Assessing Sediment Status in Europe: Frameworks, Standards and Approaches, an Expanded Review

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"Sediment Challenges and Opportunities due to Climate Change and Sustainable Development"



The initial question: How do I screen whether I have an *in situ* "sediment problem"?

In a range of European countries

Originally Belgium, France, Germany, Italy, The Netherlands, Norway, UK (report in 2017)

Ultimately, 35 countries so far (ongoing)

Internet search and national expert collaboration and review

Marine and freshwater sediments

✤Is there guidance?

Is there a decision framework?

Are there sediment quality values?

For which chemicals?

Are there chemicals which should be monitored, but are not?

Living document, but publication planned as well

Had been addressed by SedNet, but over a decade ago



SQVs have a number of bases, but can be roughly broken into four categories

- Threshold (or no) effects SQVs (TE/NE)
 - Below these levels, effects are unlikely (e.g., TEL)

Probable effects SQVs (PE)

Above these levels, effects are probable (e.g., PEL)

Extreme effects SQVs (EE)

Usually multiples of probable effects, these can be used to trigger immediate action

Background SQVs (BK)

 Not based upon toxicity, but on natural or regional levels



Chemical stressor concentration



Differences between sediment frameworks for ecological condition & dredged material disposal

Ecological condition (in situ assessment)

- Management goal is unimpacted ecosystems
 - Question is whether sediments pose risk in situ
- Management actions cover range of options (e.g., removal, treatment, capping, natural attenuation & source control)

Dredged material disposal (DM or ex situ)

- Management goal is to dredge and remove sediments
 - Question is whether DM can be disposed of without control or treatment
- Management actions focused on disposal options (beneficial use, uncontrolled, controlled in water, controlled on land)

Tools and frameworks are not directly interchangeable, but can be used with caution, when question-specific tools are not available

Standards and guidance – marine and fw

I Standards and guidance – fw

Standards for monitoring – fw and marine

Standards for monitoring - marine

Standards for monitoring – fw

International approaches

Sediments evaluated using soil values

No guidance – soil values available

No guidance but CRA recommended

Guidance pending

No sediment policy (review-based)

D No info

Always ensure the narrative intent (background, elevated levels, no risk, low risk, high risk...) is relevant for the question at hand

In situ assessment approaches



Narrative intent – why are sediments being assessed?

Few countries had formal frameworks for evaluating whether in situ sediments required remediation or management

Even those that did define threshold or intervention values differed in what actions were prescribed

 Many of the standards were focused upon monitoring and reporting for various directives or conventions
 WFD, OSPAR, MSFD, basin-wide efforts

Soil-based sediment standards in some countries – these tended to have longer action lists

Most countries had soil standards

The added question: How is dredged material status assessed?

- In a range of European countries
- Marine and freshwater sediments
- Is there guidance?
- Is there a decision framework?
- Are there chemical action levels (cALs)?
 - For which chemicals?

Are there chemicals which should be monitored, but are not?
 What biological assessment approaches are specified?
 Susanne Heise taking the lead for this, but gathered data shared



Dredging Chemical Action Levels Identified



Only marine cALs found

Only freshwater cALs found*

Same cALs for freshwater and marine

Separate cALs for freshwater* and marine

🔲 No info

*Freshwater cALs often differ depending upon land use at disposal site

Generic DM flow – testing cAL efficacy with database



Why does it matter?

✤cALs seek to

 Avoid missing toxic sediments (risk at disposal site)

Avoid rejecting non-toxic sediments (unnecessary management costs)

Minimise
 assessment costs
 (extra analyses)

You can't have it all!



Other technical tools used in combination between cALs or as Weight of Evidence (WoE)

- Regional background-based evaluation
- 'Chemical' bioavailability studies





Other technical tools used in combination between cALs or as Weight of Evidence (WoE)

Regional background-based evaluation

'Chemical' bioavailability studies
 'Biological' bioavailability studies
 Bioaccumulation, biomagnification
 Sediment toxicity assays
 Ecological surveys

Sometimes, non-technical tools, such as cost/benefit or other evaluations, are carried out



Dredged material decision flow – can the DM be disposed of here?

Are there national cALs for the right type (fw, marine) of DM assessment?

Use these values (and, if any, guidance, if available)

Are there any regional cALs for DM assessment?

Use these, with caveats

Is there information about background contaminant levels at disposal site?

Use these, with caveats

Are there international cALs or national SQVs that can be adapted for use?

Whether other lines of evidence are used, and how, are important here

This thinking can be used to consider contaminants for which no cAL exists

Summary

Each country examined differed in its approach to sediment assessment

For most countries, some guideline values could be identified for use

However, these differed vastly in action lists and narrative intent

Collecting information remains challenging

Language, disparate expertise, siloing

Although we asked about emerging contaminants, not much new is available yet

- The selection of analytes, standards and approaches should be driven by site conditions, regulatory context and assessment objectives
- New work pending (UK, Denmark, Switzerland...)
- Data collected about bioassessment methods and decision flows
 Not much new to report, but this will be synthesized with Susanne Heise
- Still working on graphics to summarise these SQVs, but the vastly different approaches make a common summary challenging (and potentially misleading)

Inputs and collaboration welcome, as I seek both closure and completeness

Feel free to contact me for more details – drsea@cvrl.org

