes of the Dutch workshop at the SedNet conference and especially to discuss and explore with the audience the feasibility of such a SedNet WG.

**References:** [1] Salomons & Brils (2004); [2] Walling (2009) [3] Syvitski *et al.* (2009) [4] Bravard *et al.* 1999; Kondolf (1997); [5] SedNet (2014).