Set-up of a Decision Support Tool

for the remediation of contaminated sediments

Interreg project Sullied Sediments

Anissa Smits – Witteveen+Bos Belgium

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Interreg - Sullied Sediments

European program:

- Interregional cooperation within EU
- Information exchange
- Partners from the North Sea Region
- Belgium: OVAM

  = Public Waste Agency of Flanders

Interreg - Sullied Sediments Goals

Improve:

1. Risk assessment of (emerging) contaminants in sediments
2. **Treatment (*in situ* and *ex situ*) and possibilities for reuse of contaminated sediments**
3. Prevention of sediment contamination by raising awareness

Further information: http://northsearegion.eu/sullied-sediments/

Objectives of the Decision Support Tool

- To create a central knowledge sharing platform on sediment remediation techniques
- To help choosing an optimal technique
- Updated frequently
- Users:
  - Soil/sediment remediation experts
  - Policy makers
  - Problem owners (e.g. industry)
  - Other stakeholders (e.g. waterway managers, etc.)

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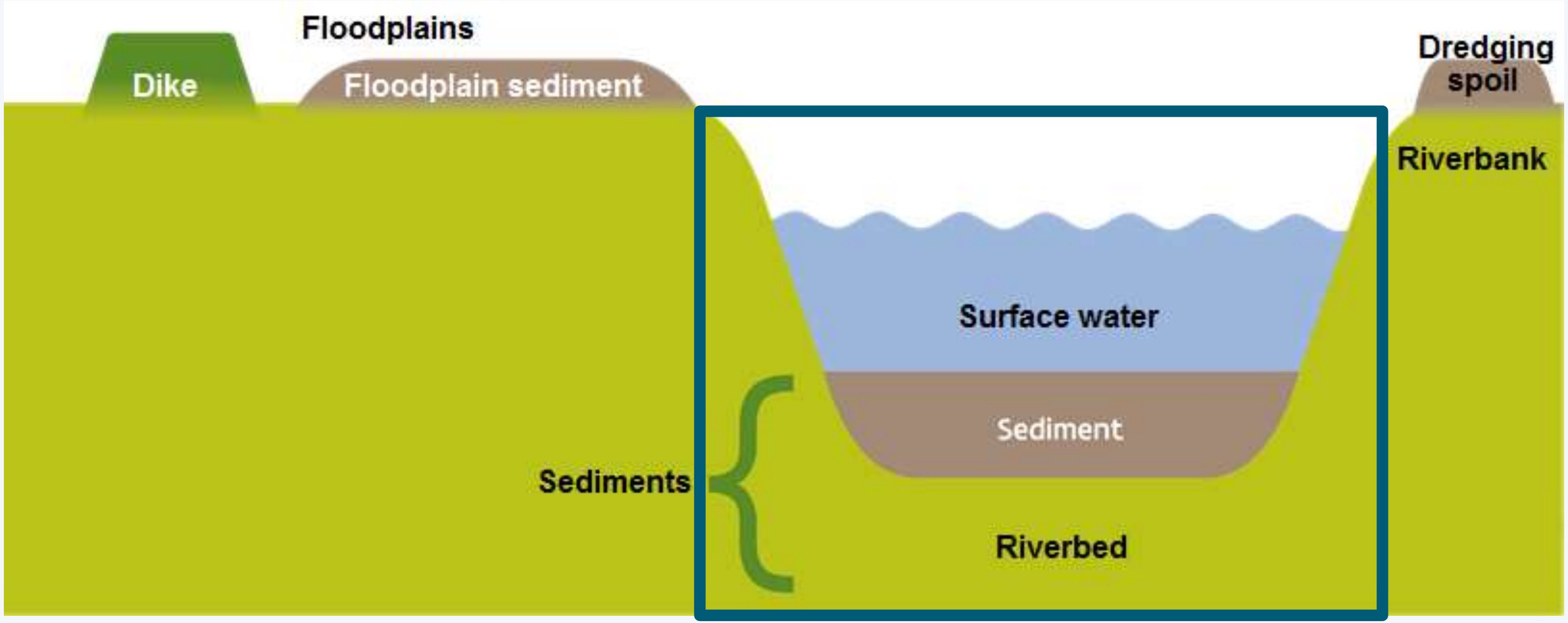
Objectives of the Decision Support Tool

- Focus on technical feasibility of techniques
- First step in cost-benefit evaluations
- Applicable in Flanders (legally and technically)
- Experimental techniques are included
- Sediments ≠soil, but for now some proven techniques for soil remediation are also included

Sediments ≠soil



Ref: OVAM

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Sediment vs. soil remediation

	Sediments	Soil
Grain size	Relatively small (clayey, loamy)	More varied
Water content	High (20-60% dry matter)	Low (>80% dm)
Organic content	Relatively high (>2%)	Limited organic content (<2%)
Contamination	Typical: heavy metals, mineral oils (>C14), PAHs	More varied
Degree of contamination	Relatively low	Relatively high
Volumes	Large	Usually smaller
Other	Occurrence of specific problem parameters such as TBT	Usually contains rocks, bricks, building- or demolition waste

Ref: DEC & Envisan

Set-up of the Decision Support Tool

Based on:

- ITRC: Remedy Selection Tool for Contaminated Sediments

  https://www.itrcweb.org/contseds_remedy-selection/

- EMIS-VITO: BOSS (BOdemsaneringsSelectieSysteem)*

  https://emis.vito.be/nl/boss-bodemsaneringsselectiesysteem

- SedNet: Sustainable Management of Sediment Resources, Vol. 2 - Sediment and Dredged Material Treatment

*DST used for soils in Flanders

Decision Support Tool – Flow

Questionnaire

In Situ Remediation Techniques

- (Enhanced) Monitored Natural Attenuation
- Biological, chemical or physical treatment
- Capping
- Diversion of the waterway

Ex Situ Remediation Techniques

Excavation or dredging

- Transportation
- Dewatering
- Further processing …

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Decision Support Tool – Flow: *Ex Situ* Techniques

Excavation or dredging (incl. transportation)

↓

Additional Questionnaire

↓

Dewatering (optional)

- Natural dewatering
- Mechanical dewatering
- Sand separation

- Re-use: e.g. construction material
- Biological, chemical, physical treatment
- Disposal

Decision Support Tool – Questionnaire

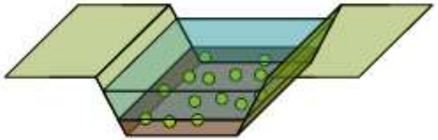
Selection criteria – partially based on soil remediation:

- Remediation goals
- Timing
- Waterbody characteristics
- Sediment characteristics
- Contamination characteristics
- Accessibility, etc.

Decision Support Tool – step 1: input user

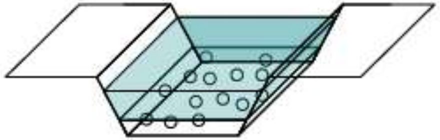
Step 1 - preconditions | Step 2 - screening | Step 3 - detailed evaluation

1. Remediation goal



Criteria	Definition
Based on the results from the Descriptive soil investigation, it is determined on the basis of the contamination situation whether there is a remediation need based on a human risk, risk of dispersion and / or ecological risk.	- [ ] source control - [ ] the removal of the risk of dispersal - [x] control of distribution by the water body - [ ] specific remediation value - [ ] remediation to the remediation standards - [ ] preventing physical contact with pollution - [ ] usage restrictions / advice for use: e.g. no fishing, no swimming, etc.

2. Characteristics of the waterbody



Criteria	Definition
Type of waterbody	- [ ] navegable - [x] non-navegable - [x] canal - [ ] dock - [ ] tidal river

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Behind the scenes: example for MNA

Evaluation by the tool

If user answers YES

Essential criteria			MNA
Remediation goal		Removal to guide value	**no**
		Removal to risk limit value	*****
		Control spreading	**maybe**
		User advise / limitation	**yes**
Timing		0-1 year	**no**
		1-5 years	**no**
		5-30 years	**yes**
Type(s) of contaminant	Mineral oil fractions < C14	Biological degradation	**yes**
		Mobility and ab- and adsorption potential	**yes**
		No harmful degradation products	**yes**
		Relatively low concentrations	**yes**
		Removal to risk limit value	**yes**
	Other…	…	**…**
Spreading of contamination		Contaminants present in groundwater or risk of spreading towards groundwater	**no**
		Risk of spreading to surface water	**no**
Waterway characteristics		Navigable / maintenance dredging necessary	**no**
		Susceptible to erosion	**no**

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Decision Support Tool – Step 2: Evaluation

Remediation technologies		Remediation technologies – ex-situ	
Step 1 - Input	Step 2 - Evaluation	Step 3 - Input	Step 4 - Evaluation

Technologies

#	Remediation technology	Result	
1	Biological treatment	yes	>
2	Chemical treatment	yes	>
3	Physical treatment	yes	>
4	Conventional capping	no	>
5	Amended capping	no	>
6	Monitored Natural Recovery (MNR)	no	>
7	Enhanced MNR	no	>
8	Excavation (dry)	no	>
9	Dredging (wet)	no	>

Monitored Natural Recovery (MNR) View more →

Criteria	Your selection	Matches?
1. Remediation goal	Remediation to the remediation standards	✓
2. Timing	0-1 years	✗ ⓘ
3. Parameters		
3.1 Mineral oil fractions < C14	Remediation to th	
4. Contamination		
4.1 Contamination to surface water?	yes	

Required answer:
5-30 years

Description:
Desciption about why this is the required answer

Decision Support Tool – Step 3: Additional input user for *ex situ* techniques

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Decision Support Tool – Step 4: Evaluation *ex situ* techniques

Remediation technologies | Remediation technologies – ex-situ

Step 1 - Input | Step 2 - Evaluation | Step 3 - Input | Step 4 - Evaluation

Technologies

#	Remediation technologies – ex-situ	Result	
	Re-use		>
1	Geowall	yes	>
2	USAR	yes	>
3	Durme-river	yes	>
4	Bricks	no	>
5	Artificial basalt	no	>
	Ex-situ treatment		>
6	Thermal treatment	yes	>
7	Bioreactor	yes	>
8	Landfarming	no	>
9	BioGenesis	no	>

Bioreactor

View more →

Criteria	Your selection	Matches?
3. Parameters		
3.1 Mineral oil fractions < C14	No damaging breakdown products, Remediation to the remediation standards	✔
3.4 Heavy metals	no	✔
3.5 PAHs	yes	✔
5. Timing	1-5 years	✔

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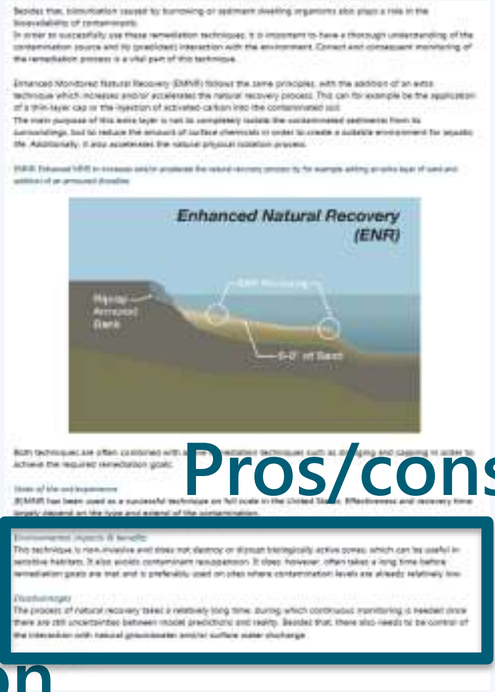
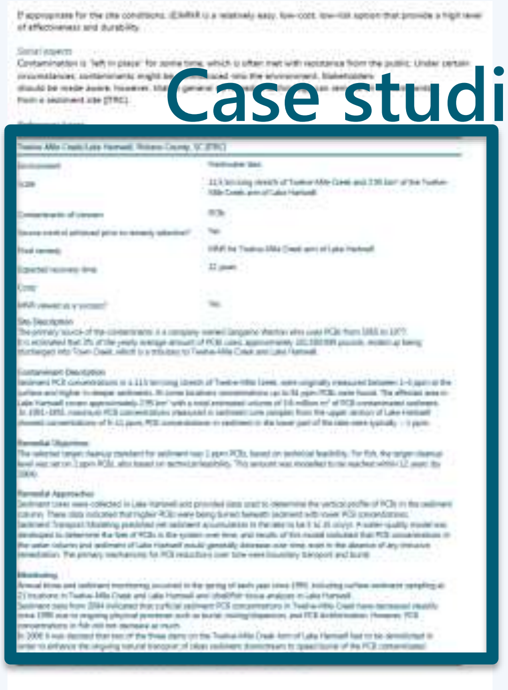
Technical info pages: example for MNA





Case studies

Pros/cons

Detailed description

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Tool = work in progress

- More practical experience is needed
- Next phase: stakeholders will be involved
- Techniques will be updated (added / deleted) frequently
- Suggestions are always welcome!

Thank you for your attention

www.witteveenbos.com/belgium/