



VLAAMSE MILIEUMAATSCHAPPIJ

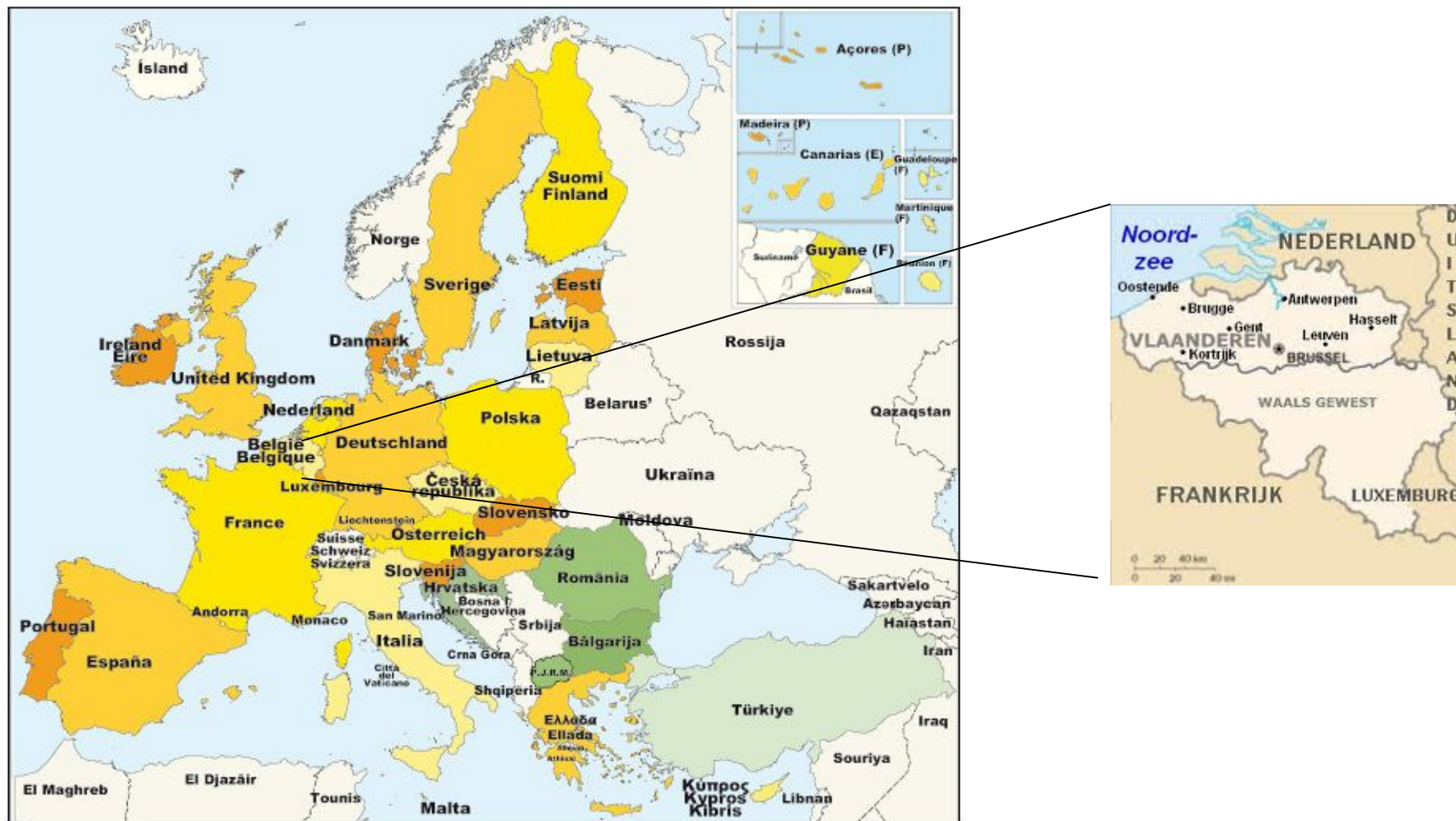
Sediment characterisation in Flanders (Belgium) using the Triad approach

Ir. Ward De Cooman
Flemish Environment Agency
Division Reporting Water



- Flemish Environment Agency
- Definitions, research & milestones
- Monitoring Quality Network: why – how
- Triad-approach
- D-base – Geoview – mapping
- SQC

Belgium and Flanders in Europe



Flemish government



**Flemish Minister for
Environment and Nature**

Technical committees

Management council

**Adv. Council Environment,
Nature and Energy
(MiNa)**

Ministry of Environment, Nature & Energy

**Department
Environment, Nature & Energy**

**Flemish Energy Agency (VEA)
(VEA)**

**Agency for Nature and Forestry
(ANB)**

**Institute of
Nature and Forestry Research
(INBO)**

**Flemish Environment Agency
(VMM)**



**Public Waste Agency of Flanders
(OVAM)**

**Flemish Land Agency
(VLM)**

**Flemish Regulation Entity
for the Electricity and Gas market
(VREG)**

Policy domain Environment, Nature & energy

VMM - mission

VMM = internally independent agency with powers of jurisdiction (°1990)

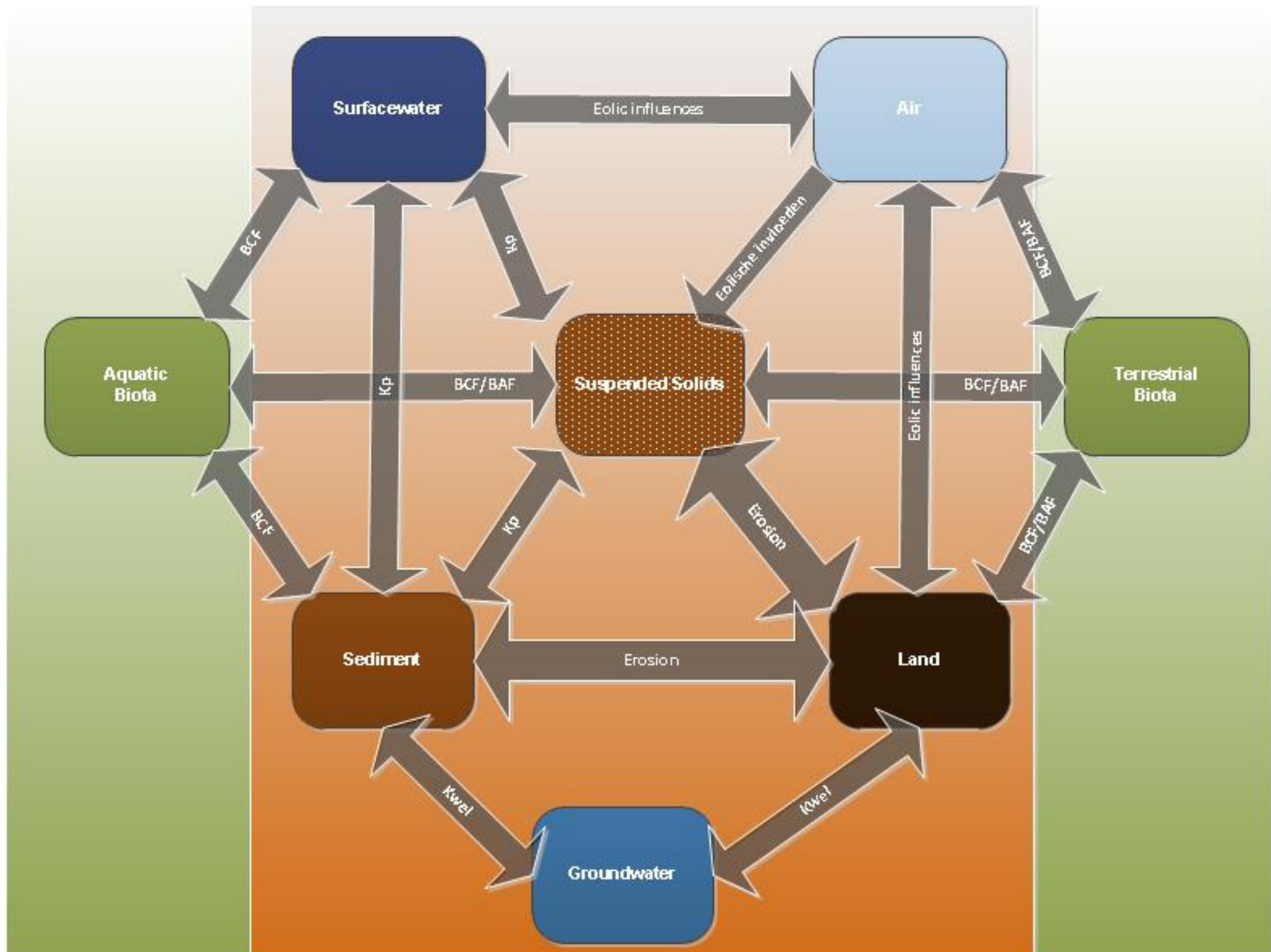
Founding Decree of 23 December 2005: mission

“contribute to

- the realisation of the objectives of the environmental policy by preventing, limiting and eliminating the harmful effects to water systems and the atmosphere and by reporting on the state of the environment and
- the realisation of the objectives of integrated water management.”

Organisation chart





20

Vmm

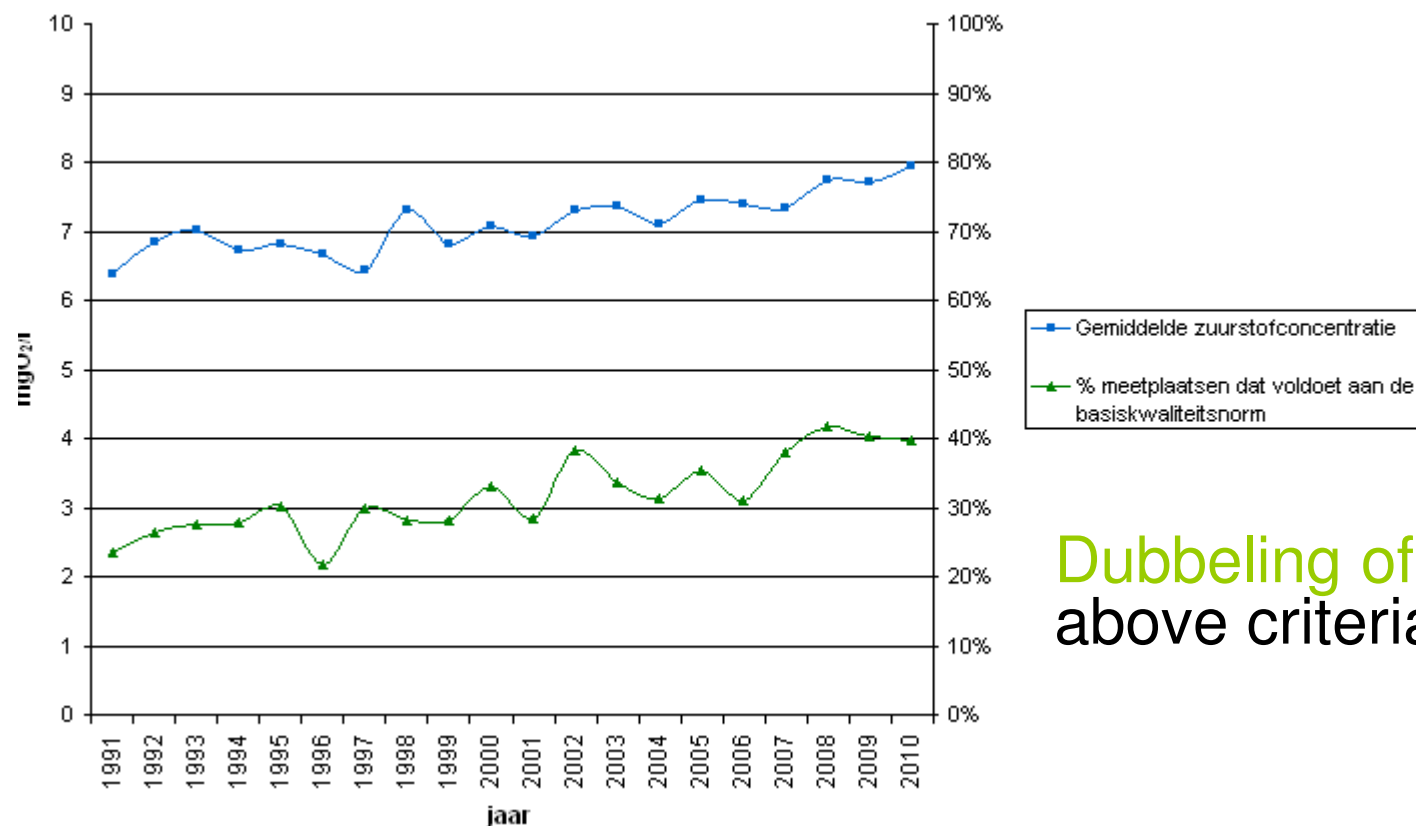
VLAAMSE MILIEUMAATSCHAPPIJ



20 year of measuring



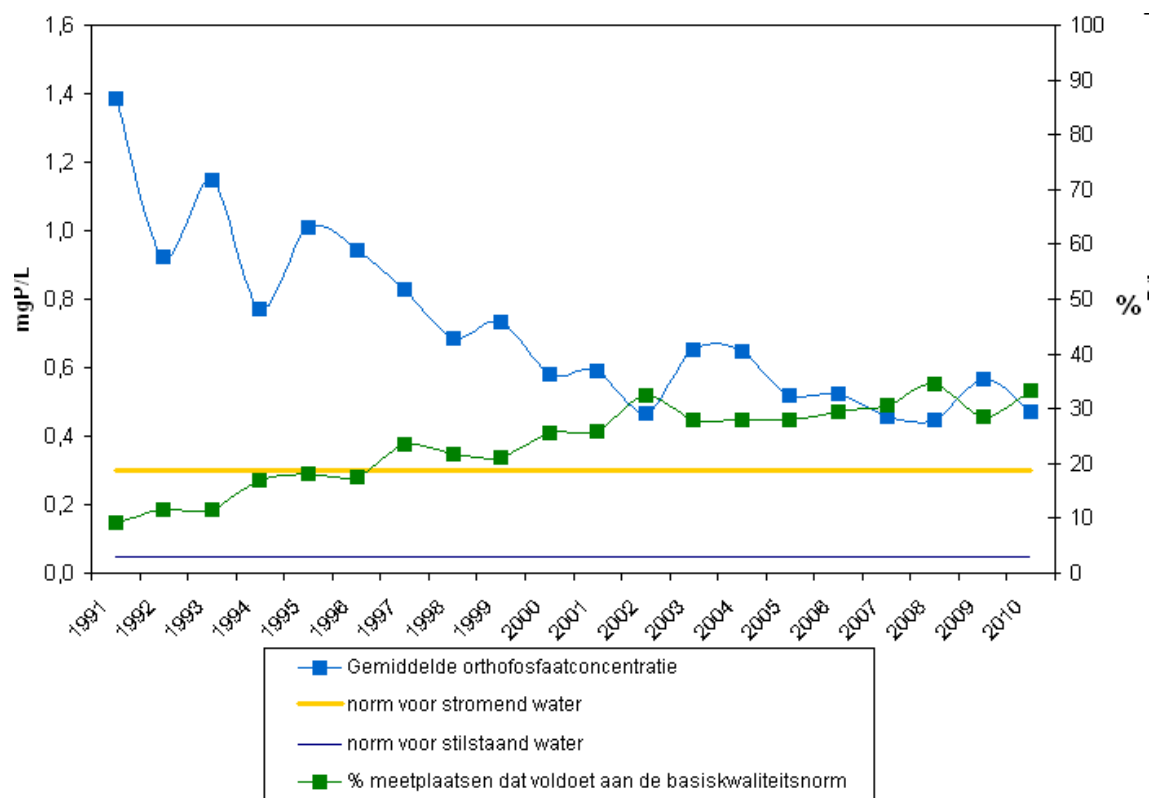
20 year measuring



Evolution of dissolved oxygen

Dubbeling of points
above criteria of 5 mg/L

20 year measuring

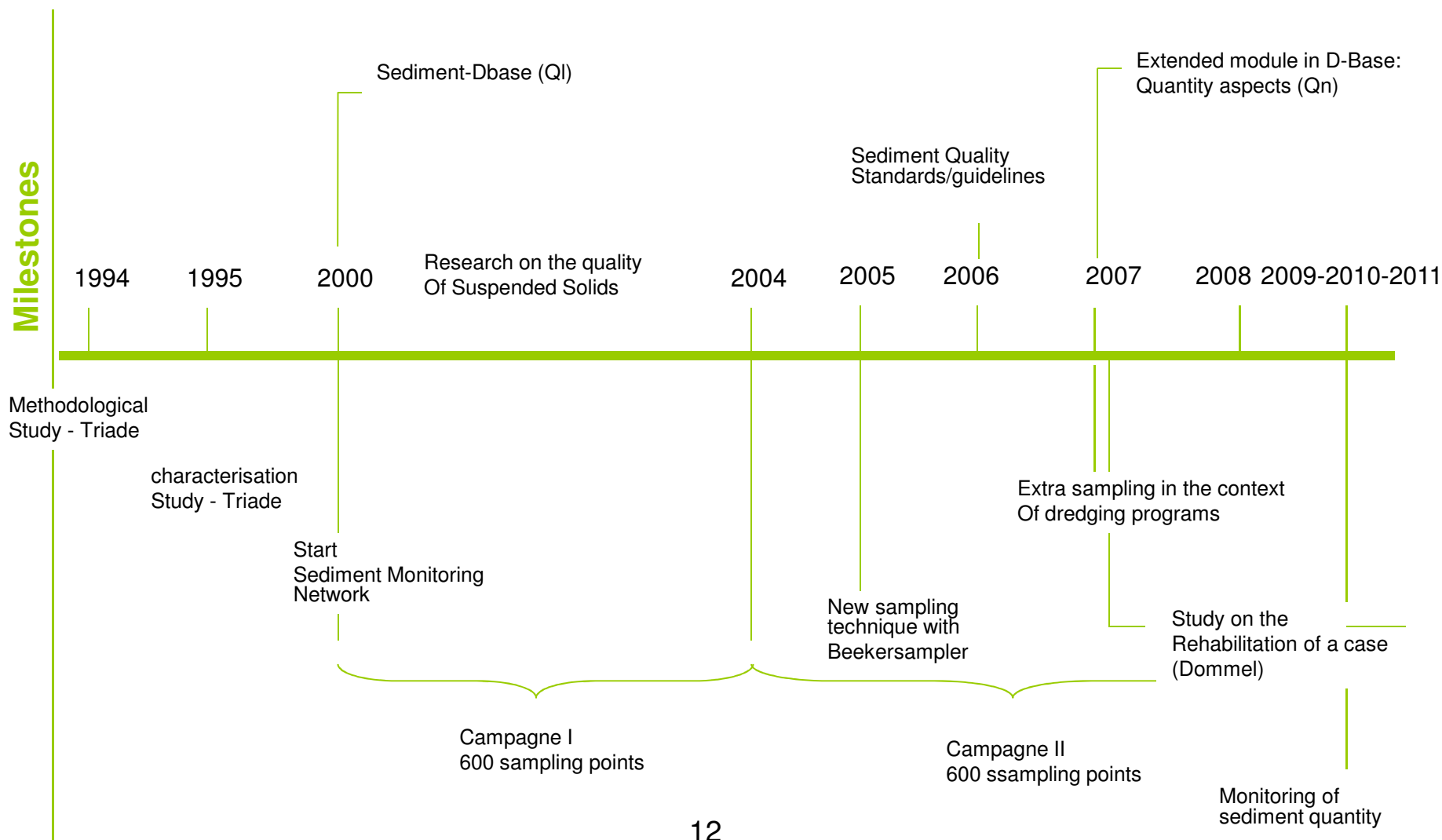


Evolution of orthophosphate in surfacewater

Points above the O-PO₄ criterium in water:

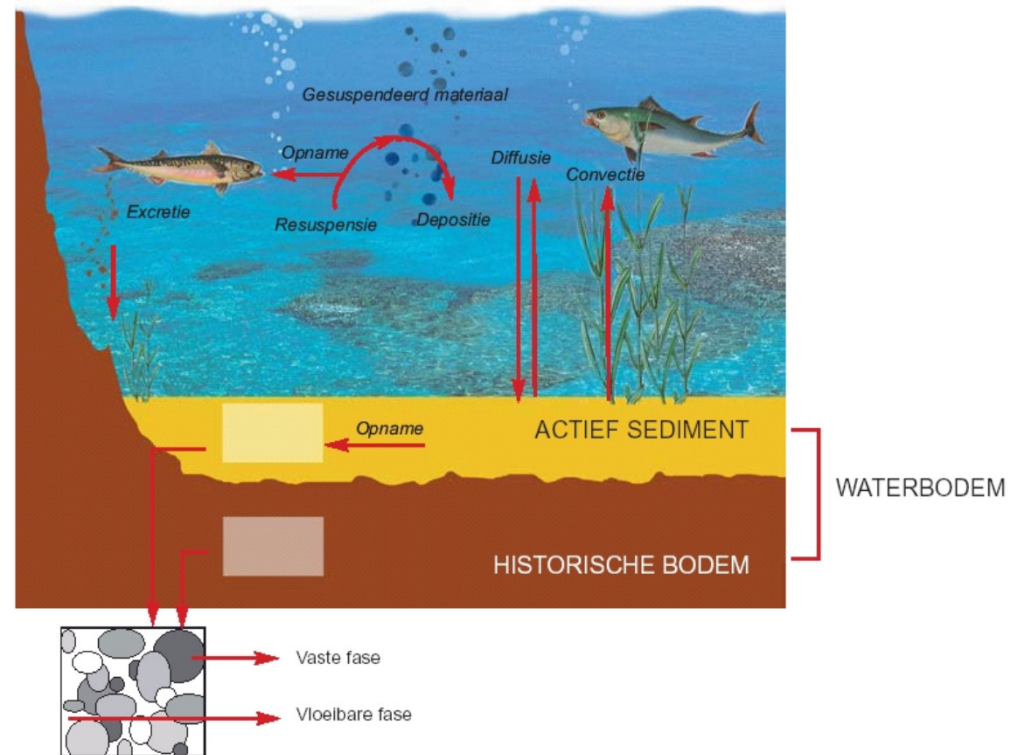
from 1 over 10 in 1991
to 1 over 3 in 2010

Milestones of the last 17 years



Definitions sediment

- **Natural sediment:**
 - part of aquatic ecosystem underneath sedimentlayer, or the ecological soil of the region (sand, clay, loam)
- **Sediment (active layer):**
 - disposed suspended sediments (sedimentlayer).



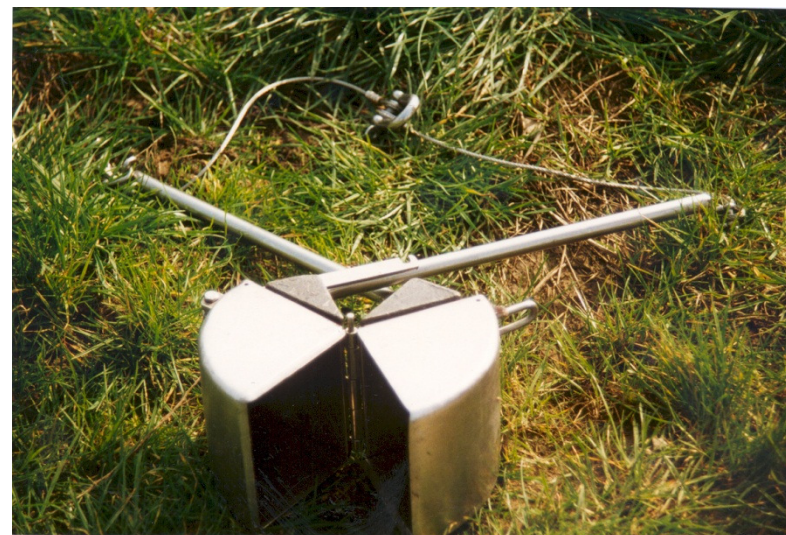
Why monitoring?

- Collecting abiotic and biotic information of the aquatic ecosystem
- Sediment quality/quantity inventory with respect to
 - integrated water management
 - sediment policy
 - international reporting of sediment quality
- Reporting sediment quality/Quantity (on maps)
- Assessment changes before and after dredging programs
- Evaluation environmental policy

Sediment quality/quantity inventory Sampling



- **Van Veen grab sampler (2 liter/6 liter)**
- **Zig zag sampling in 50 meter zones or stratified ad random sampling**
- **20-70 subsamples**
- **Mixed sample : ~40 à 50 liter**







Waterbodemmeetnet en triadeconcept

Fysico-chemische parameters:

Korrelgrootte,

Ecologische kwaliteit van waterbodem
TRIADE-concept

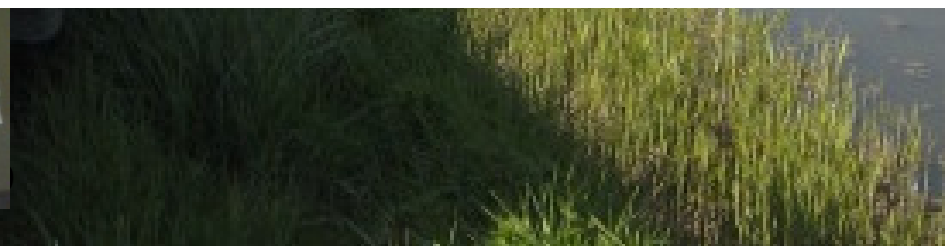
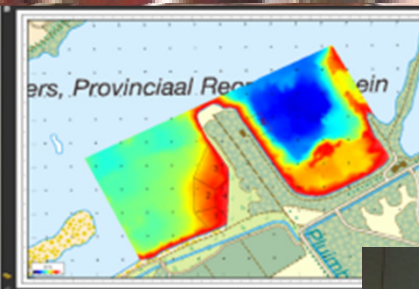
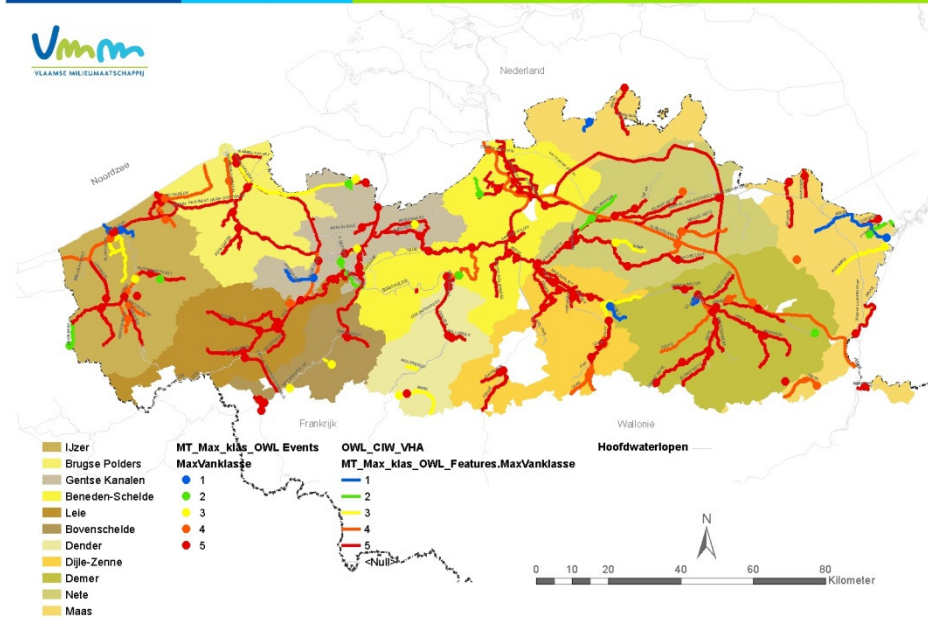
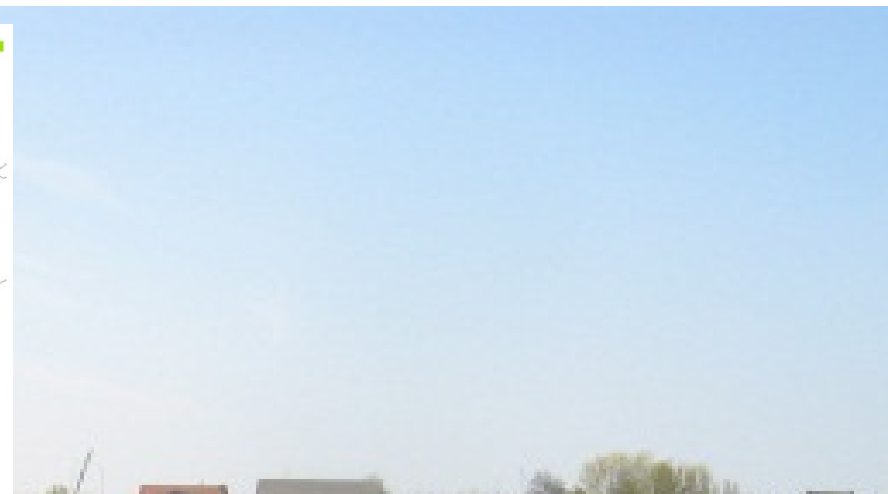
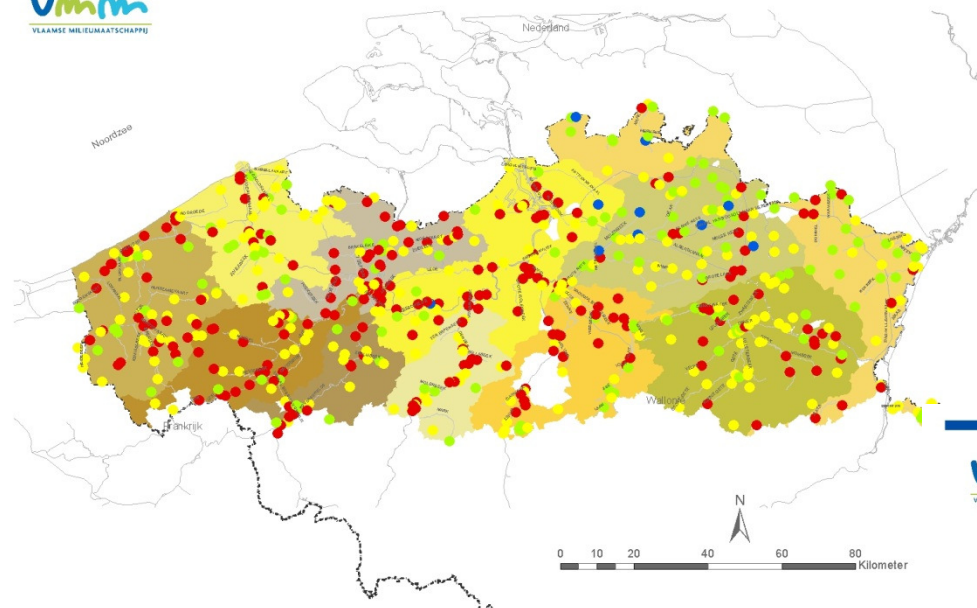
Ecotoxicologie

Acute effecten van
waterbodem op
test-organismen

Ecotoxilogische parameters:

Vaste-fase test:
• *Hyalella azteca*

Ponienwater test:
• *Raphidocelis subcapitata*



TRIAD approach

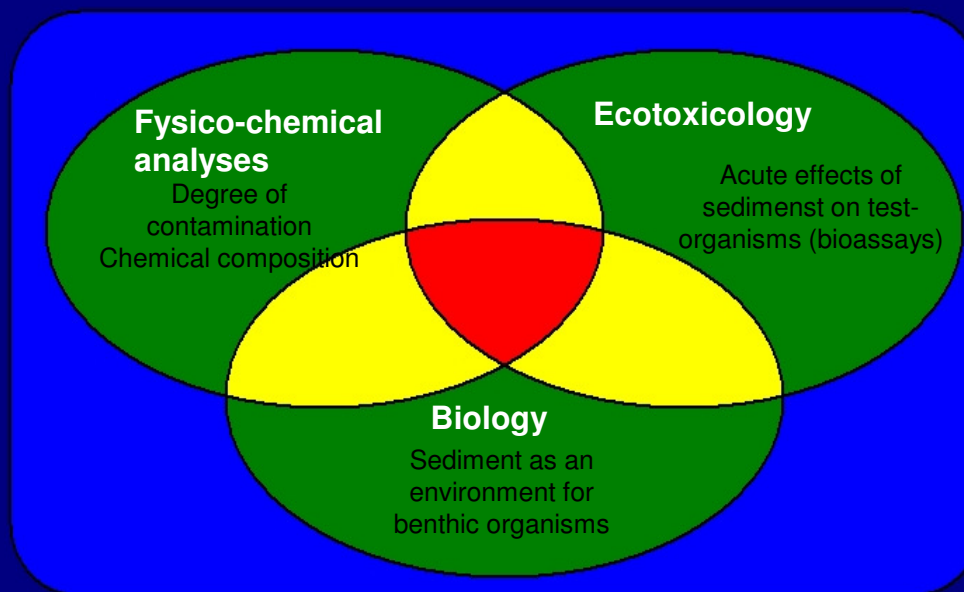
- Fysico-chemical analyses
 - chemical content
 - but: bioavailability or effects
- Ecotoxicological analyses:
 - effects
 - but: extrapolation to field conditions
- Biological analyses:
 - effects on in situ benthic community
 - but: effects of other ecological factors

TRIAD-approach

Fysico-chemical parameters:

Fractions,
Organic matter,
Mineral oil,
Heavy metals,
OCP's,
PAH's,
PCB's.

Ecological quality of sediments TRIAD-concept



Ecotoxicological parameters:

Solid-phase test:

- *Hyalella azteca*



Liquid-phase test:

- *Raphidocelis subcapitata*



Liquid-phase test:

- *Thamnocephalus platyurus*



Biological parameter:

Benthic macro-invertebrates



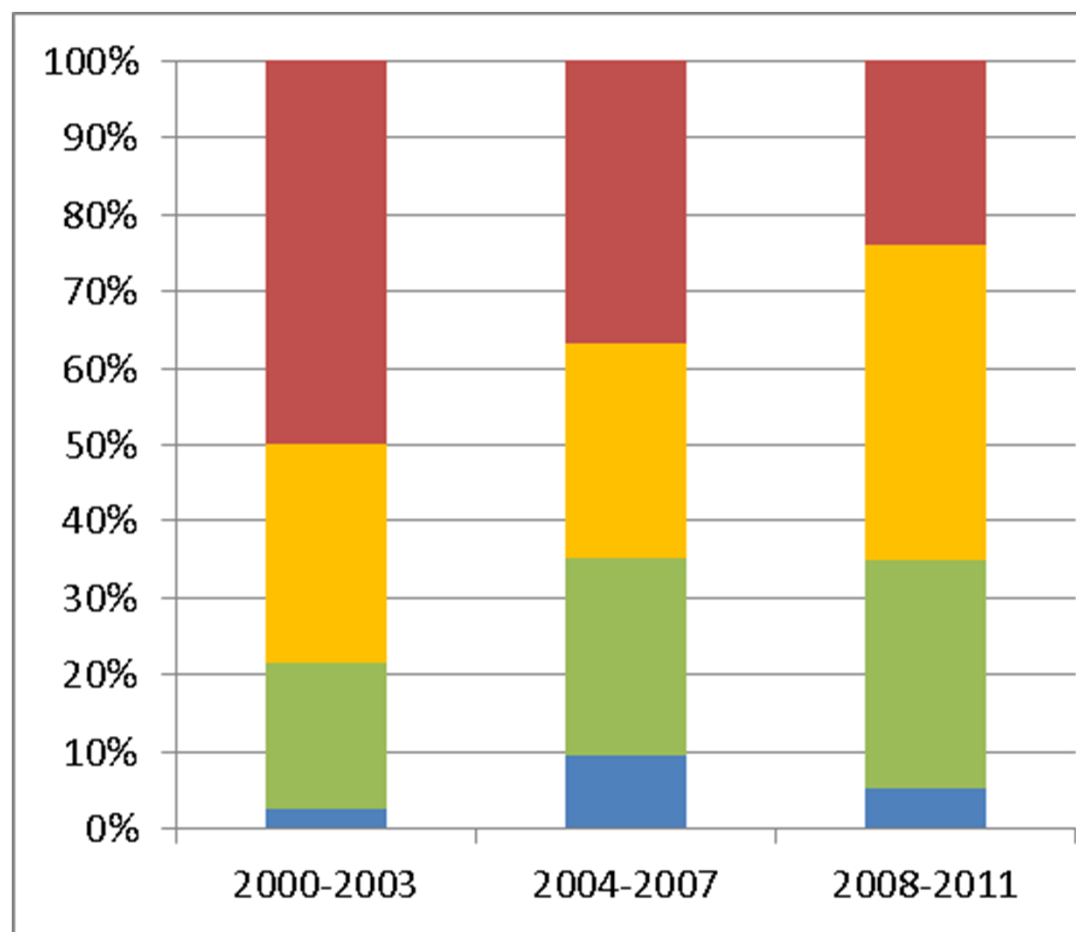
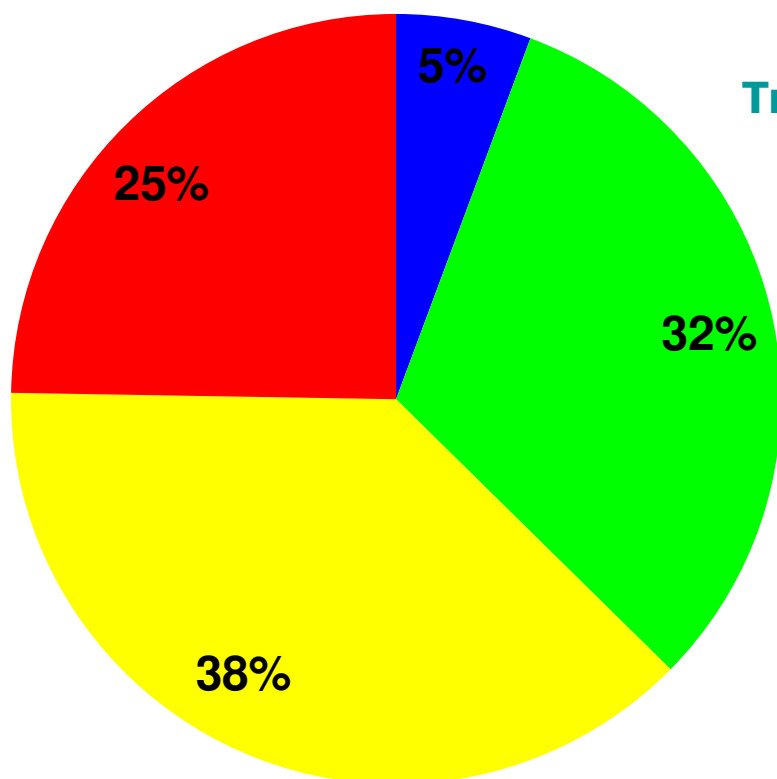
Biotic Sediment Index (BSI): presence of indicator organisms and taxonomic diversity



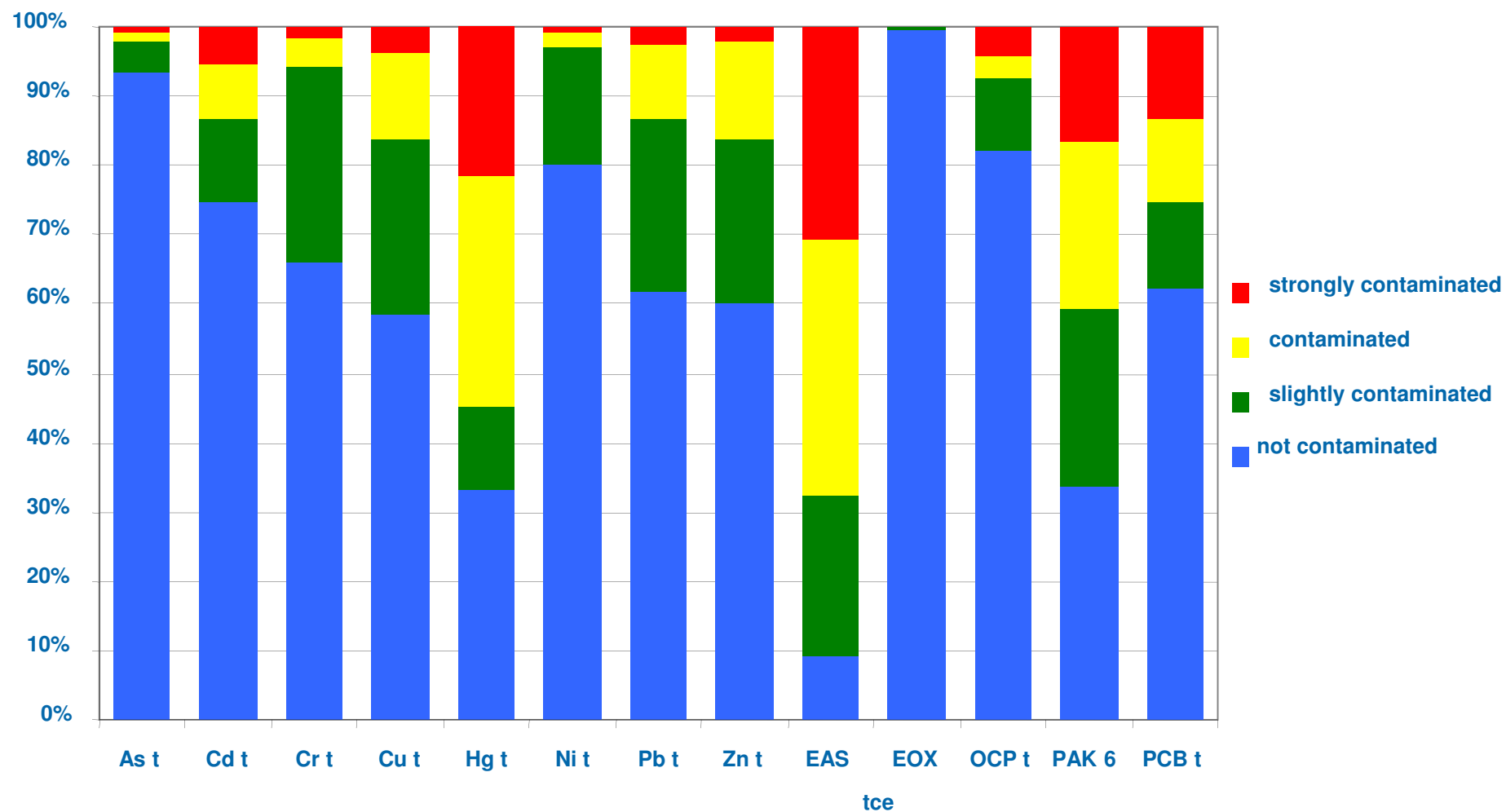
Ecological characterisation of sediments in Flanders

Integrated results

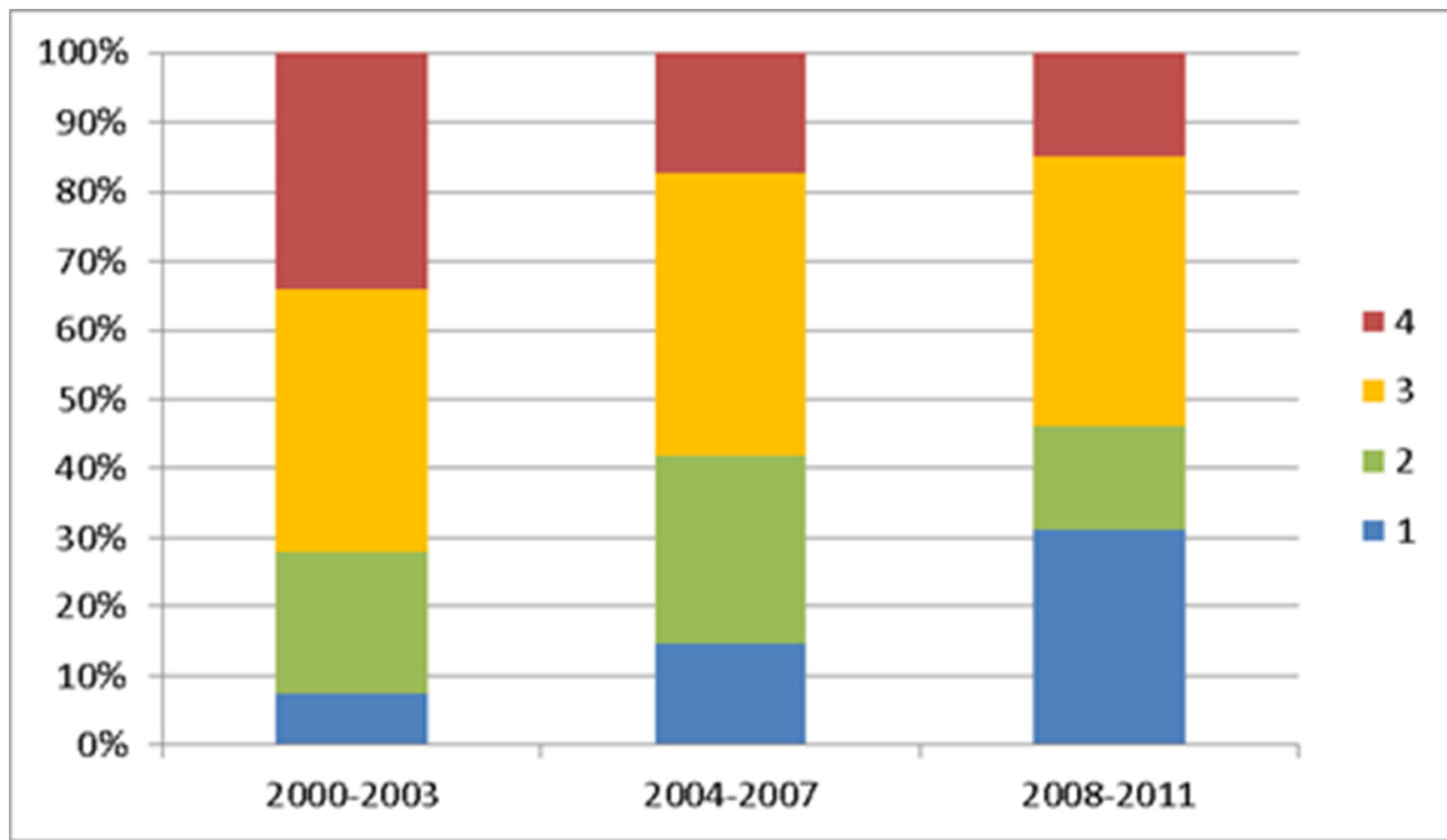
Triad Assessment of 600 points (2008-2011)



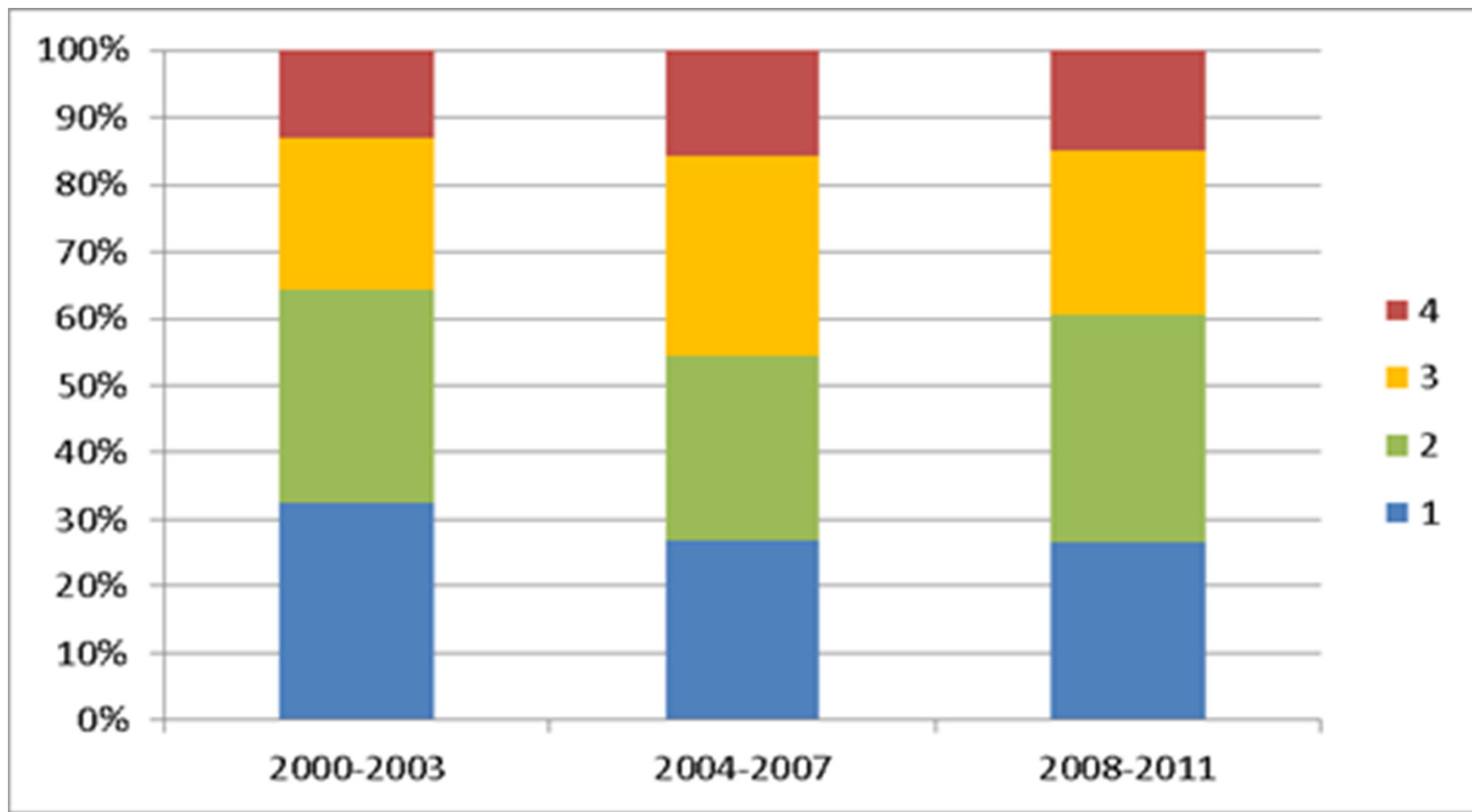
Fysico-chemical assessment

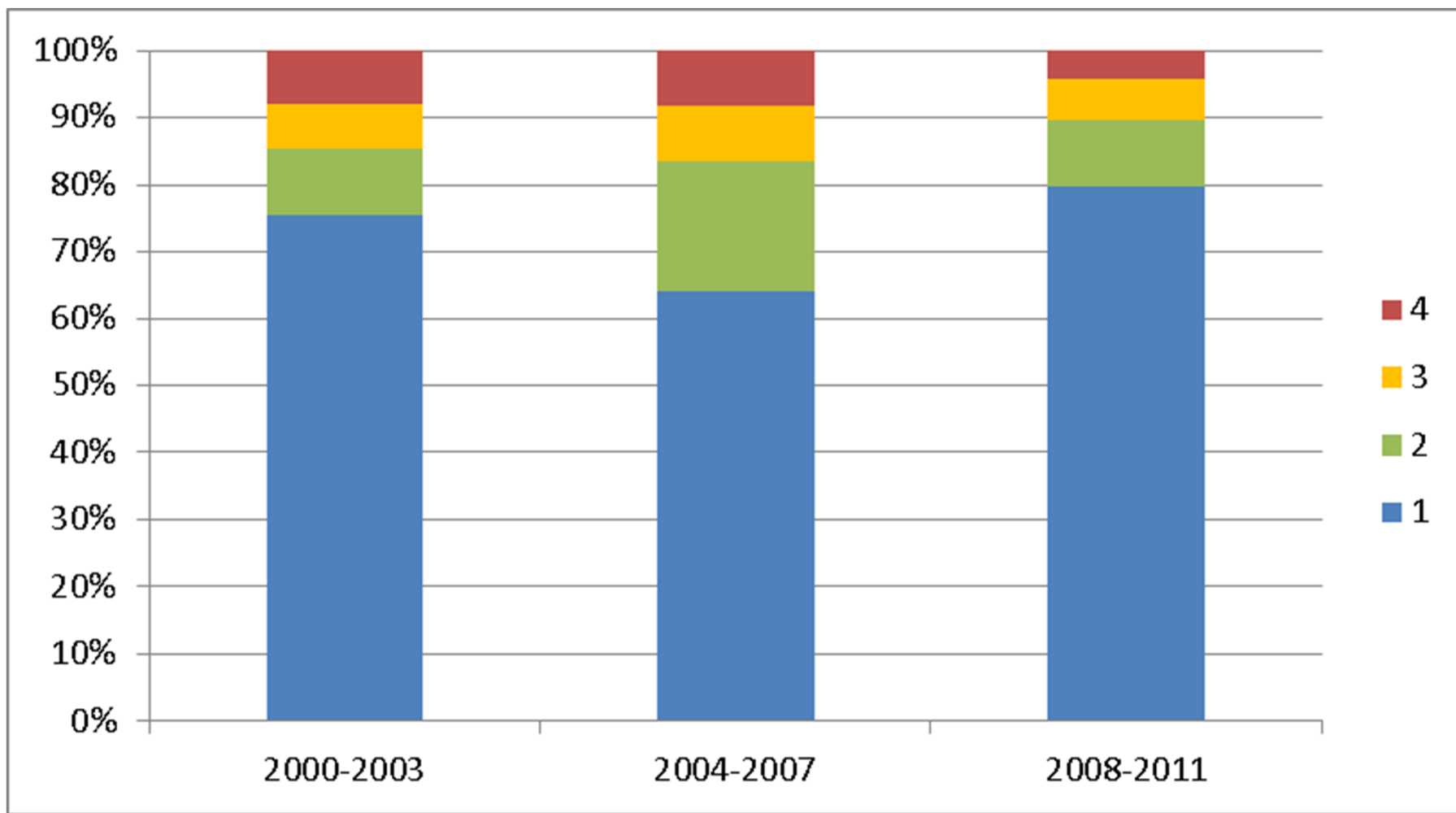


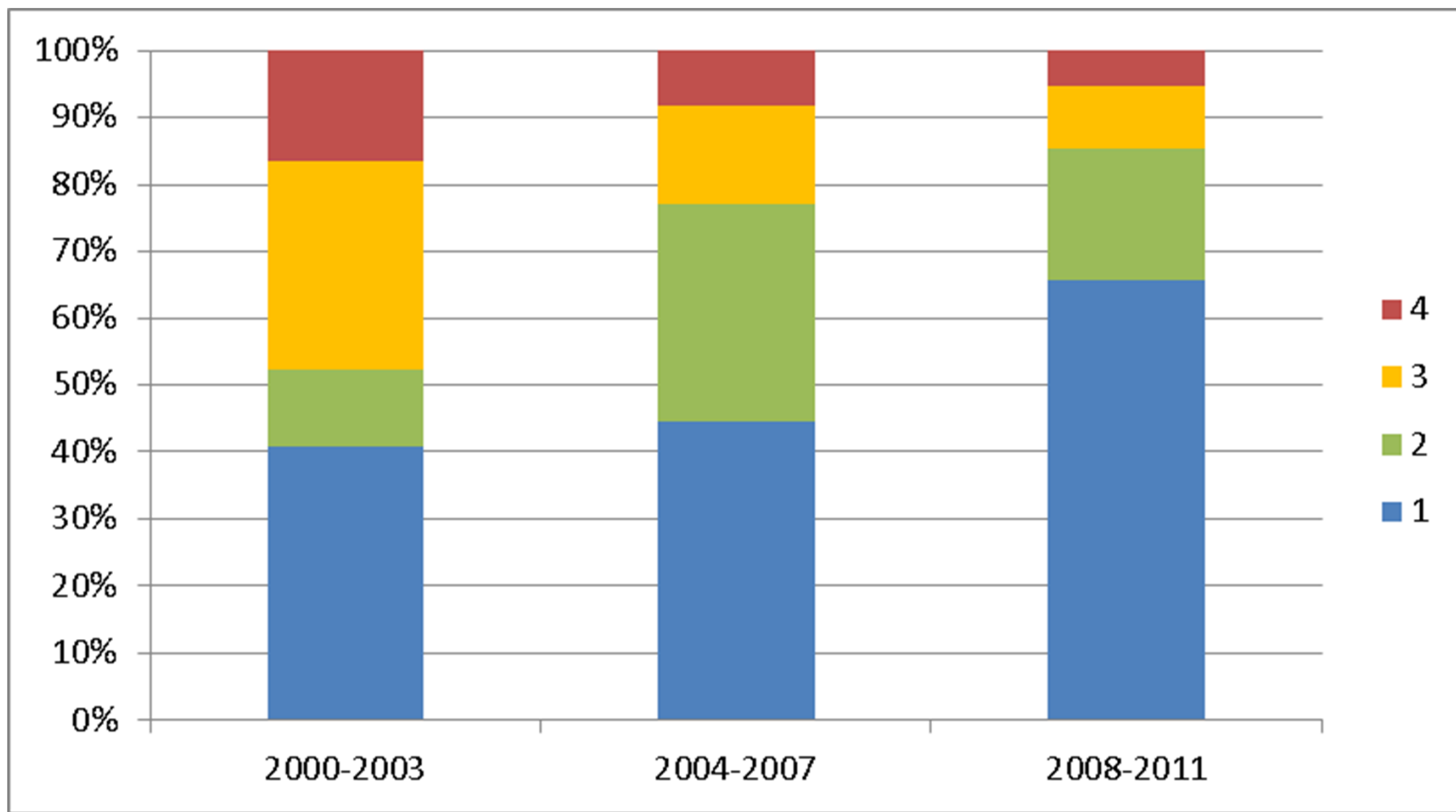
Oil

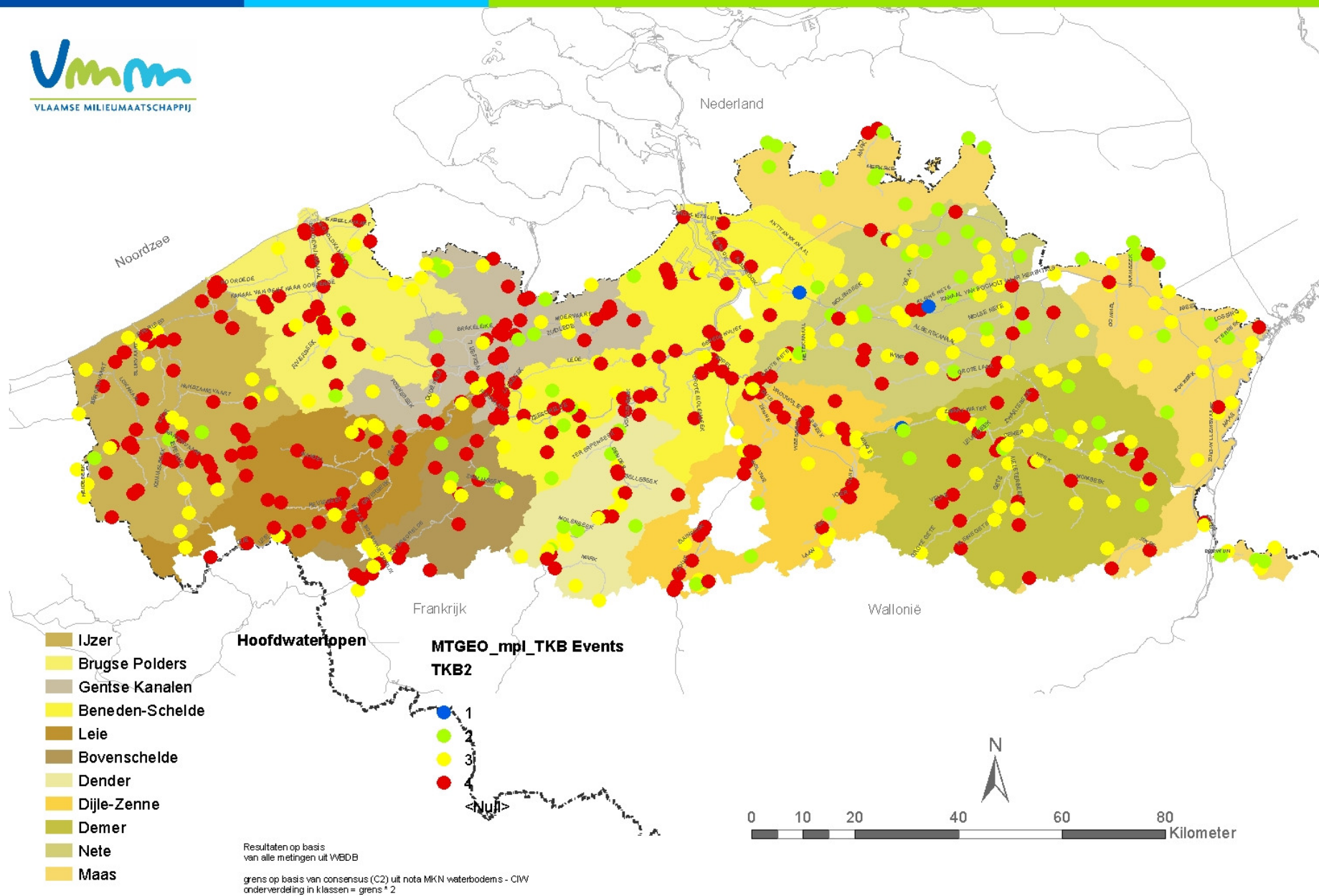


PAH

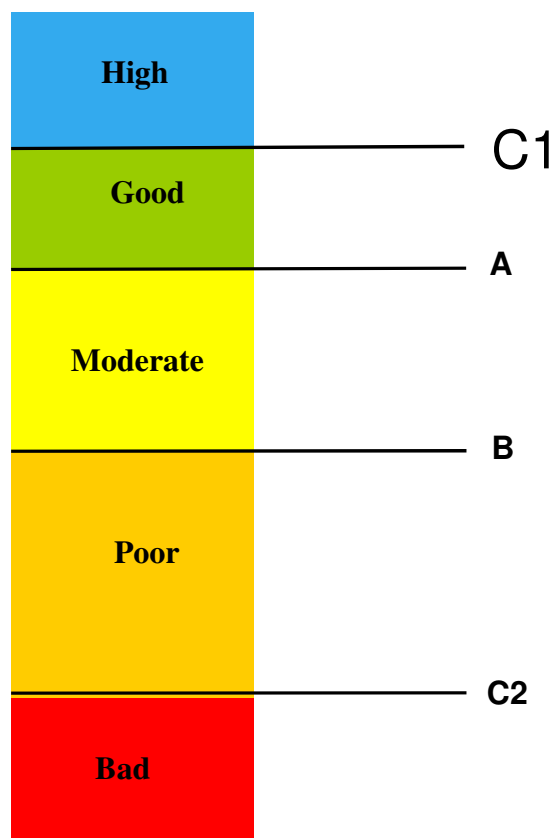








Sediment Quality Criteria



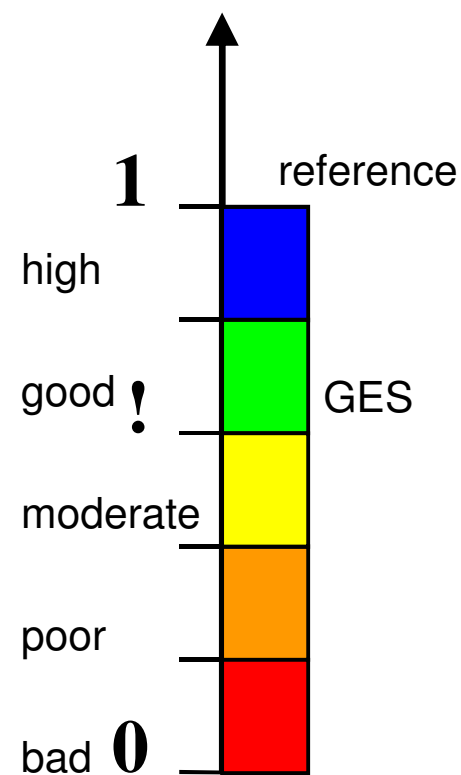
Consensus between:

biological abundances
(LEL and SEL)

ecotoxicological thresholds
(TEL and PEL)

Sediment Quality Criteria

- LEL, SEL
- TEL, PEL
- C1, A, B, C2



Sediment Quality Criteria

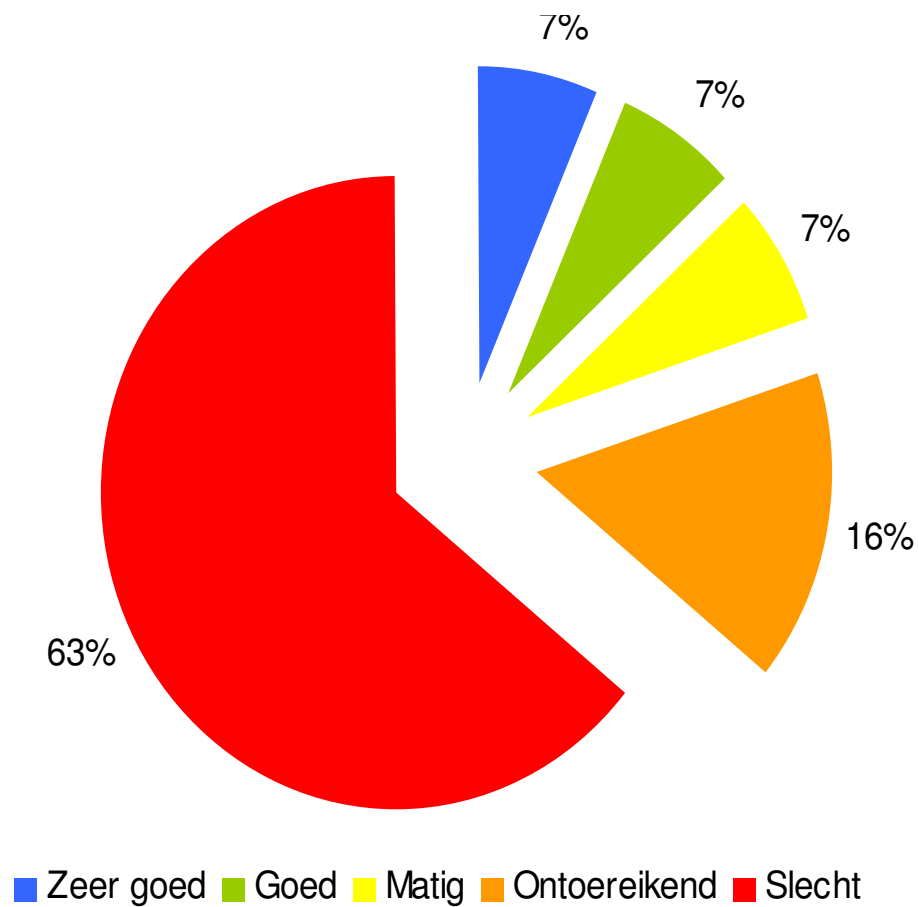
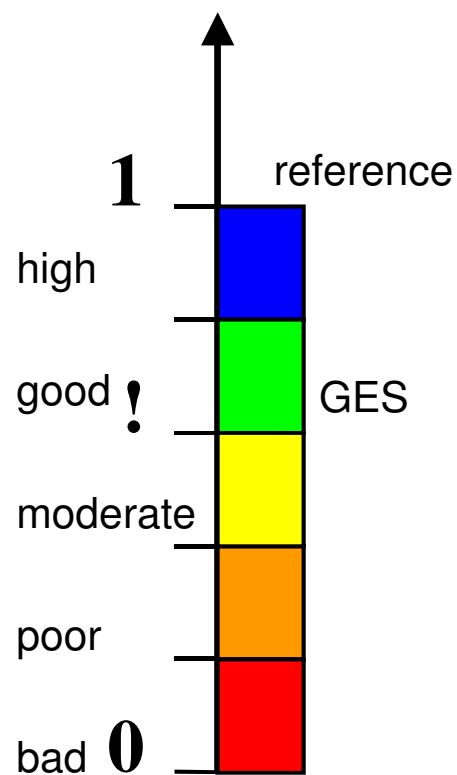
- LEL: 5 percentile of the 90 percentile values of species at least in 5 locations. Healthy benthic community
- LEL25: 25 percentile of the 90 percentile values
- LEL50: 50 percentile of the 90 percentile values
- SEL: 95 percentile of the 90 percentile values. Unhealthy benthic community

Sediment Quality Criteria

- TEL: geometrical average of the 5 percentile of the 'effect' results and the 50 percentile of the 'no effect' results. Lower than this threshold: we expect no effect (mortality).
- PEL: geometrical average of the 50 percentile of 'effect' results and the 85 percentile of the 'no effect' results. Higher than this threshold: effect

Consensus

	C1	A	B	C2
LEL	X			
LEL ₂₅		X		
LEL ₅₀			X	
SEL				X
TEL	X			
TEL ₂₅		X		
TEL ₅₀			X	
PEL				X





Noordzee

Frankrijk

Wallonië

Hoofdwaterlopen

MT_Maxklas_OWL_Qn Events
MaxVanklasse

- 1
- 2
- 3
- 4
- 5

OWL_CIW_VHA

MT_Maxklas_OWL_Qn_Features.Qn

1

- 6,450000 - 1869,000000
- 1992,000000 - 5508,000000
- 7192,000000 - 14814,800000
- 16000,000000 - 29600,000000
- 406440,000000 - 480240,000000

2

- 6,450000 - 1869,000000
- 1992,000000 - 5508,000000

7192,000000 - 14814,800000

16000,000000 - 29600,000000

406440,000000 - 480240,000000

3

- 6,450000 - 1869,000000
- 1992,000000 - 5508,000000
- 7192,000000 - 14814,800000
- 16000,000000 - 29600,000000
- 406440,000000 - 480240,000000

4

- 6,450000 - 1869,000000
- 1992,000000 - 5508,000000
- 7192,000000 - 14814,800000
- 16000,000000 - 29600,000000
- 406440,000000 - 480240,000000

5

- 6,450000 - 1869,000000
- 1992,000000 - 5508,000000
- 7192,000000 - 14814,800000
- 16000,000000 - 29600,000000
- 406440,000000 - 480240,000000

- IJzer
- Brugse Polders
- Gentse Kanalen
- Beneden-Schelde
- Leie
- Bovenschelde
- Dender
- Dijle-Zenne
- Demer
- Nete
- Maas



J Soils Sediments (2011) 11:504–517

DOI 10.1007/s11368-010-0328-x

SEDIMENTS, SEC 1 • SEDIMENT QUALITY AND IMPACT ASSESSMENT • RESEARCH ARTICLE

Development of sediment quality guidelines for freshwater ecosystems

Eric de Deckere • Ward De Cooman • Vicky Leloup •
Patrick Meire • Claudia Schmitt • Peter C. von der Ohe

Received: 8 September 2010 / Accepted: 8 December 2010 / Published online: 20 January 2011
© Springer-Verlag 2011

Questions?

Ir. Ward De Cooman
w.decooman@vmm.be



www.vmm.be

