

Sed
Net



WFD CIS sediment guidance document and outlook on future EU developments

Jos Brils, SedNet Steer Group member and SedNet delegate to WFD CIS SCG, Zero Pollution Stakeholder Panel & enlarged Soil Expert Group

2023 SedNet conference key-note, Lisbon 6 September 2023



Sediment in Grensmaas (picture J. Brils)

Deltares

Enabling Delta Life



European Sediment Network (SedNet)

Mission

Inclusion of sediment issues and knowledge into European strategies and policies to support the achievement of a good environmental status and developing of new sediment management tools

Identity

- Network of sediment professionals: science, policy, management and practice
- Independent platform to expert advice on sediment management
- Window on sediment issues to EC DG Environment (e.g. NGO at CIS WFD / FD)

Focus

- Sediment quality AND quantity issues
- Entire water system scale: river to coastal sea
- Fresh water, estuarine and coastal/marine sediments

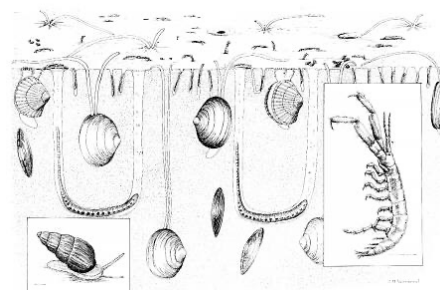
Website www.sednet.org

Key-message (since '02): Sediment needs management due to ...

Too much sediment	Too little sediment	Sediment as resource
Obstruction of channels Rivers fill and flood Reefs get smothered Turbidity	Beaches erode Riverbanks erode Wetlands are lost River profile degradation	Construction material Sand for beaches Wetland nourishment Soil enrichment Habitat and food for life



Source scheme: Martin (2002)

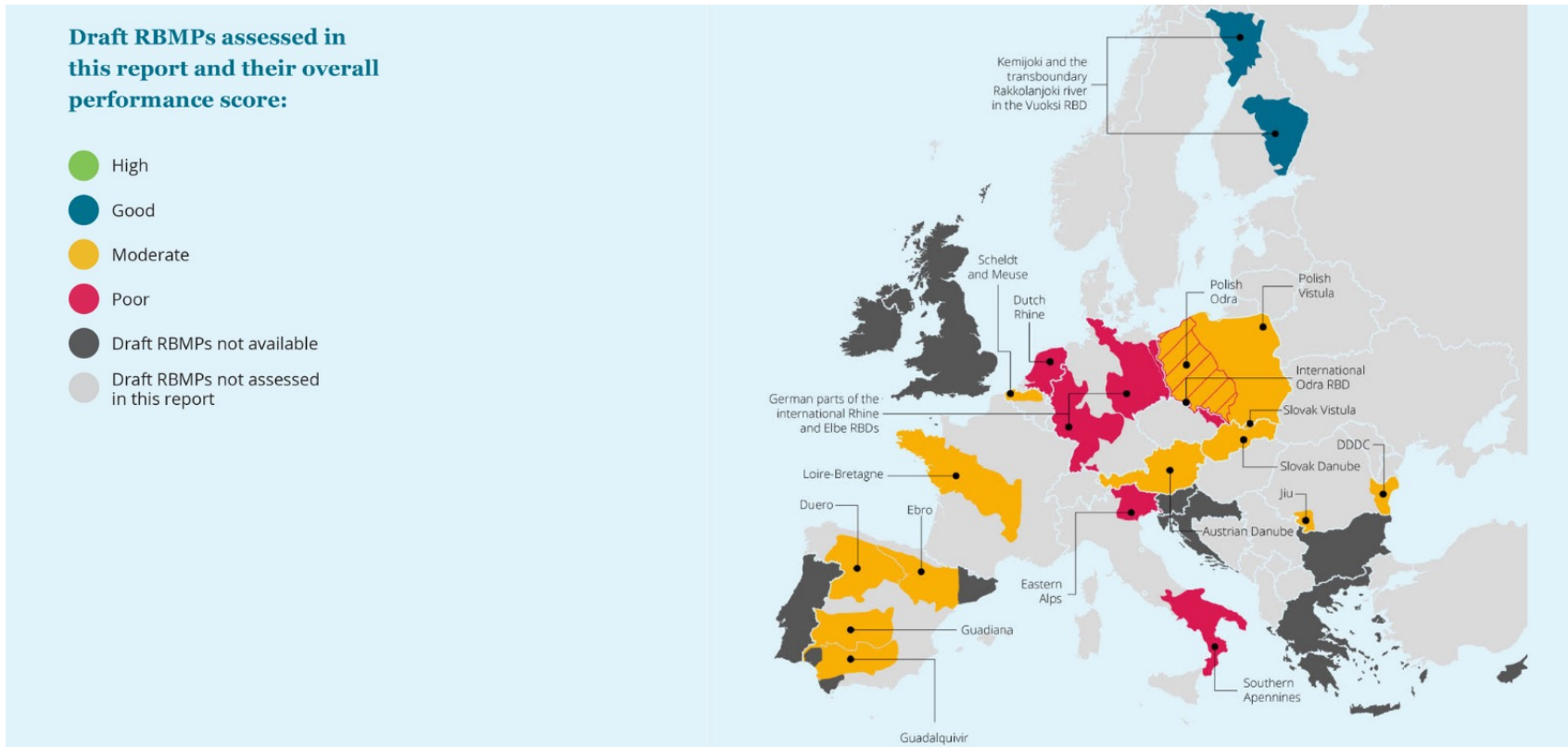


Sediment = “no waste” =
essential & integral element of river-sea systems

**Achieving of
WFD
objectives
asks for
inclusion of
sediment in
RBMPs!**

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How much due to too much, too little or too dirty sediment?



WWF et al. (2021):
**THE FINAL SPRINT
FOR EUROPE'S RIVERS**



Growing attention for too little sediment

World-wide dramatic decreases in up-down stream sediment delivery (hindered sediment flows)

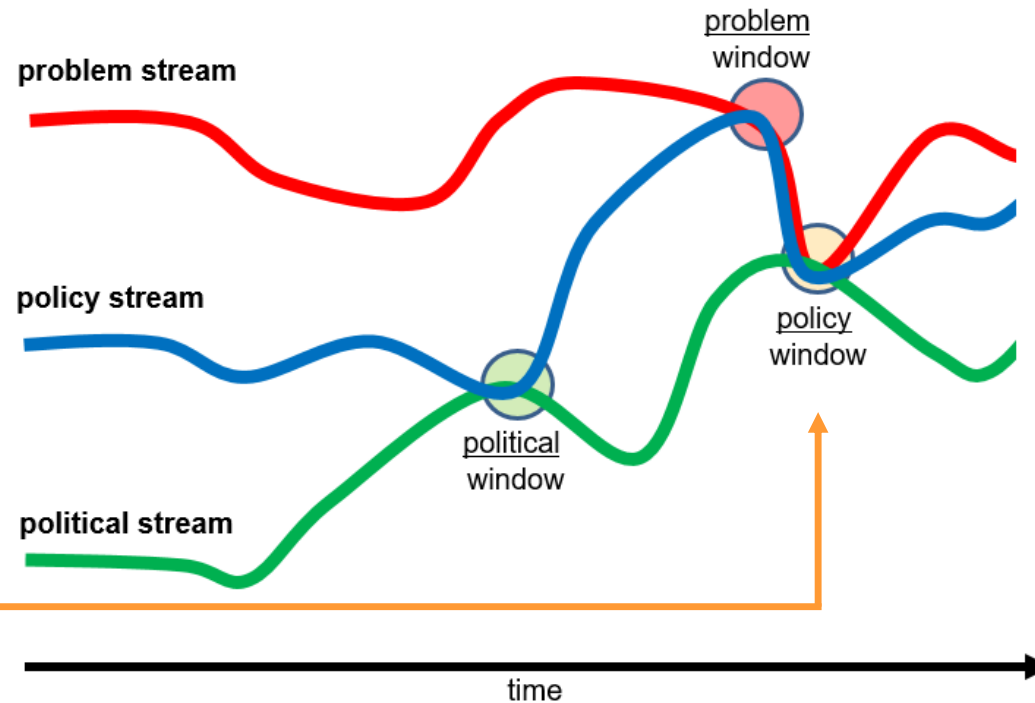
River	Sea	Discharge (m ³ /s)	Decrease in delivery (%)	Reference
Yangtze	East China Sea	30,166	≥ 65	Yang et al. (2006)
Paraná	Atlantic Ocean	17,290	60	Amsler & Drago (2009)
Mississippi	Gulf of Mexico	16,792	50	Restore Mississippi River Delta (sine anno)
Mekong	South China Sea	16,000	≤ 96	Kondolf et al. (2014)
Danube	Black-Sea	7,130	60	Habersack et al. (2015)
Nile	Mediterranean Sea	2,830	≤ 100	Sharaf El Din (1977)
Yellow River	East China Sea	2,571	90	Wang et al. (2016)
Rhine	North Sea	2,330	70	Van der Perk et al. (2019)

Passing the messages, being aware of Kingdon's* 3-streams model

“We conceive of three process streams flowing through the system – streams of problems, policies and politics.

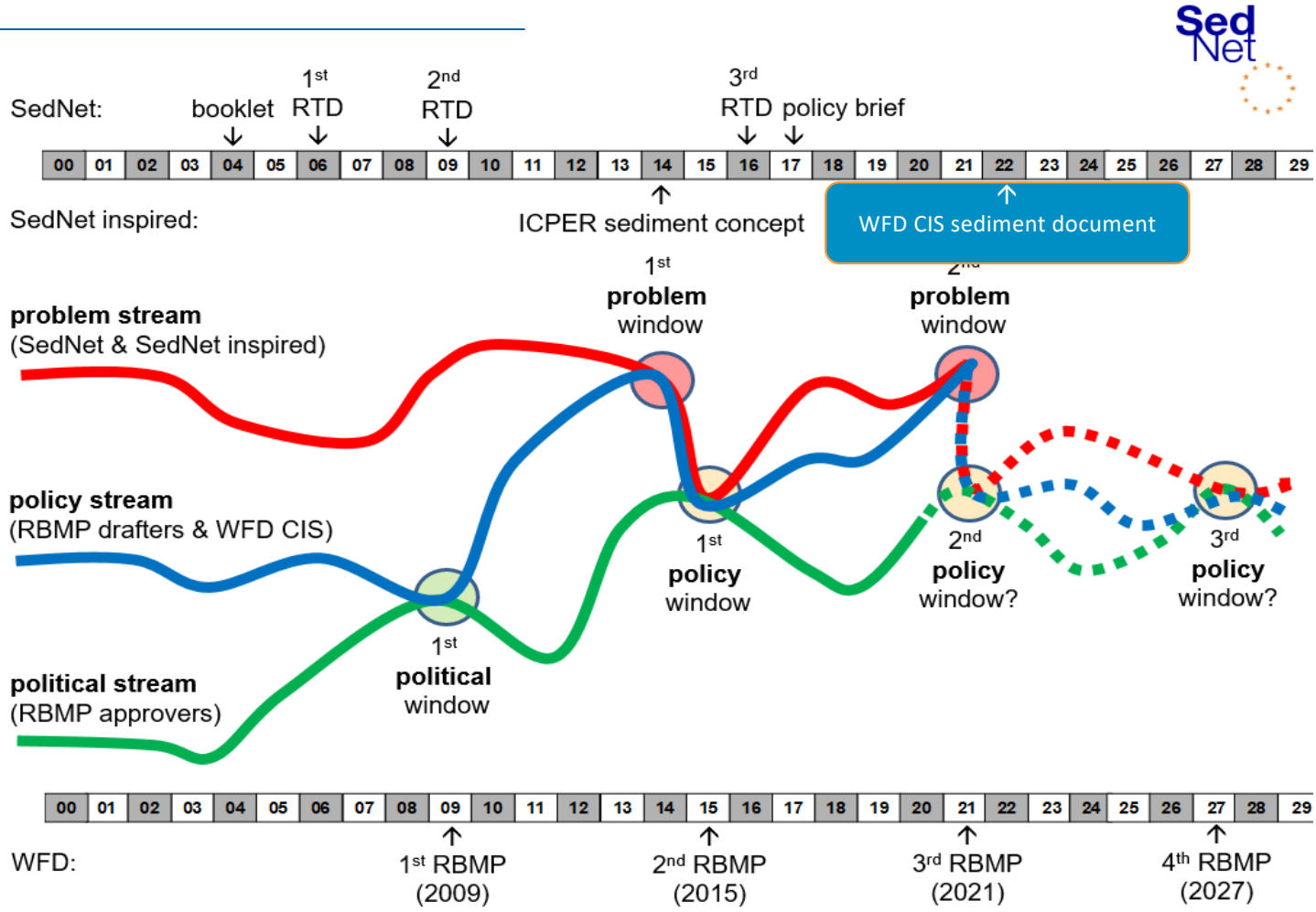
They are largely independent of one another, and each develops according to its own dynamics and rules.”

“But at some critical junctures the three streams are joined, and the greatest policy changes grow out of that coupling of problems, policy proposals, and politics”



* Kingdon JW (1995) *Agendas, alternatives, and public policies*. New York, Longman

SedNet's advocacy: anticipating Kingdon's windows*



RTD:
Round Table Discussion

ICPER:
International Commission for the
Protection of the Elbe River

CIS:
Common Implementation Strategy
(of the WFD)

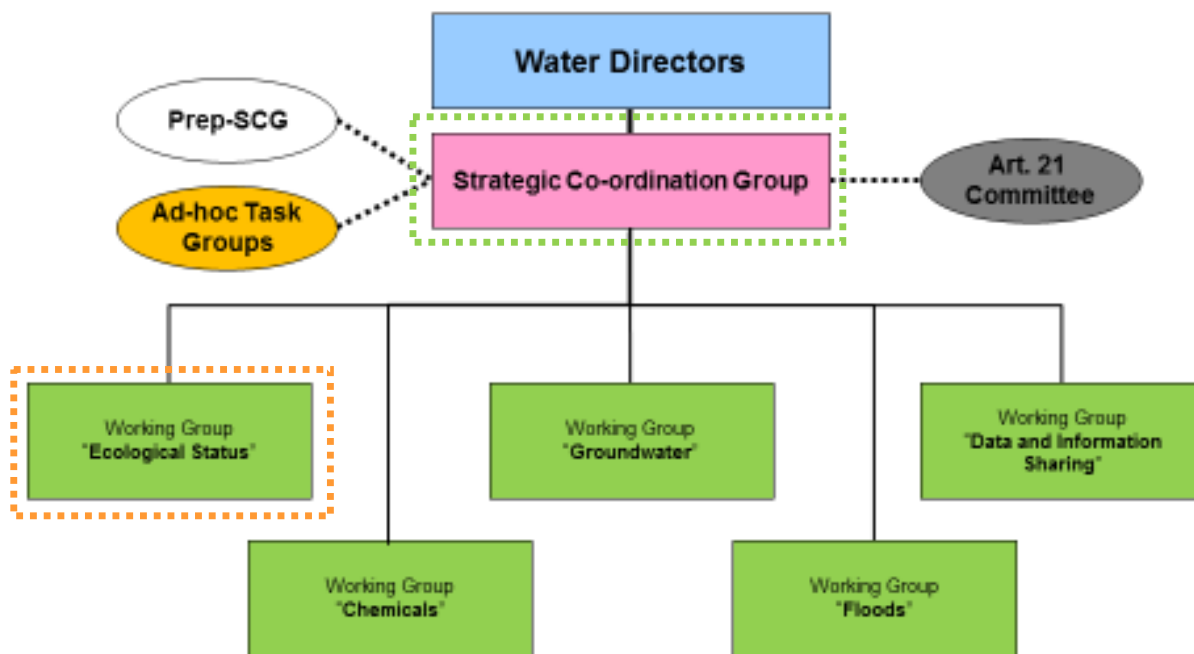
WFD:
Water Framework Directive

RBMP:
River Basin Management Plan

* Brils J (2020) Including sediment in European River Basin Management Plans: twenty years of work by SedNet. Journal of Soils and Sediments

WFD CIS*

CIS Organisation 2019-2021



SedNet became member CIS SCG (18 September 2019)

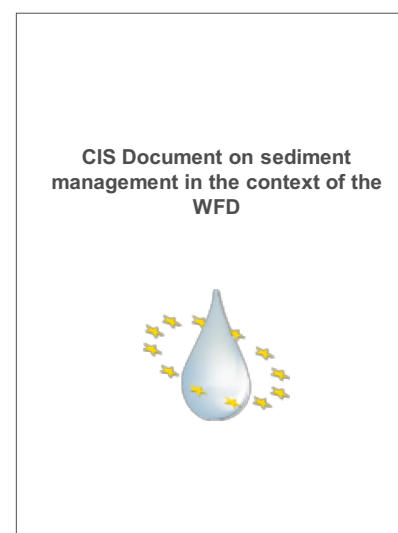
WG ECOSTAT:

- Participants:
 - MS delegated experts
 - Network delegates
 - Lead JRC & DG Env.
- Development guidance to implement WFD & FD
- 2019-2021 work program: develop CIS sediment document

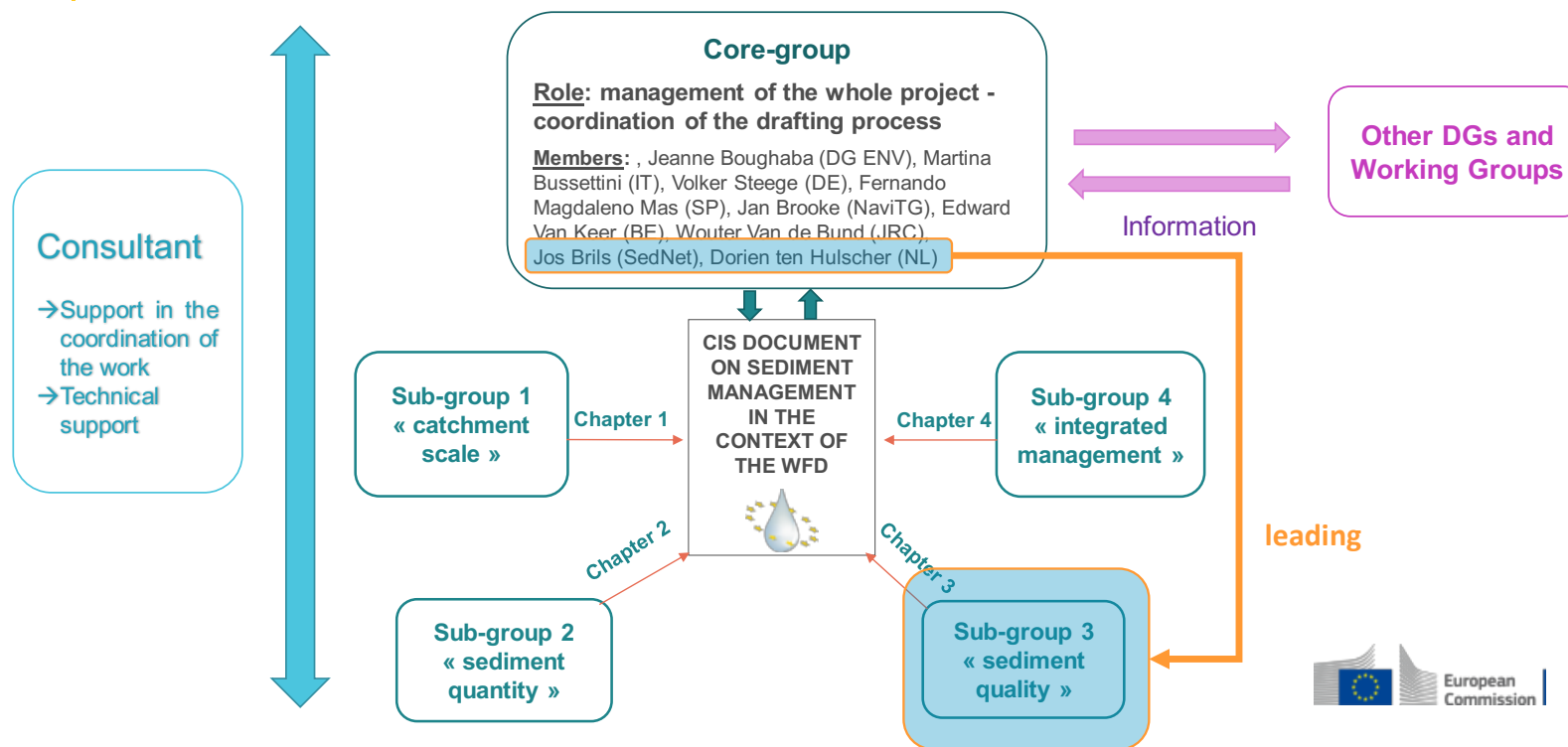
* CIS = Common Implementation Strategy of the WFD & FD

Towards a CIS technical document on Sediment Management

- **Objective:** develop a technical document on the management of sediment in the context of the WFD
- **Deliverables:** Technical document + supporting resource library



Organisation of the work

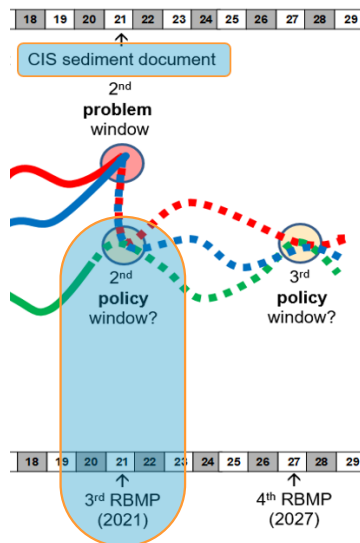
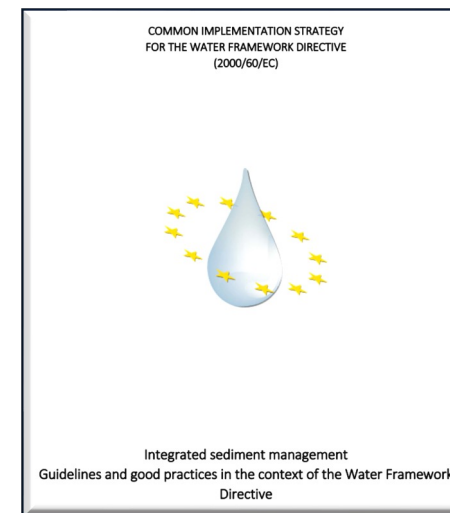


Presentation Jeanne Boughaba (EC DG Env. WFD team) at WG ECOSTAT meeting 14 October 2020

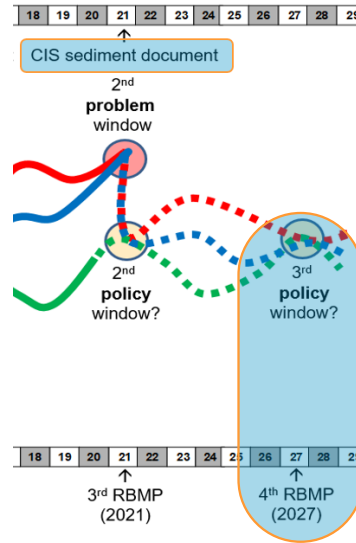
Character of the document (published September 2022*)

In my (personal) opinion it:

- Is not intended as a cooking book
- Raises awareness about why and how to manage sediment from a WFD perspective
- Draws attention to key-messages related to that management
- Hopefully inspires for better inclusion of sediment measures in WFD RBMPs:



document not timely for 3rd RBMP



document timely for 4th RBMP

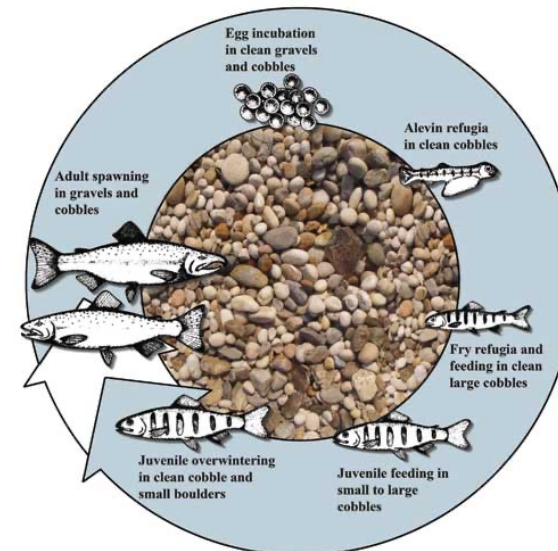
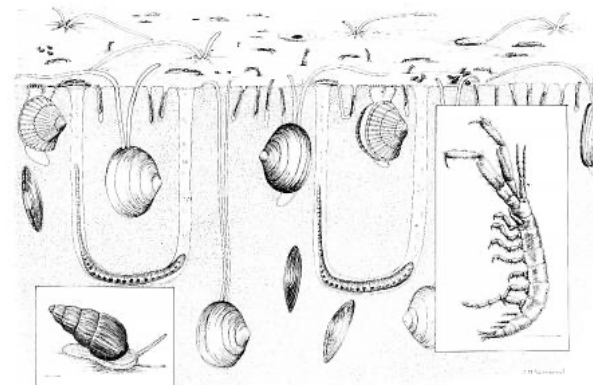
* <https://circabc.europa.eu/ui/group/9ab5926d-bed4-4322-9aa7-9964bbe8312d/library/fcb12a03-6908-45e4-a0ce-6829bc176a77/details>

Sediment quantity key-messages

- Many aquatic habitats are sediment-dependent
- A **surplus** or **deficit** of sediment can compromise or prevent effective ecological functioning
- Indicators suggesting a possible human-induced sediment quantity problem may include:
 - biological quality element failures
 - evidence from hydromorphological assessment
 - outcomes of catchment pressures assessment

A good ecological status/potential requires:

- At the **right time** and place;
- The **right sediment quantity** (supply, transport, delivery, deficit or surplus, at reach, catchment or coastal cell scales); and
- The **right sediment type** (size distribution of particles)



<http://www.tcrd.net/almanac/v16n4/article02.htm>

Sediment quantity key-messages

- Sediment **quantity problems** may be manifested at different scales, and are often inter-related
- Seven categories of sediment quantity problems exist:
 - sediment supply into the system
 - sediment continuity through the system
 - widespread sediment deficit
 - widespread sediment surplus
 - local sediment deficit linked to transport capacity
 - local sediment surplus linked to transport capacity
 - sediment discontinuity
- To be able to identify the most relevant sediment management measures, it is needed to **understand** the nature of the problem
- The **sediment budget*** is a consistent approach to understand the balance and dynamics of sediment quantity



* Sediment budgets:

- Identify the magnitude of sediments sources, transport pathways and stores in a catchment, for any given period of time (Reid and Dunne, 2016);
- Allowing the sensitivity of the catchment sediment yield to perturbations to be appreciated.

Sediment associated contamination key messages

Contaminants (including nutrients) love sediment!

sorption to soils and sediments is probably the most influential factor on the transport and fate of **organic contaminants** in the environment*

In the presence of water with many contaminants, water is adsorbed on the surface of mineral matter, whereas, contaminants are absorbed into the organic matter by a partition process.

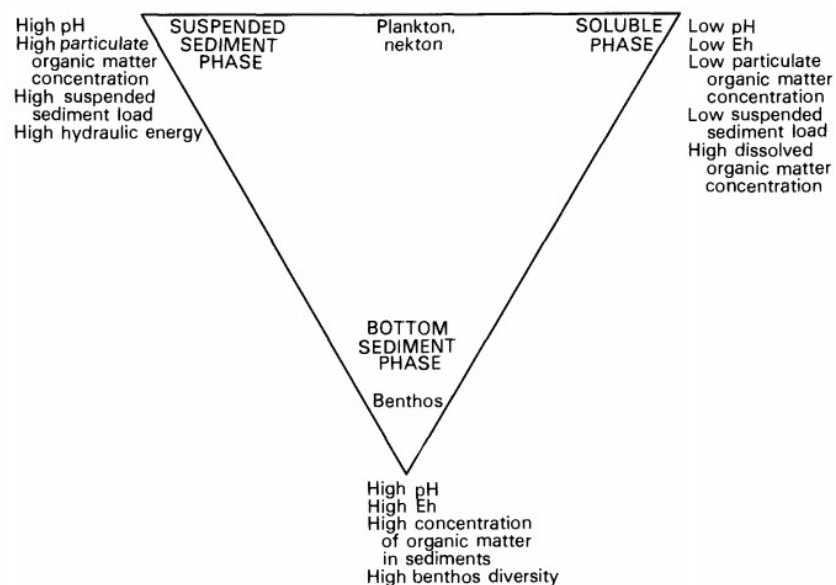
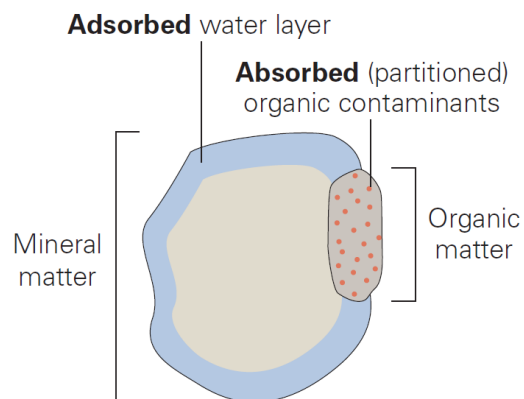


Figure 2. Metal partitioning in aquatic systems among three major phases (inside the triangle) and some environmental conditions that favor each phase (outside the triangle). Biological components (plankton, nekton, and benthos) are positioned according to the phases with which they are most closely associated.

partitioning of **metals** in the environment**

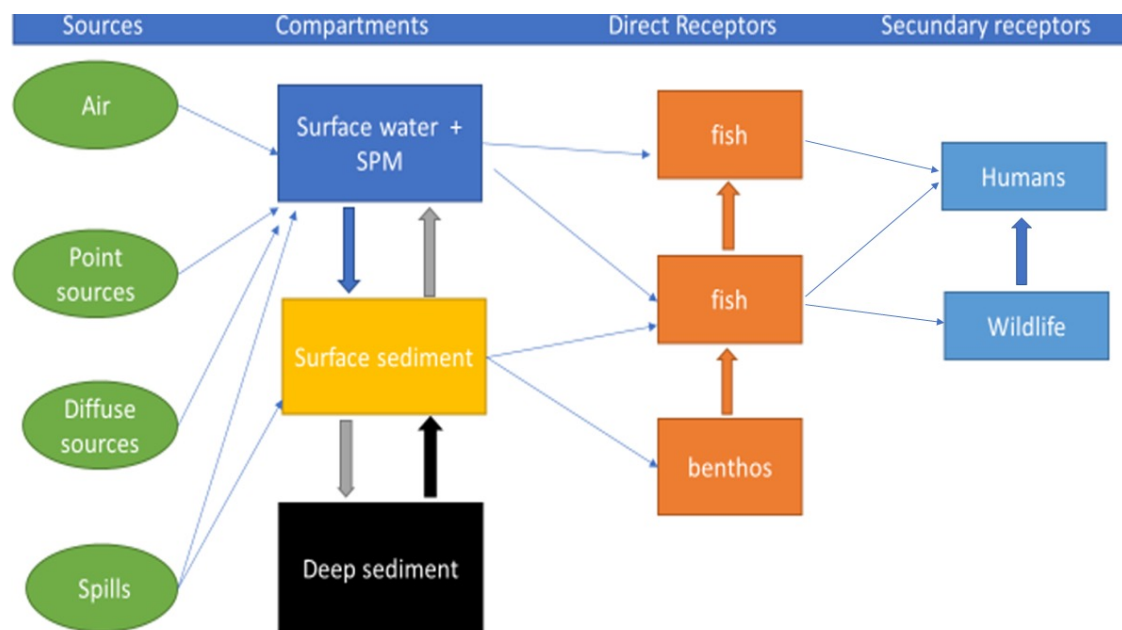
* Chiou & Kile (2010) *Contaminant Sorption by Soil and Bed Sediment – USGS Fact Sheet June 2000*

** Elder (1988) *Metal Biogeochemistry in Surface-Water Systems: A Review of Principles and Concepts*

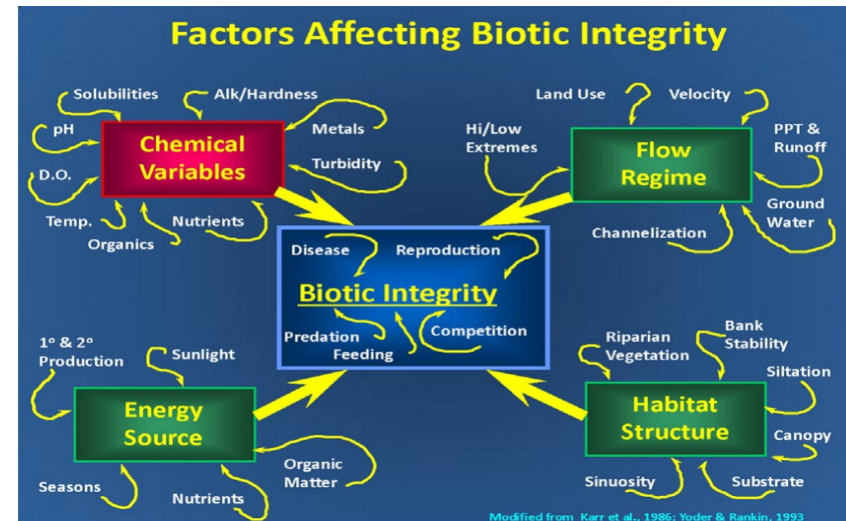
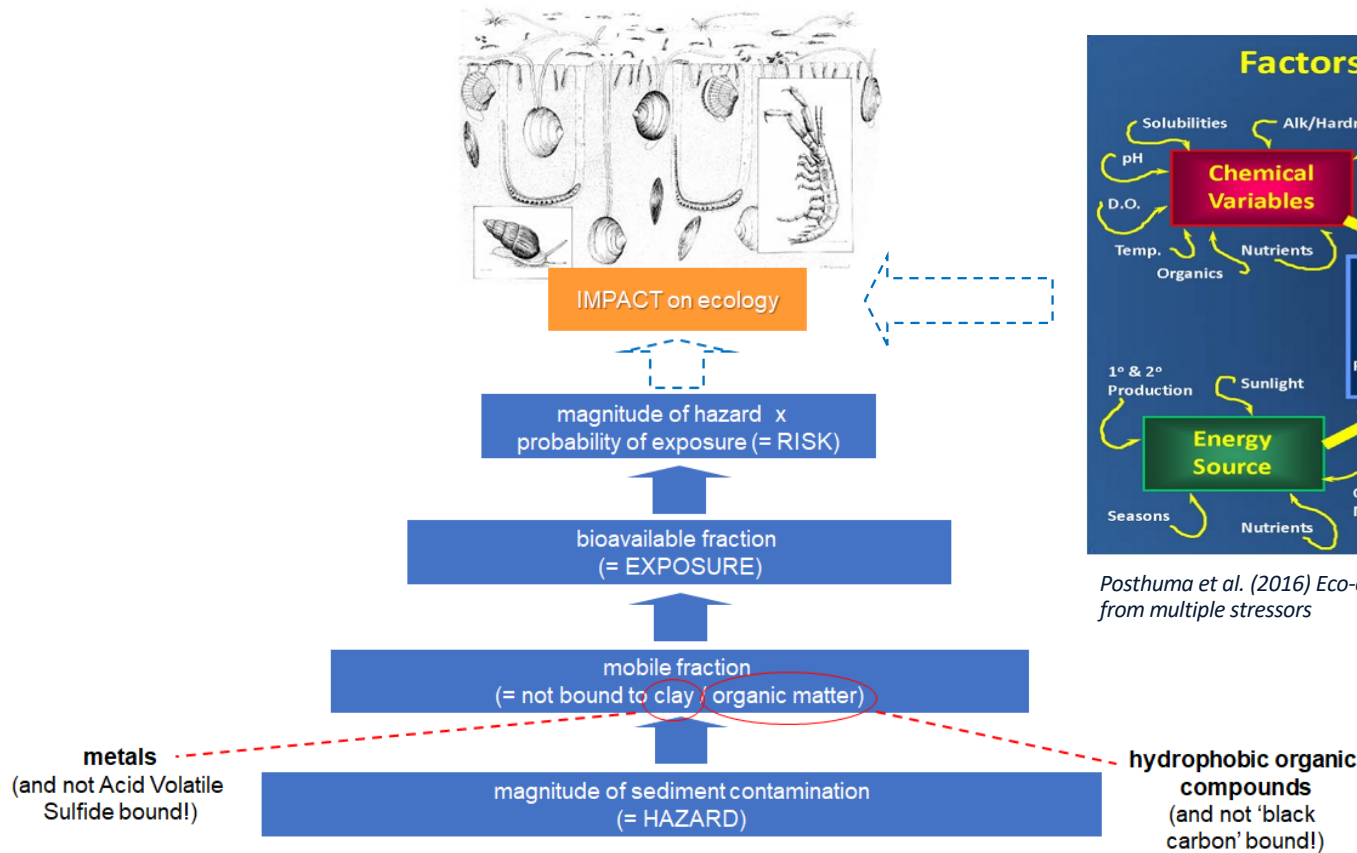
WFD obligations regarding sediment associated contamination

Member States (MS) are obliged to:

- Establish an **inventory** of emissions, discharges and losses of all Priority Substances and Priority Hazardous Substances
- Arrange for the **long-term trend analysis** of concentrations for priority substances that tend to accumulate in sediment and/or biota.
- **Take measures** aimed at ensuring that such **concentrations do not significantly increase** in sediment and/or relevant biota.



Fate of sediment associated contamination

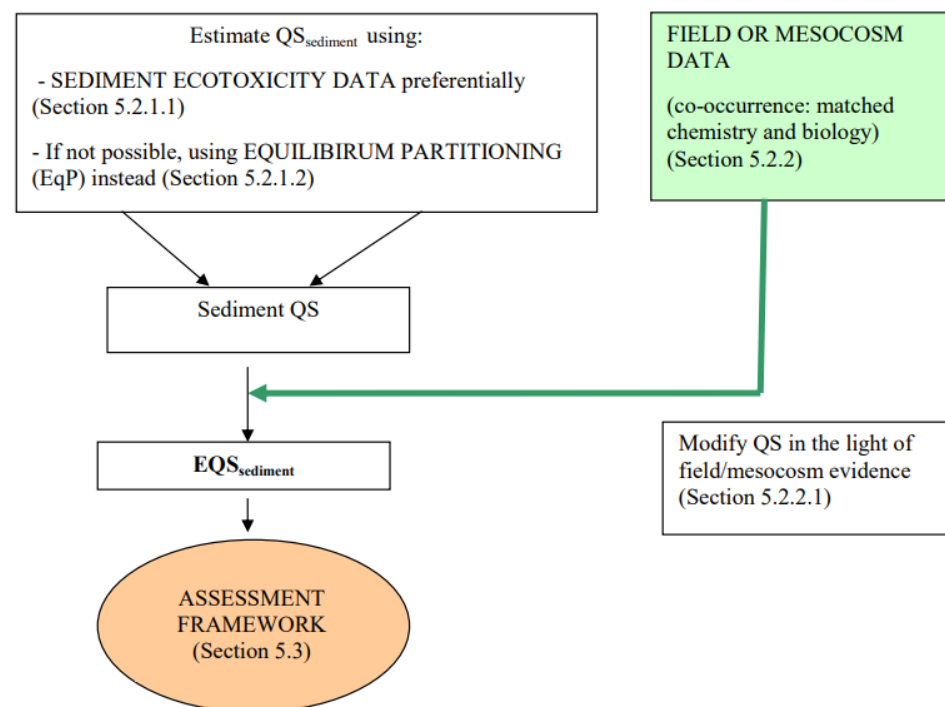


Posthuma et al. (2016) *Eco-epidemiology of aquatic ecosystems: Separating chemicals from multiple stressors*

Sediment EQS

- WFD demands to assess priority pollutants and river-basin specific pollutants with **environmental quality standards (EQS*)**.
- Exceedance of the EQS **indicates a hazard** and thus, **potential impact** on human health and the environment.
- It is **not an obligation** for MS to establish **sediment EQSs**, but once established and implemented at national level, it is an obligation for sediment contamination levels to comply with these EQSs.

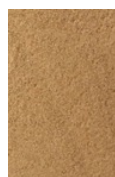
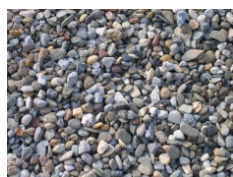
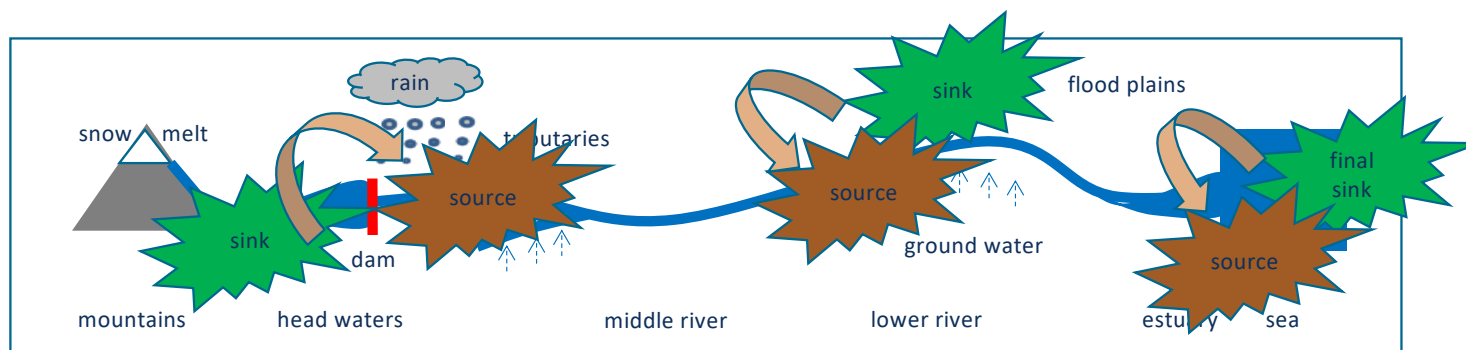
*EQS = the concentration of a particular pollutant or group of pollutants in water, sediment or biota which should not be exceeded in order to protect human health and the environment.”



Technical Guidance for Deriving EQSs (CIS Guidance document No. 27)

Sediment sink and source

- Sediment can act as a **sink or a source** for contaminants and nutrients
- Remobilization may result in an **uncontrolled downstream transport** of the contaminated material



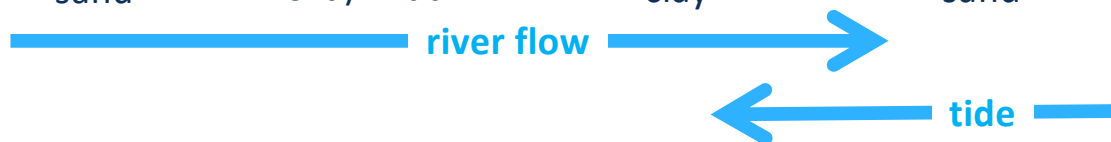
gravel

sand

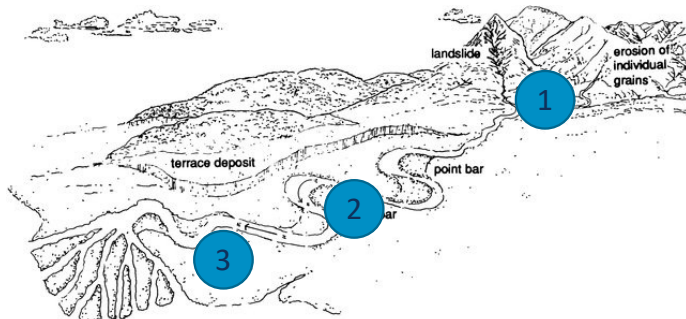
silt / mud

clay

sand



Flooding remobilizes sediment: some examples



Kondolf (1997) *Hungry Water: Effects of Dams and Gravel Mining on River Channels*

Due to **climate change** the frequency and intensity of flooding's will increase!



1

Dam breach failure of an earth dam (Algodres dam - Brazil, 2009)

http://www.civil.ist.utl.pt/~dconde/FMBNE/?page_id=267



3

Soil erosion

Photo by Tim McCabe, USDA Natural Resources Conservation Service [1983]

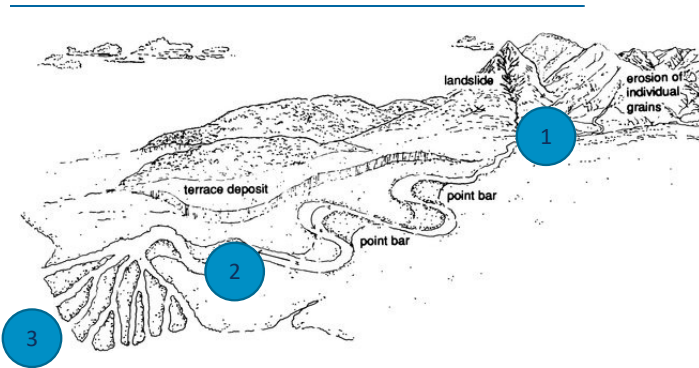


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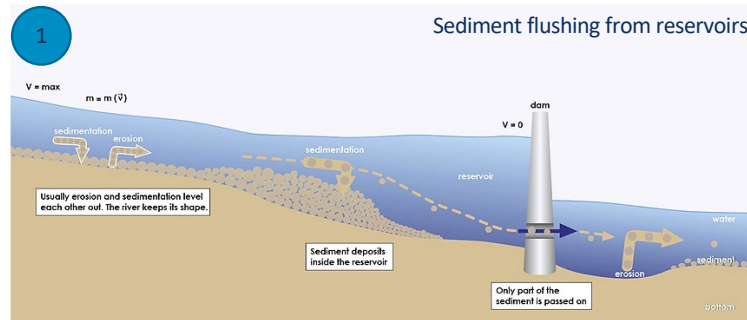
Missouri's Great Flood of 1993

<https://pages.wustl.edu/mnh/flooding>

Human interferences remobilize sediment: some examples



Kondolf (1997) *Hungry Water: Effects of Dams and Gravel Mining on River Channels*



<http://www.db-sediments.com/index.php/two-sides-of-sediment.html>



Dredging & dredged material relocation

<https://www.wartsila.com/encyclopedia/term/dredging-and-dredgers>

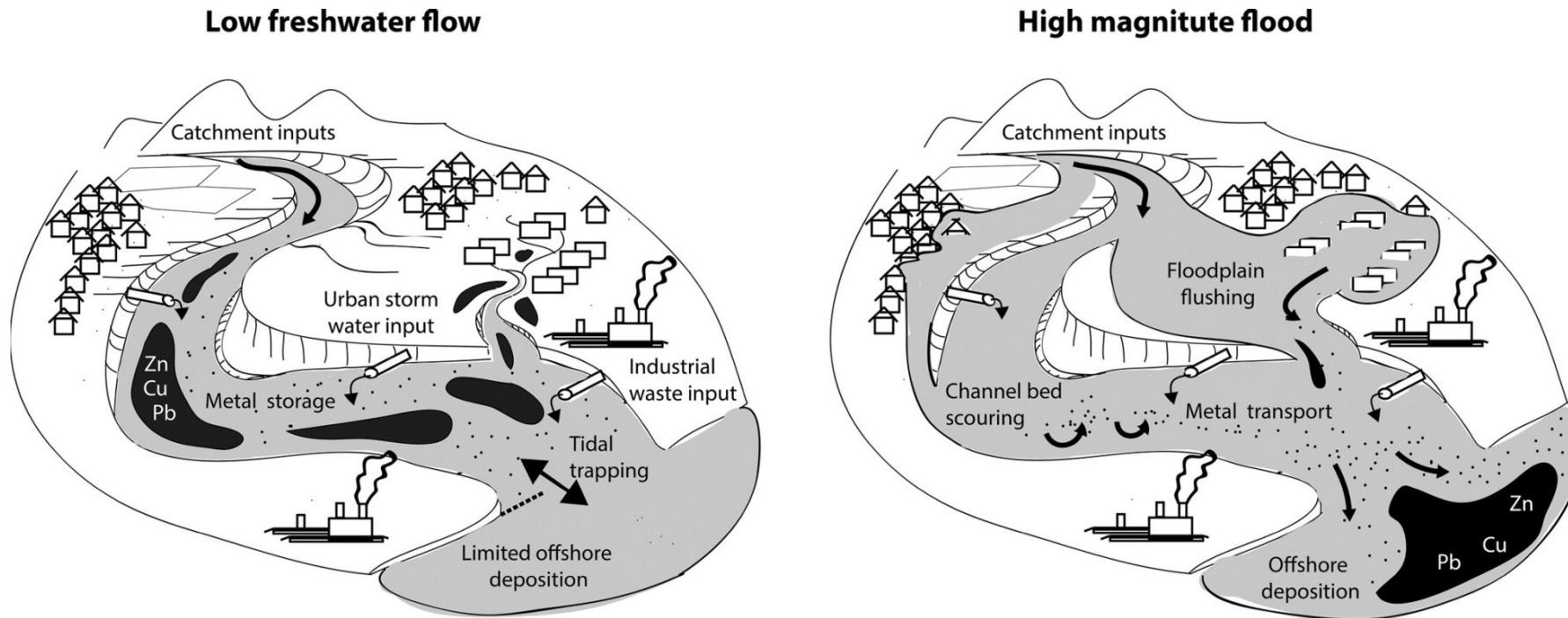


River restoration / 'Room for the river' (Vecht river, digging side channel)

<http://www.van-lenthe.nl/projecten/algemene-projecten/aanleg-nevengeul-voor-de-vecht/>

Down-stream transport of sediment associated contamination

Flooding and human interferences may result in **downstream transport** of sediment associated contamination

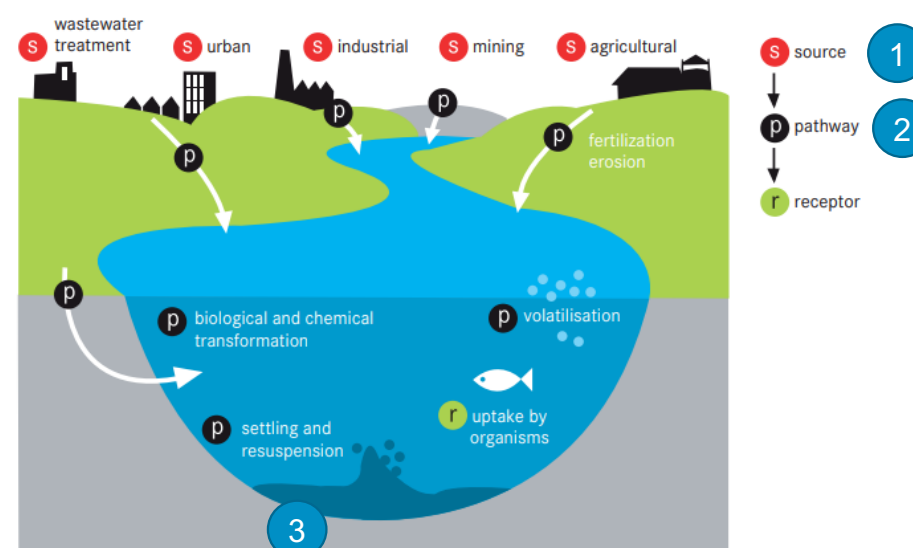


Coates-Marnane et al. (2016) *The impact of a high magnitude flood on metal pollution in a shallow subtropical estuarine embayment*

Management of sediment associated contamination

Sediment contamination can be managed by:

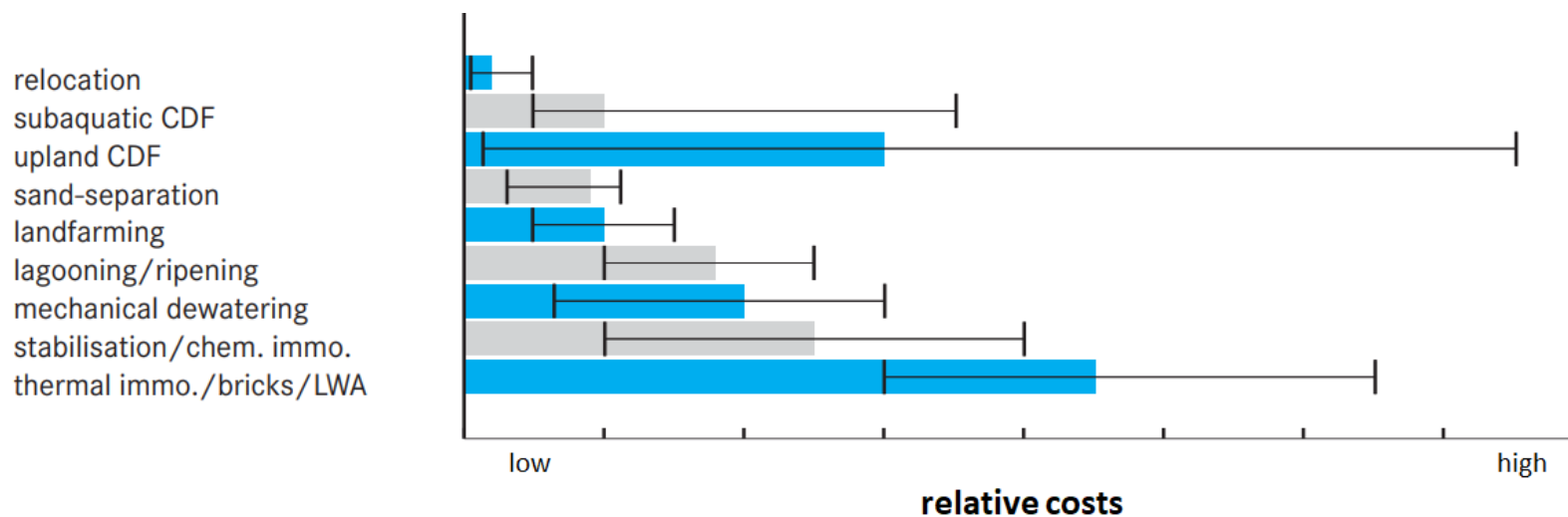
- 1 **Prevention:** It is easy to contaminate sediment, but once in the sediment, it is often difficult and costly to revert the situation: **aim for Zero-Pollution.**
- 2 **Mitigation:** Specific measures can be taken to reduce the mobility and thus the bioavailability of sediment associated contamination (table 3.3 in document)
- 3 **Remediation:** Remediation techniques can be applied on site (*in situ*), or the contaminated sediment can be removed and transported to another location (*ex situ*)(table 3.4 in document)



Brils et al. (2014) Risk-Informed Management of European River Basins

Costs

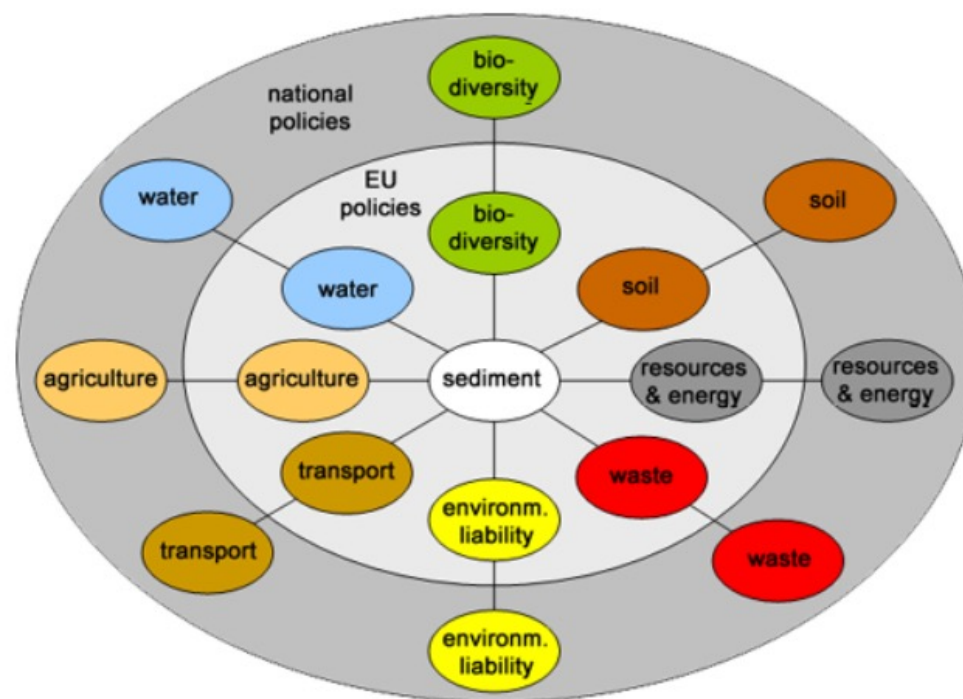
Mitigation and remediation **costs** depend very much on the site-specific circumstances.



Salomons & Brils (2004) Contaminated sediments in European River Basins

Integrated sediment management planning key-messages

- The WFD includes a few **explicit and several implicit links** to sediment
- Thus, the management of **sediment is inherent part of the WFD**
- Several **other EU environmental policies** also directly or indirectly address sediment management:
 - Floods Directive
 - Habitats Directive
 - Marine Strategy Framework Directive
 - Waste Framework Directive & circular economy
 - Zero Pollution: air, water, soil ... and **sediment!**
 - CAP
 - Environmental Liability Directive
 - Etc.

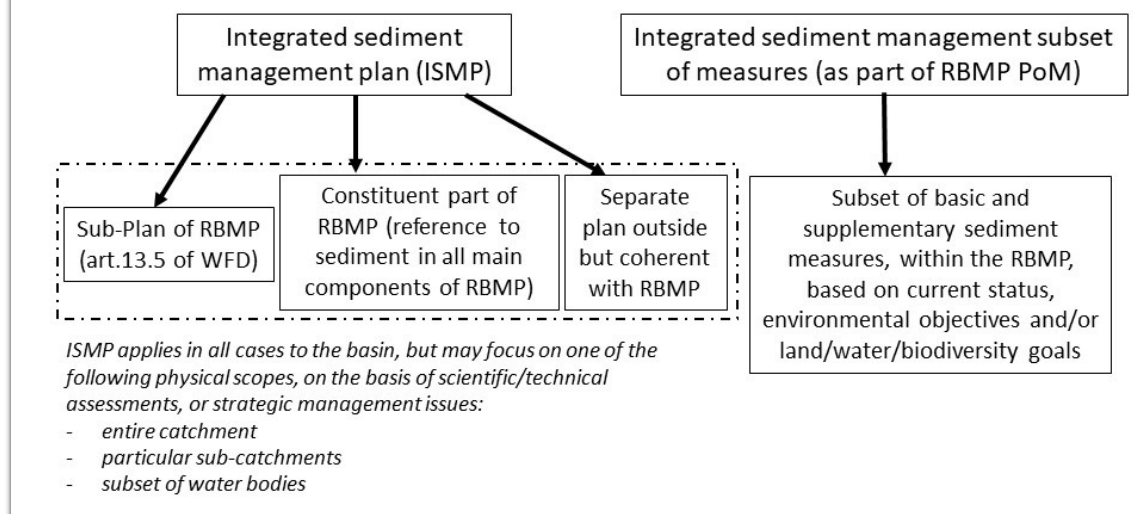


Integrated sediment management planning key-messages

Requirements of the WFD with regard to integrated sediment management:

- Integrated sediment **management plans** (ISMP) and **related measures** are to be **included in RBMP**
- Objectives of ISMP should be to reach and maintain the WFD's good status / potential while providing a sustainable use of water bodies
- Apply CIS guidance 37* in case of conflicts between reaching good status and maintaining specific water uses regarding sediment management issues
- Secure funding and apply the cost recovery principle to finance sediment-related measures

Different approaches for the implementation of sediment management plans and measures in consistency with RBMPs

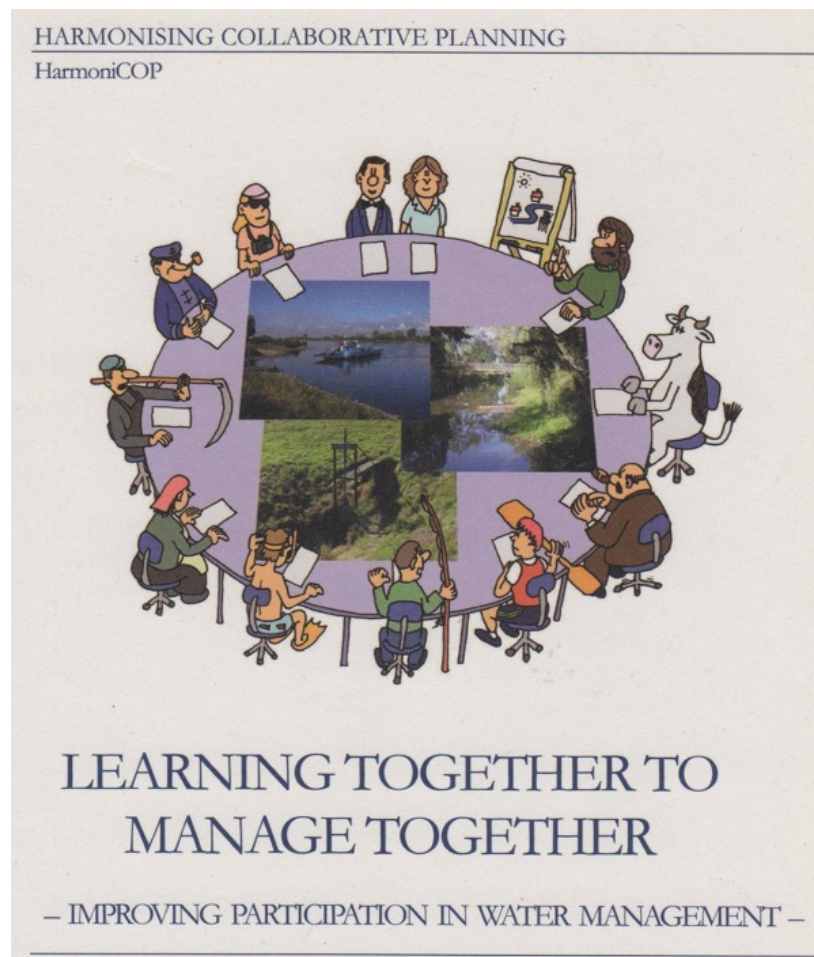


* CIS Guidance Document No. 37 (2019) Steps for defining and assessing ecological potential for improving comparability of HMWB

Integrated sediment management planning key-messages

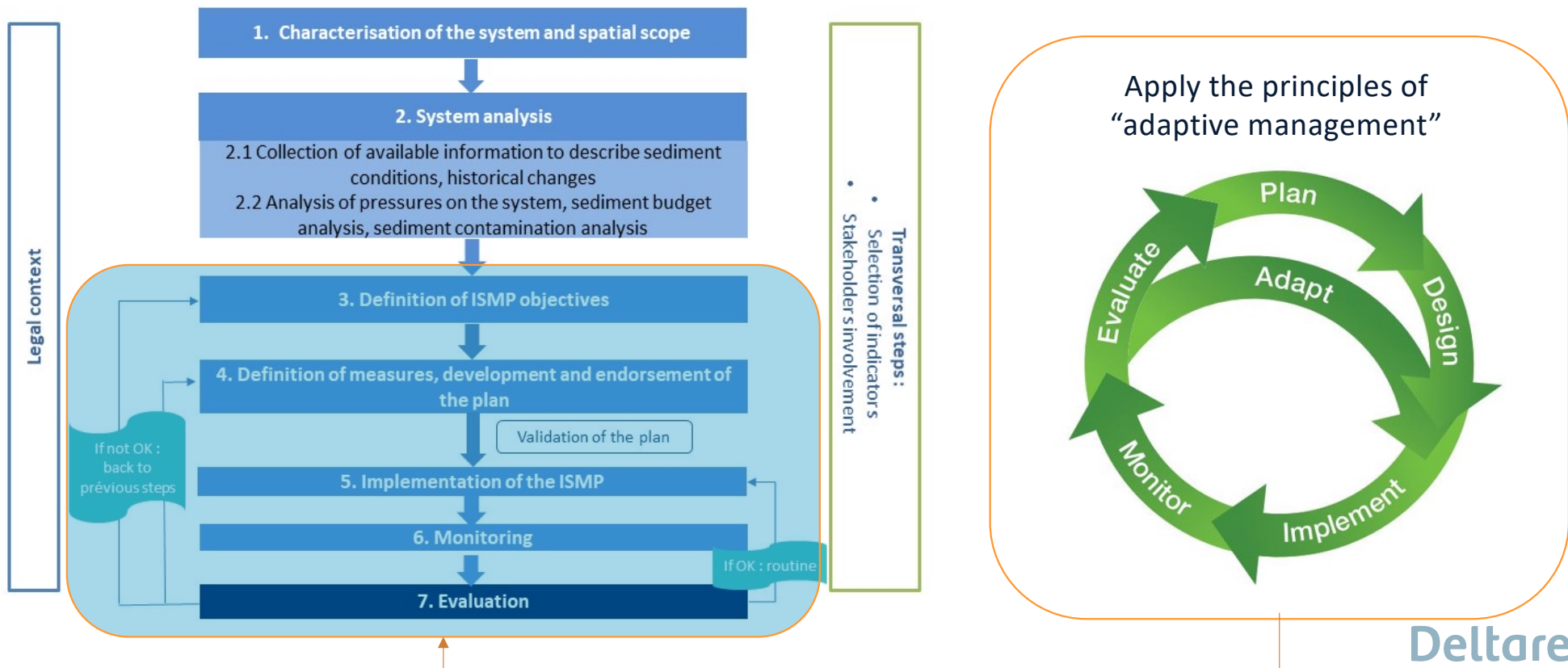
Governance:

- Involve all **stakeholders** as early as possible in the process, both during the development of the management plan and during its implementation
- Ensure that all relevant stakeholders are involved and active
- Ensure good communication, dialogue between stakeholders
- Identify responsibilities and interests of the different stakeholders



Integrated sediment management planning key-messages

Integrated sediment management plan development and implementation:



SedNet membership WFD CIS SCG

Role of SedNet regarding sediment and WFD:

- Not to verify or assess that member states have include sediment in their 4th (i.e. 2027) RBMPs
 - But yes to:
 - Continue to raise awareness on sediment and its management
 - Including promotion of the WFD CIS sediment document
- Bring ‘sediment in RBMPs’ experiences together
 - Increase sediment literacy



Sediment literacy* =

“The state of knowing about or being familiar with sediment. It concerns both a popular awareness about the importance of sediment, and specialised and practice-oriented knowledge related to achieving sediment health”

WFD CIS WG ECOSTAT workplan 2022-2024:

Task 8 - Exchange of information on sediment by producing guidelines of best practices and organizing a workshop

Core-group comprises following organisations:
ENV, JRC, ES, DE, IT, NGO **SedNet**, NGO NTG



Sediment in Loire (picture J. Brils)

* Adapted from Nougues and Brils (2022) Soil and Land Management Ontology Reference document

SedNet membership Zero Pollution Stakeholder Platform

Zero Pollution Stakeholder Platform (ZPSP):

- Engages stakeholders and experts of different policy areas
- Helps to deliver on the flagship initiatives and actions set out in the Zero Pollution Action Plan and its related Work Program
- Which includes “Flagship 3, Action 15 – Explore good practices in sediment management (2024).”

SedNet position in ZPSP:

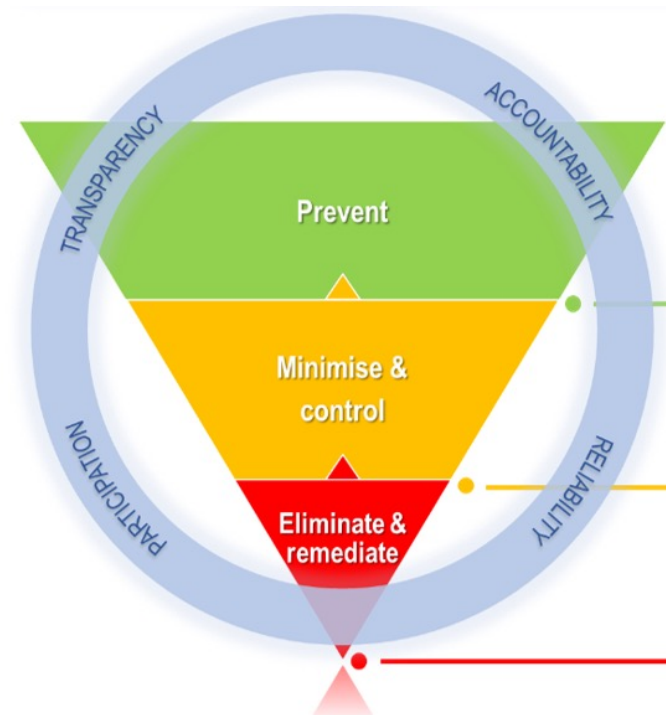
- Prevention of further pollution of sediment as well as the prevention of the remobilization of pollutants from sediment and of the transport of contaminated sediment, should also be key elements in a ZP ambition.
- Without that ZP can not be achieved

• We offer to mobilize state-of-the-art knowledge on best management practices for contaminated sediment: prevention, control and remediation (including NBS)



This 2023 SedNet conference!

Deltares



Zero Pollution hierarchy

SedNet membership of enlarged Soil Expert Group(eSEG)

Enlarged Soil Expert Group (eSEG):

- Engaged MS delegates, stakeholders and experts of different policy areas
- Advised the EC and provides expertise on the:
 - implementation of the Soil Strategy
 - the development of the proposal for the **Soil Health Law**
- Started of with an **integrated focus on soil-sediment-water**
- *“Proposal for a Directive on Soil Monitoring”* delivered July 2023*

→ continued capacity to support ecosystem services
 → sediment zero times mentioned in the proposal!



SedNet position in eSEG

- ‘Voice for sediments’: brought in sediment management expertise
- Also raised in 1st eSEG meeting (4 October) that achieving of soil health takes an **ecosystem-based management approach**
- EC DG Env. Soil team at first agreed but no reference to it in the *“Proposal for a Directive on Soil Monitoring”*

→ see my presentation this afternoon!

* https://environment.ec.europa.eu/publications/proposal-directive-soil-monitoring-and-resilience_en



THANK YOU FOR YOUR ATTENTION

BIG THANK YOU TO ALL CO-AUTHORS OF CHAPTER 3 (alphabetical order family names):

Antonella Ausili*, Piotr Borowiec, Jeanne Boughaba, Marvin Brinke, Jan Brooke, Ilka Carls*, Mario Carere, Carmen Casado*, Helen Clayton, Ronald van Dokkum, Katalin Dudas, Anne Grudzinski, Stephen Lofts, Erik Mink, Agata Mitura, Claude Putavy, Elena Romano*, Henrich Röper*, Ann-Sofie Wernersson, Lieske Zalden

* SedNet Steer Group members

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outlook on future EU developments**

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