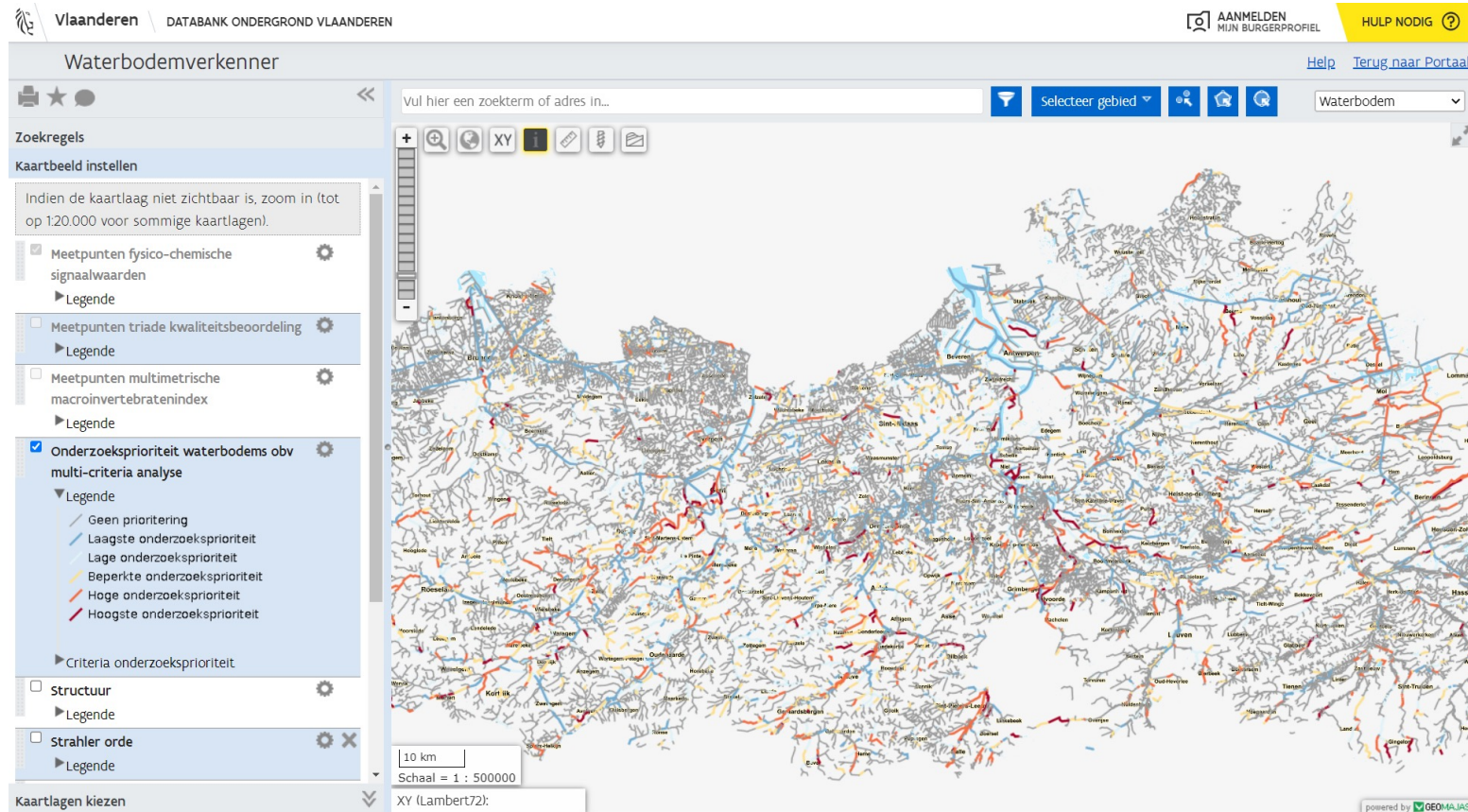


# Exploring the remediation of contaminated sediments

Sediment explorer – a spatial decision  
support tool

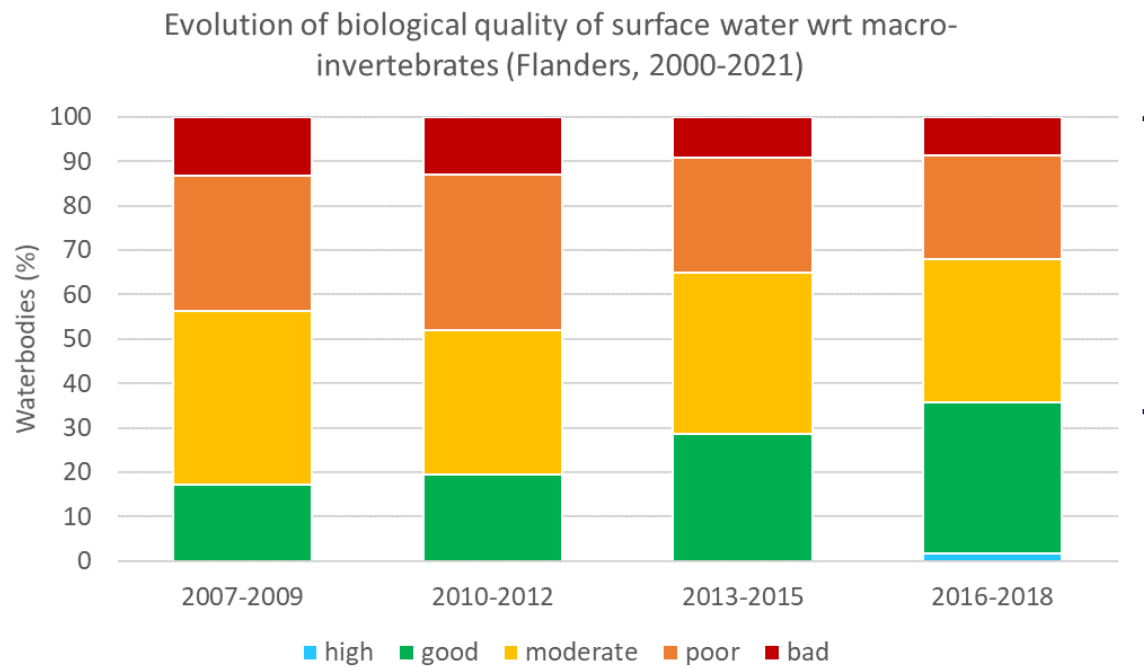
Wim Clymans (VITO)

# The sediment explorer (*dutch: Waterbodemverkenner*)



# Towards integrated sediment management

Authorities focus on reducing impact of pollution from urban wastewater and industry on surface and groundwater



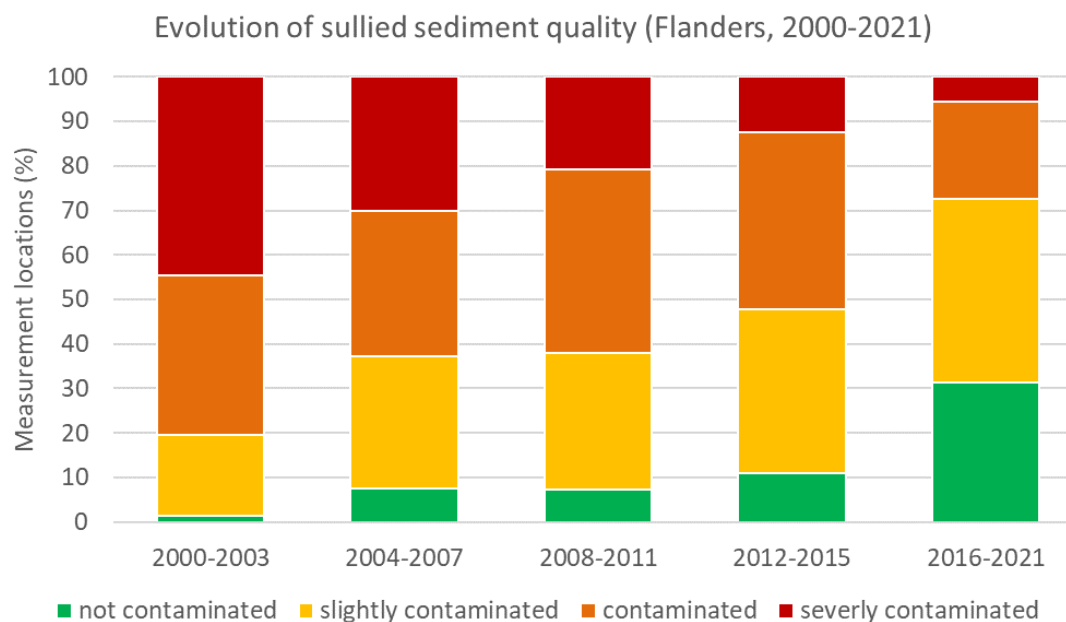
Improvements are stabilizing



Historical contamination with heavy metals and PAKs

# Towards integrated sediment management

The role of contaminated stream sediments has been increasingly acknowledged by Flemish authorities. Setting the scene for an integrated approach to remediate and manage sediments.



Active sediment management since 2010

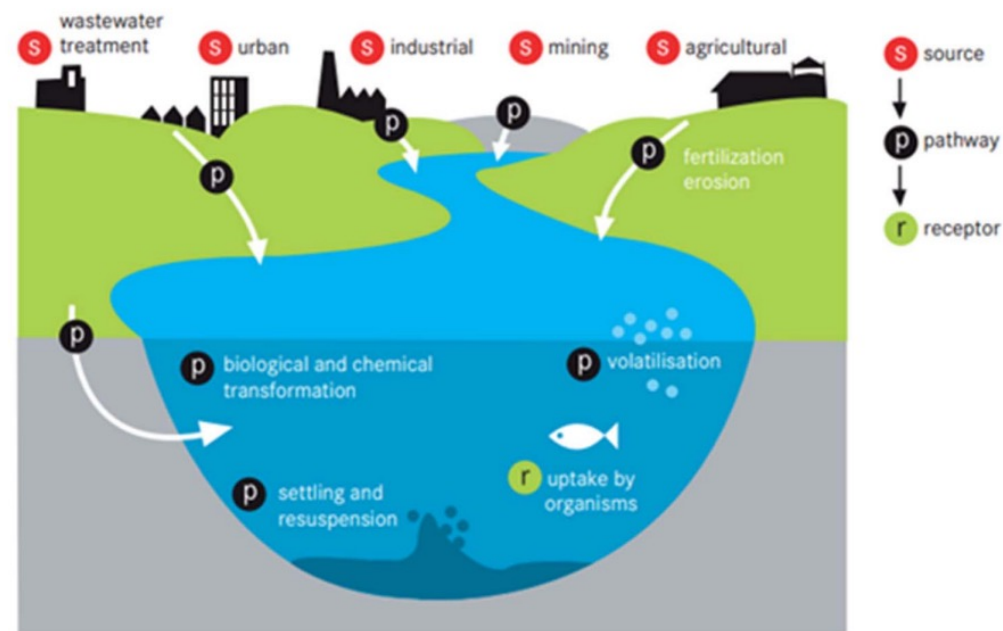


Hotspots of contamination with heavy metals and PAKs

# Towards integrated sediment management

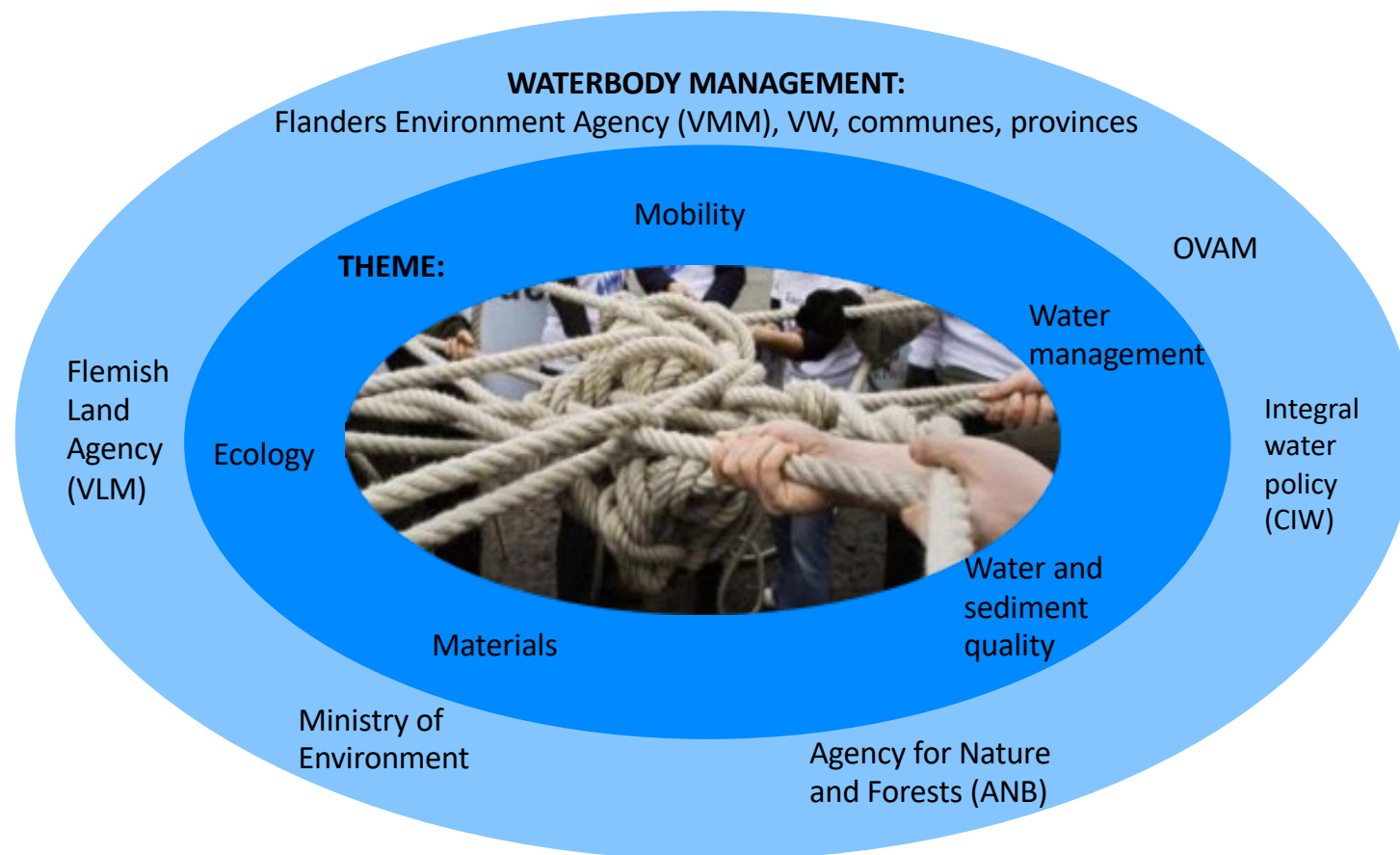
Recommendations for addressing sediment contamination assessment (CIS document WFD)

- Aspect of monitoring
  - Data collection and assess contamination status
  - Prioritize and trigger action
- Aspect of cost and benefits
- Flanders has taken several steps:
  - 2022 launched River Basin Management Plan for Scheldt-Maas
  - Developed dedicated policy instruments



Sediment associated contamination sources (s), pathways (p) and receptors (r) (Source: CIS, 2000/60/EC)

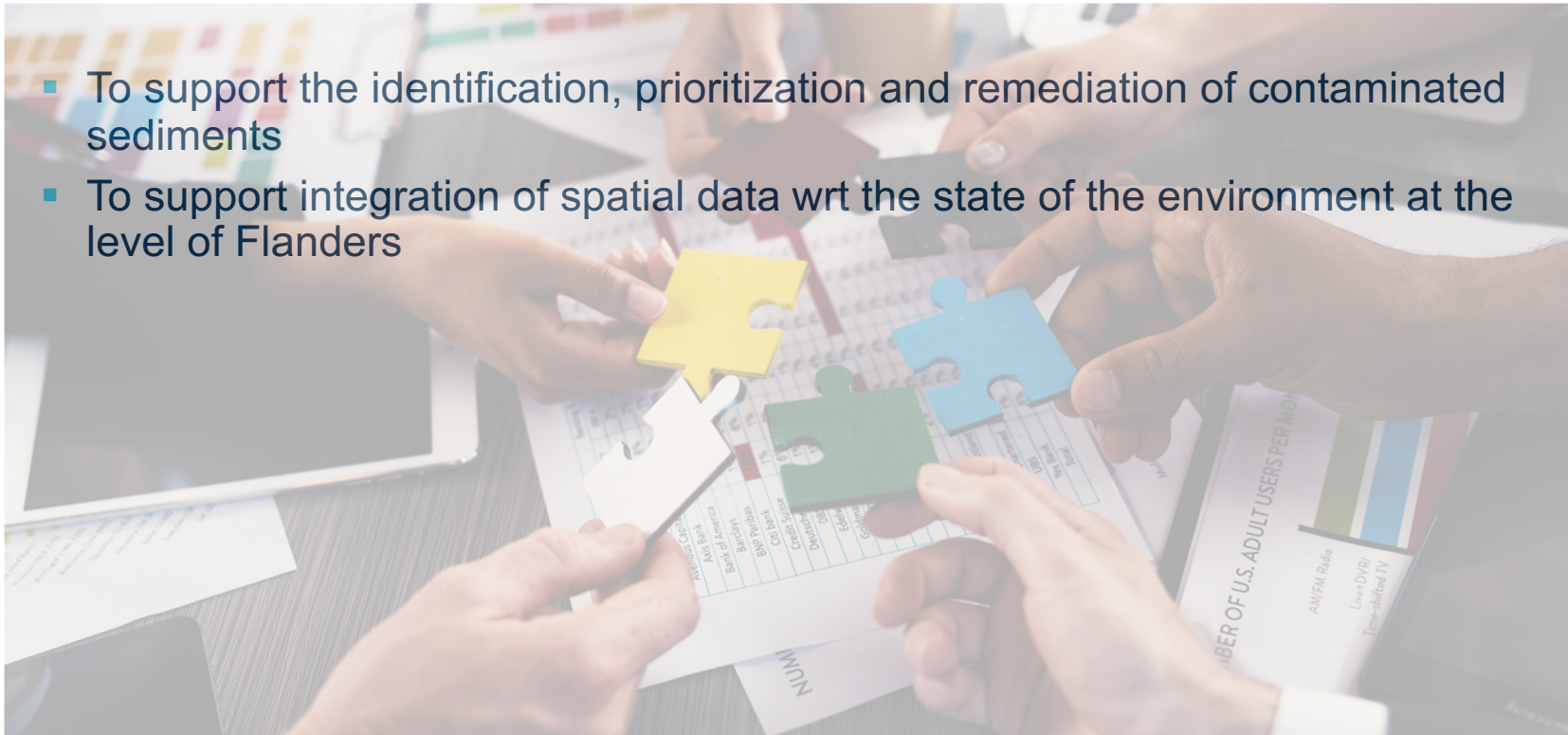
# Integrated approach



# Why the sediment explorer?

Spatial explicit approach is needed

- To support the identification, prioritization and remediation of contaminated sediments
- To support integration of spatial data wrt the state of the environment at the level of Flanders



# What can be found on the Sediment Explorer?

Vlaanderen DATABANK ONDERGROND VLAANDEREN

AANMELDEN MIJN BURGERPROFIEL HULP NODIG ?

Waterboderverkenner

Vul hier een zoekterm of adres in...

selecteer gebied

Waterboderm

Zoekregels

Kaartbeeld instellen

Indien de kaartlaag niet zichtbaar is, zoom in (tot op 1:20.000 voor sommige kaartlagen).

- Meetpunten fysico-chemische signaalwaarden  
▶ Legende
- Meetpunten triade kwaliteitsbeoordeling  
▶ Legende
- Meetpunten multimetrische macroinvertebratenindex  
▶ Legende
- Onderzoeksprioriteit waterbodems obv multi-criteria analyse**  
▼ Legende
  - Geen prioritering
  - Laagste onderzoeksprioriteit
  - Lage onderzoeksprioriteit
  - Beperkte onderzoeksprioriteit
  - Hoge onderzoeksprioriteit
  - Hoogste onderzoeksprioriteit▶ Criteria onderzoeksprioriteit
- Structuur  
▶ Legende
- Strahler orde  
▶ Legende

Kaartlagen kiezen

10 km  
Schaal = 1 : 500000  
XY (Lambert72):

powered by GEO4A.IAS



# What can be found on the Sediment Explorer?

Vlaanderen | DATABANK ONDERGROND VLAANDEREN

AANMELDEN MIJN BURGERPROFIEL HULP NODIG ?

Waterbodemverkenner

vul hier een zoekterm of adres in...

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XY (Lambert72):

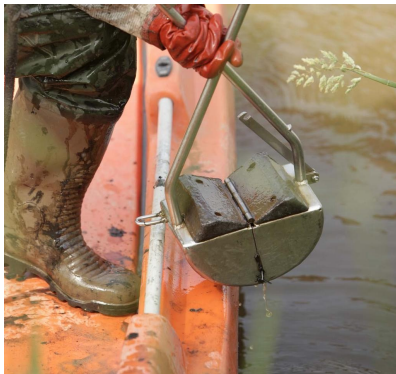
powered by GEO4M.A.I.S

- Quality data:
  - Period: 2000 till present day
  - Different data sources: Monitoring net, dredging operations, research projects, etc
  - Physical as chemical characteristics:
    - Standard analysis package: Metals, Hydrocarbons, PCB's en PAH
    - Pesticides, Emerging pollutants etc
    - Texture, Organic C, pH
  - Contamination degree and re-use potential are assessed

# What can be found on the Sediment Explorer?

Research and remediation priority using a multi-criteria analysis

- **Result:** A ranking of a Flemish waterbodies using a weighted score based on the relevant technical and environmental variables per stream in Flanders.
- **Criteria:**



*Level of  
pollution*



*Environmental  
risks*



*Sustainable  
remediation*

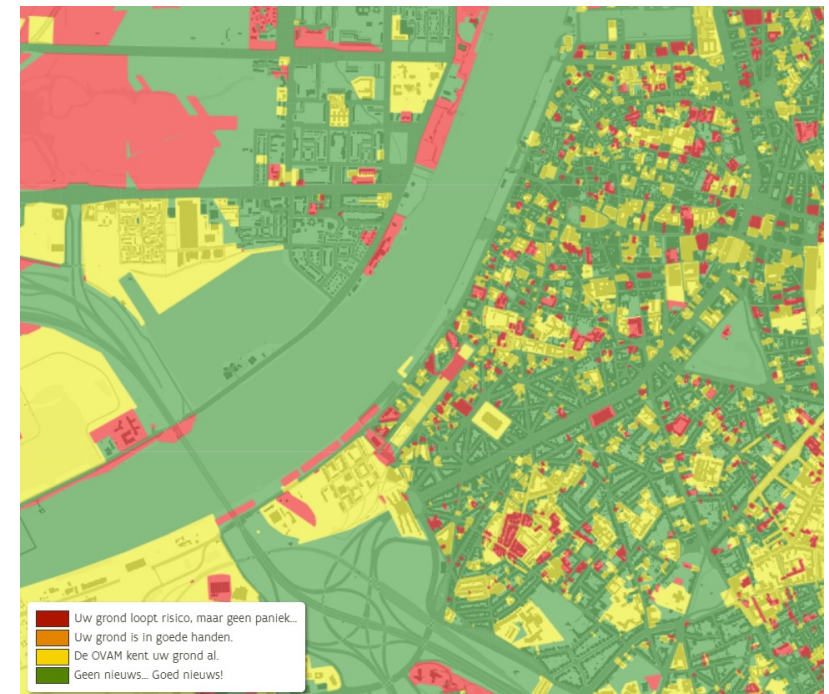


# What can be found on the Sediment Explorer?

Research and remediation priority by identifying potential hotspots based on historical and current activities along the watercourse

Flanders inventory:

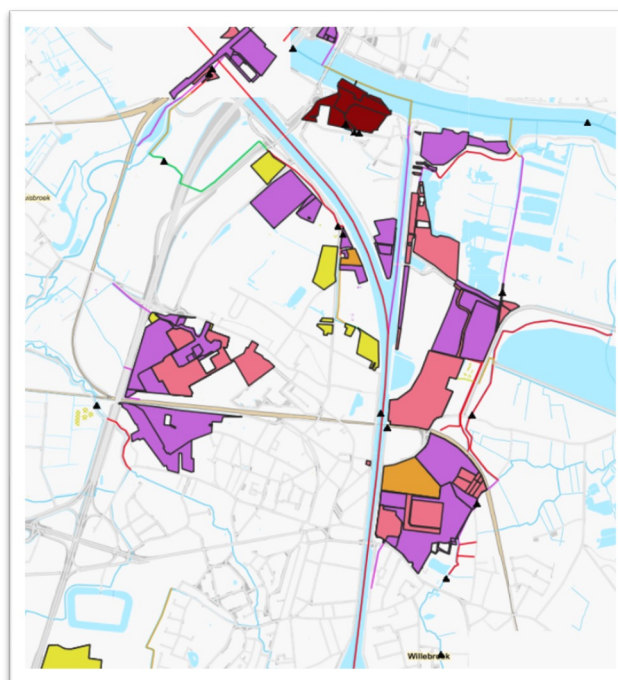
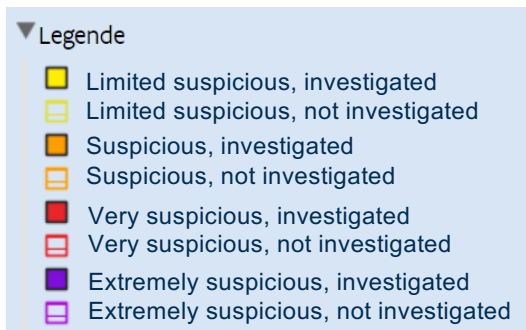
- At the level of (cadastral) plot
- Historical and current permits for certain activities
  - Scoring of risk activities



# What can be found on the Sediment Explorer?

- **Result:** A ranking of potential hotspot activities along watercourses and a ranking of Flemish watercourses from low to very high priority to be investigated based on risk activities.

## Hotspots risk activities



## Priority watercourses based on risk activities



# What can be found on the Sediment Explorer?

Relevant background layers to perform an area-oriented analysis

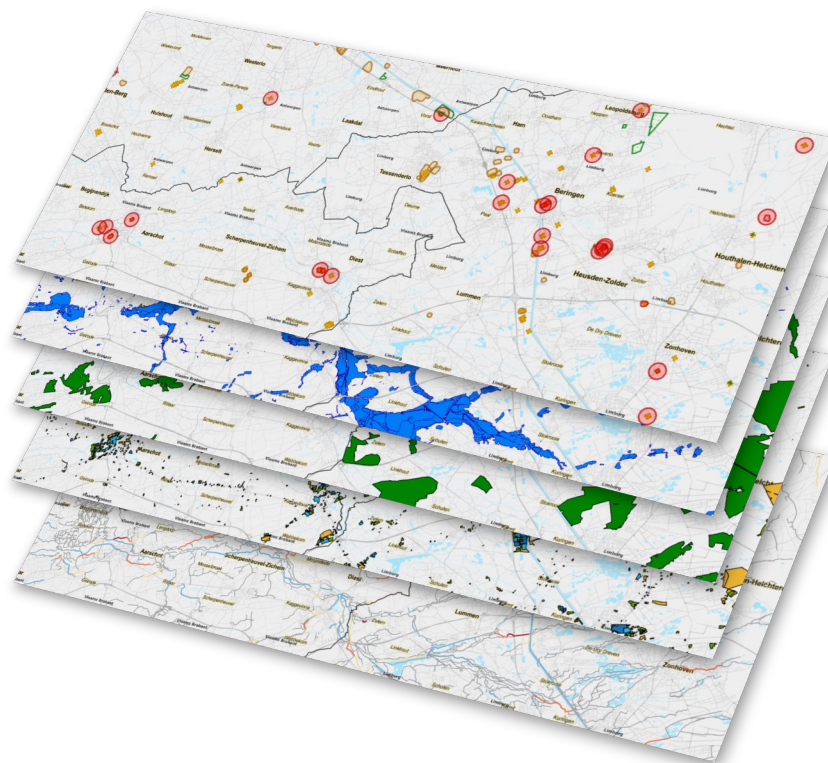
PFAS results

Flood risk

Nature goals (e.g.  
Natura2000)

Soil data

Sullied sediments



# What can be found on the Sediment Explorer?

Relevant background layers to perform an area-oriented analysis

Area-oriented analysis

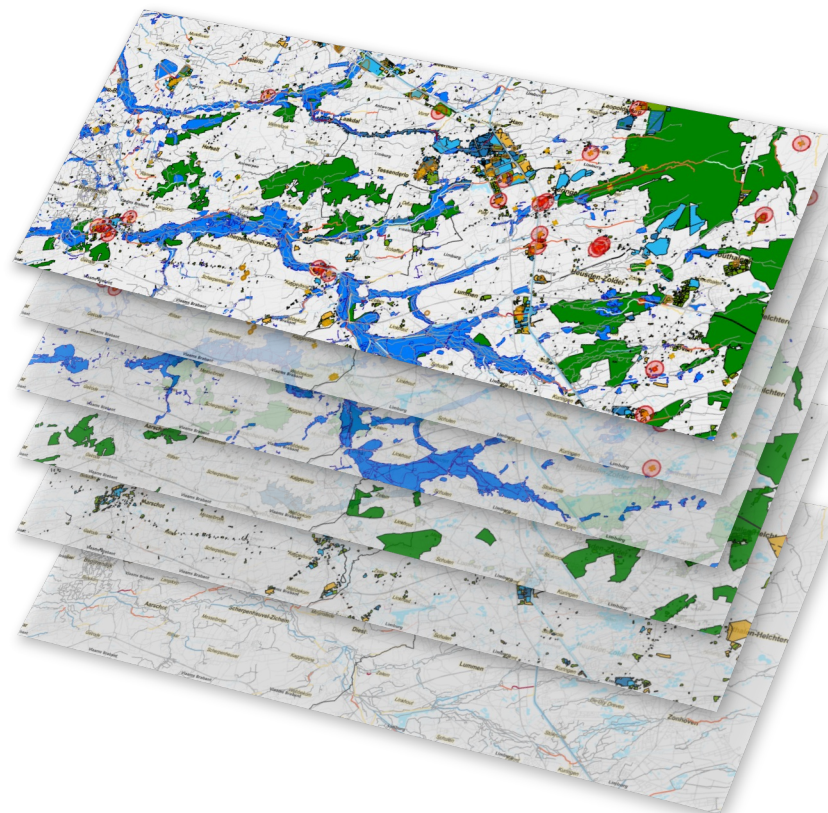
PFAS results

Flood risk

Nature goals (e.g.  
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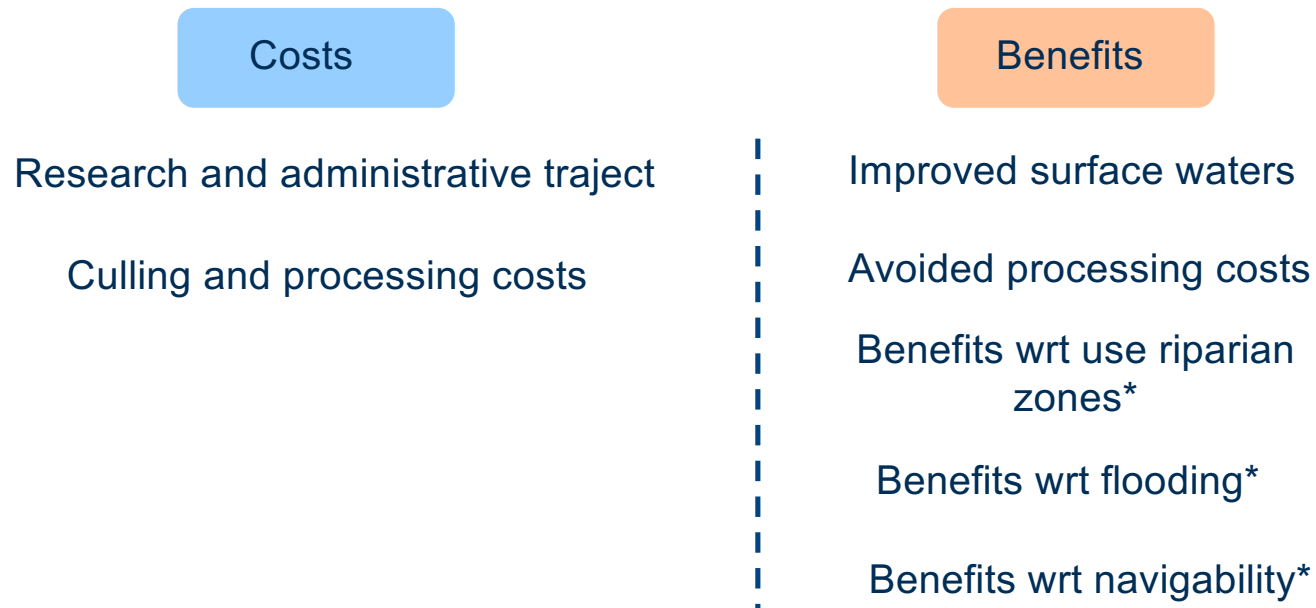
Soil data

Sullied sediments



# What would be the cost to remediate contaminated sullied sediments in Flanders?

A societal cost-benefit analysis (bottom-up approach)



\*not included as not directly related to improved state of the sullied sediments



# What would be the cost to remediate contaminated sullied sediments in Flanders?

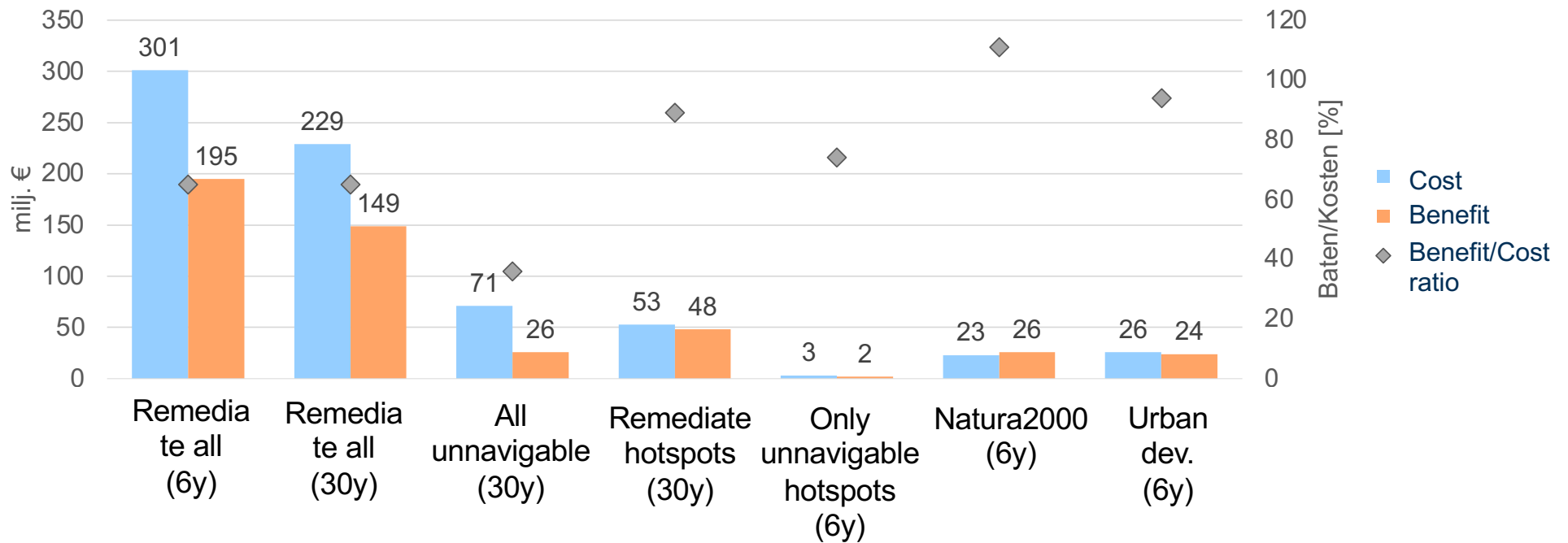
A societal cost-benefit analysis (bottom-up approach)

	Economic value (mio €)	
	Min	Max
<b>Costs</b>		
Navigable	188	864
Unnavigable	113	598
<b>Total</b>	<b>301</b>	<b>1462</b>
<b>Benefits</b>		
Navigable	192	635
Unnavigable	72	197
<b>Total</b>	<b>264</b>	<b>832</b>

- Quantified benefits compensate for 40-95% of the costs for remediation
- Ratio benefits/costs is below one for unnavigable watercourses.

# What would be the cost to remediate contaminated sullied sediments in Flanders?

A societal cost-benefit analysis (bottom-up approach)



Annual cost (milj. €)	min	50	7,6	2,4	1,8	0,5	3,8	4,3
	max	267	41	14	7,4	3,9	26	16

# How is the sediment explorer used?

Analysis, policy, ...

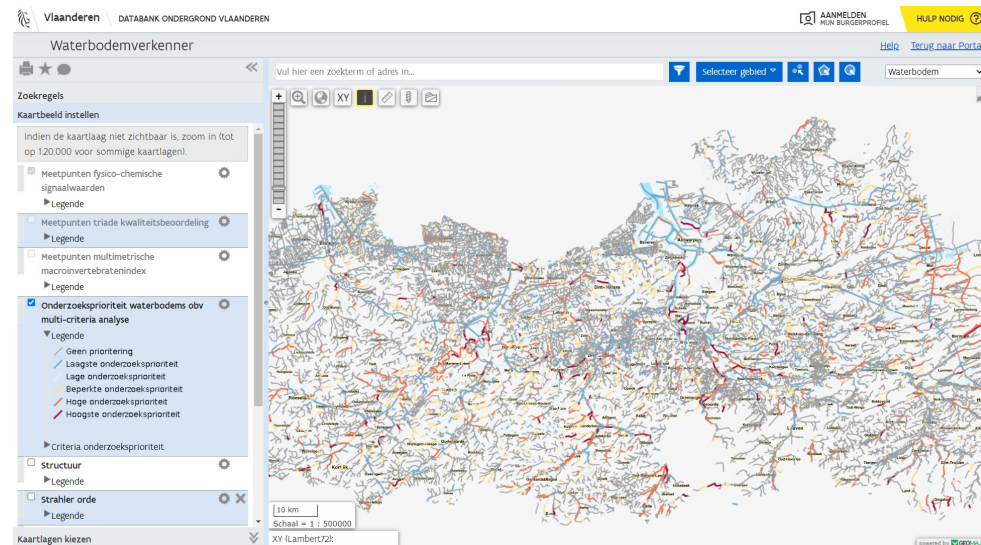
- Identify problem parameters at the level of a waterbody
- Identify which factors control the bad sullied sediment quality in a project area
- Prioritize measures at the basin scale by combining the ranking and cost/benefit data



# The sediment explorer a success!

Strengthening each other

- Stimulates and simplifies data exchange
- Increased accessibility of environmental data
- Supports an area-oriented approach to derive scientific and policy insights



# Thank you for your attention!

Contact: [wim.clymans@vito.be](mailto:wim.clymans@vito.be)

A project for the Public Waste Agency of Flanders (OVAM) in  
collaboration with:



DATABANK  
ONDERGROND  
VLAANDEREN



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