

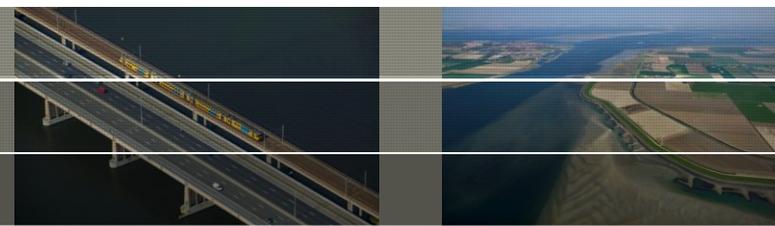


Marine Strategy Framework Directive (MSFD), monitoring and assessment

Theo Prins, Arjen Boon

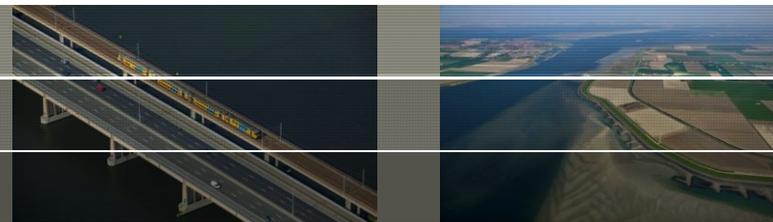
21 juni 2017

Outline



- What is the MSFD?
 - Objectives
 - Approaches
 - Geographical scope
 - Roles of Member States, Regional Sea Conventions, European Commission
- Monitoring and assessment
 - What is needed for assessments
 - Requirements for monitoring
 - Some examples

What is the MSFD?



The Marine Directive

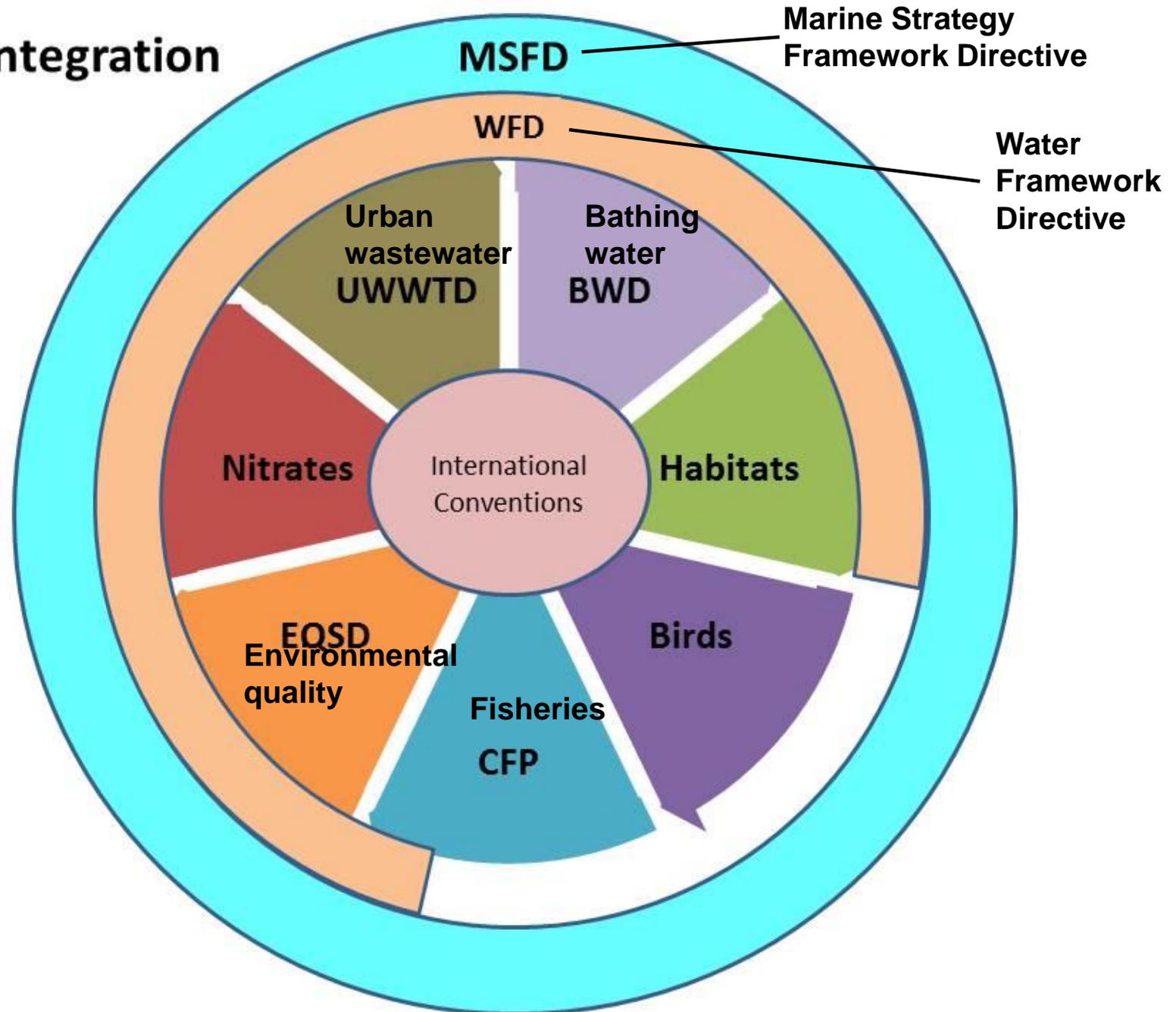
EU's legal instrument for the protection of our seas



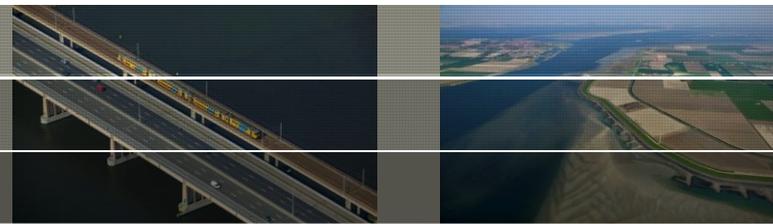
Ecosystem-based, adaptive and integrated approach to the management of all human activities which have an impact on the marine environment.

EU environmental directives and policies

Policy integration



What is the ambition?



MSFD: Good Environmental Status (Art. 3.5):

- ecologically diverse and dynamic oceans and seas which are clean, healthy and productive
- use is at a sustainable level, ensuring their continuity for future generations
- fully functioning and resilient ecosystems
- biodiversity decline is prevented and biodiversity is protected
- no pollution effects

Good Environmental Status (MSFD)

D1. Biological diversity



D2. Alien species



D3. Commercially exploited fish and shellfish



D4. Marine food webs



D5. Human-induced eutrophication



D6. Sea-floor integrity



D7. Hydrographic conditions

D8. Concentrations of contaminants

D9. Contaminants in the seafood



D10. Marine litter



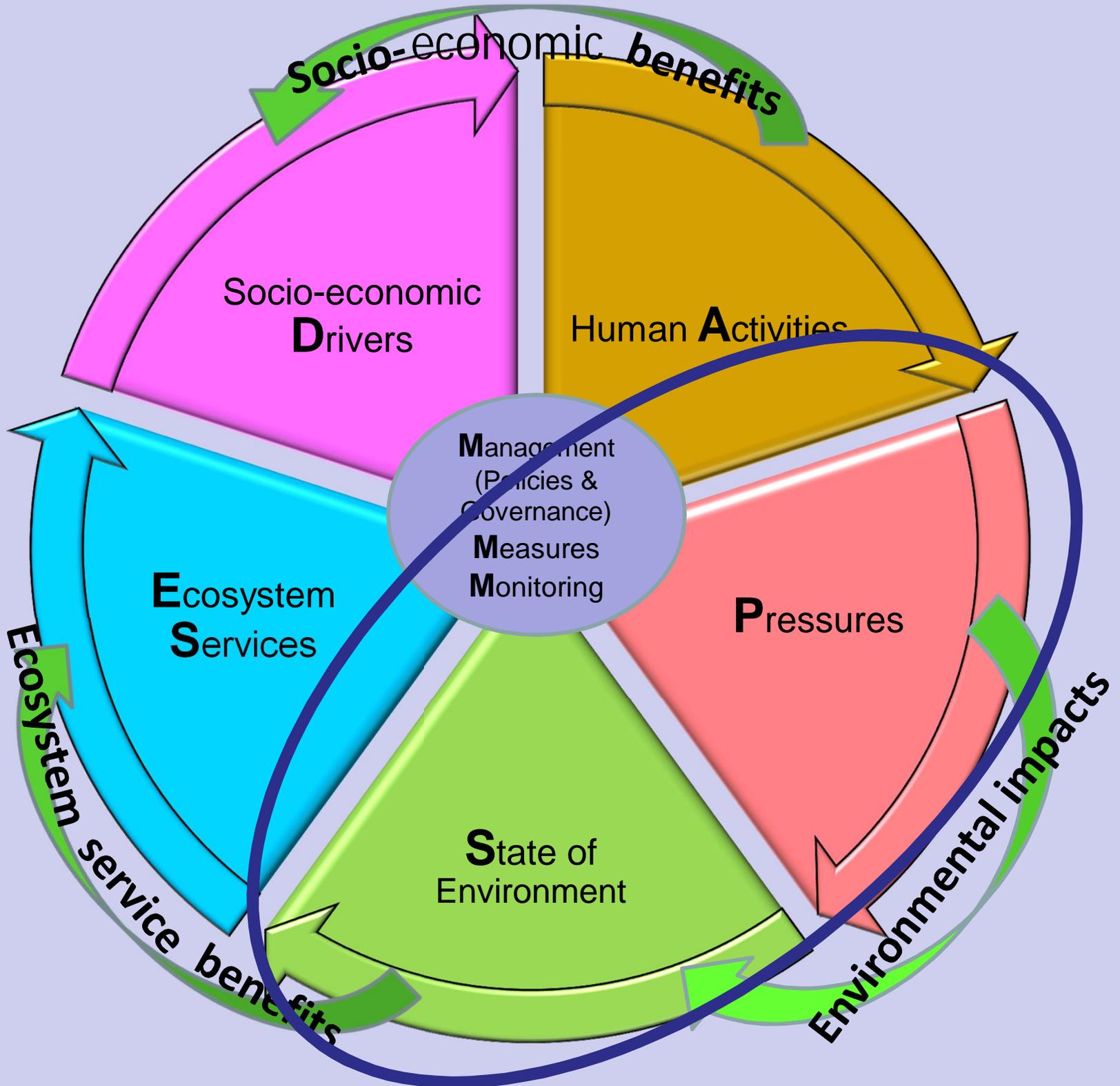
D11. Underwater noise



Implementation steps MSFD in a six-year cycle



Framework for information system

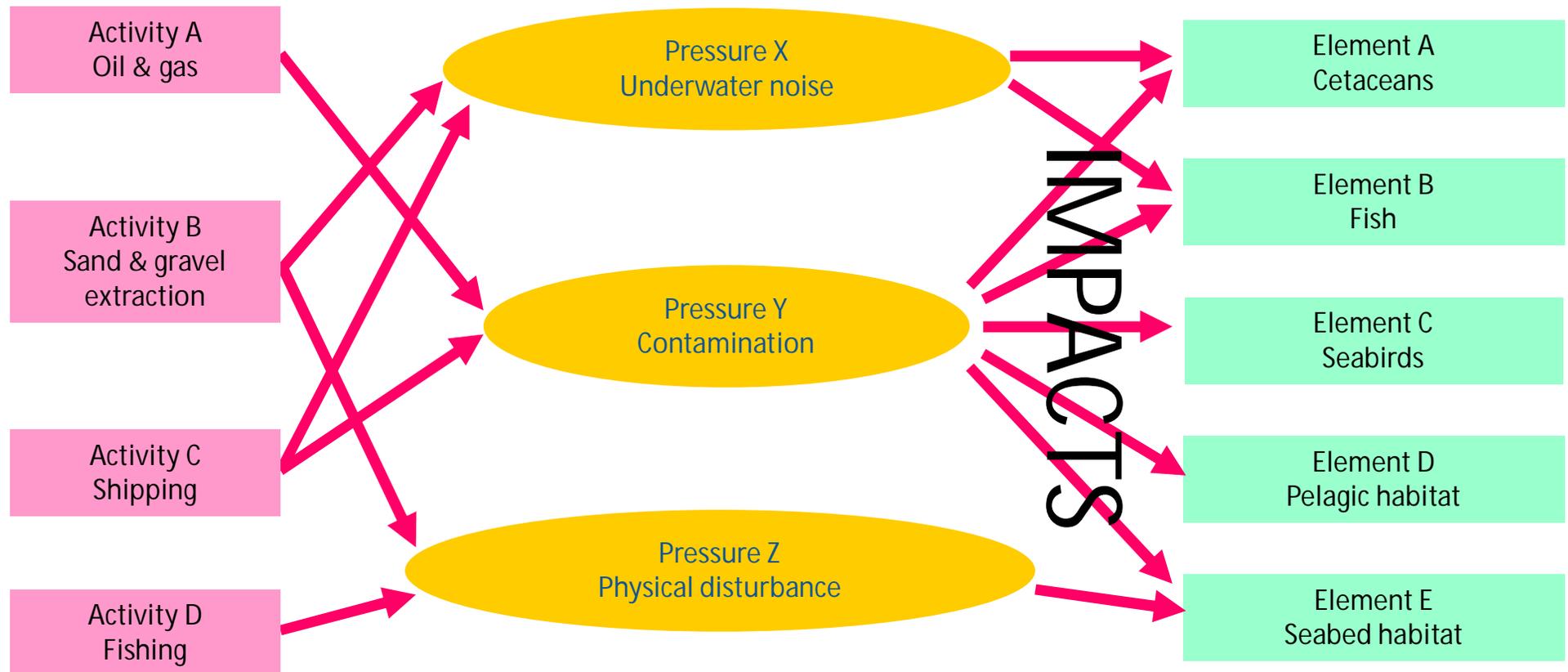


Linking human Activities to Pressures and State

Activity

Pressure

State



Good Environmental Status (MSFD)

D1. Biological diversity



D2. Alien species



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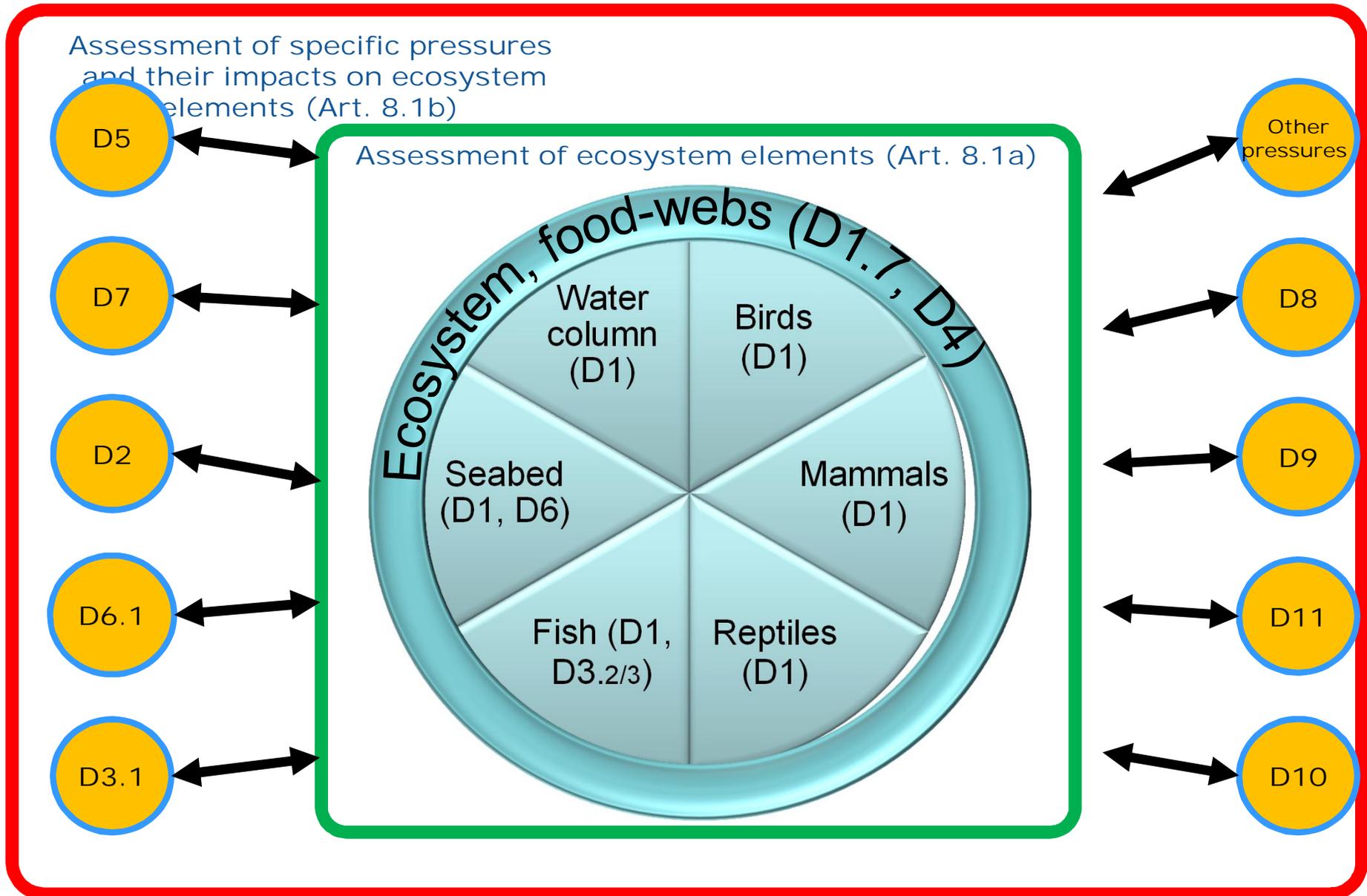
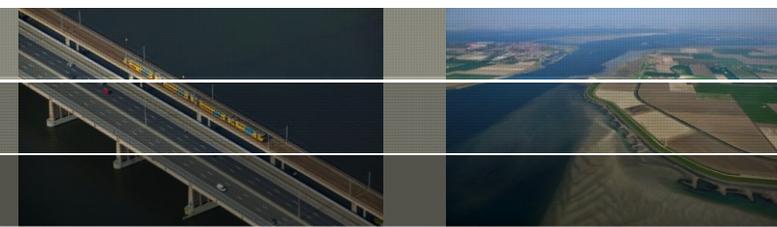
D10. Marine litter



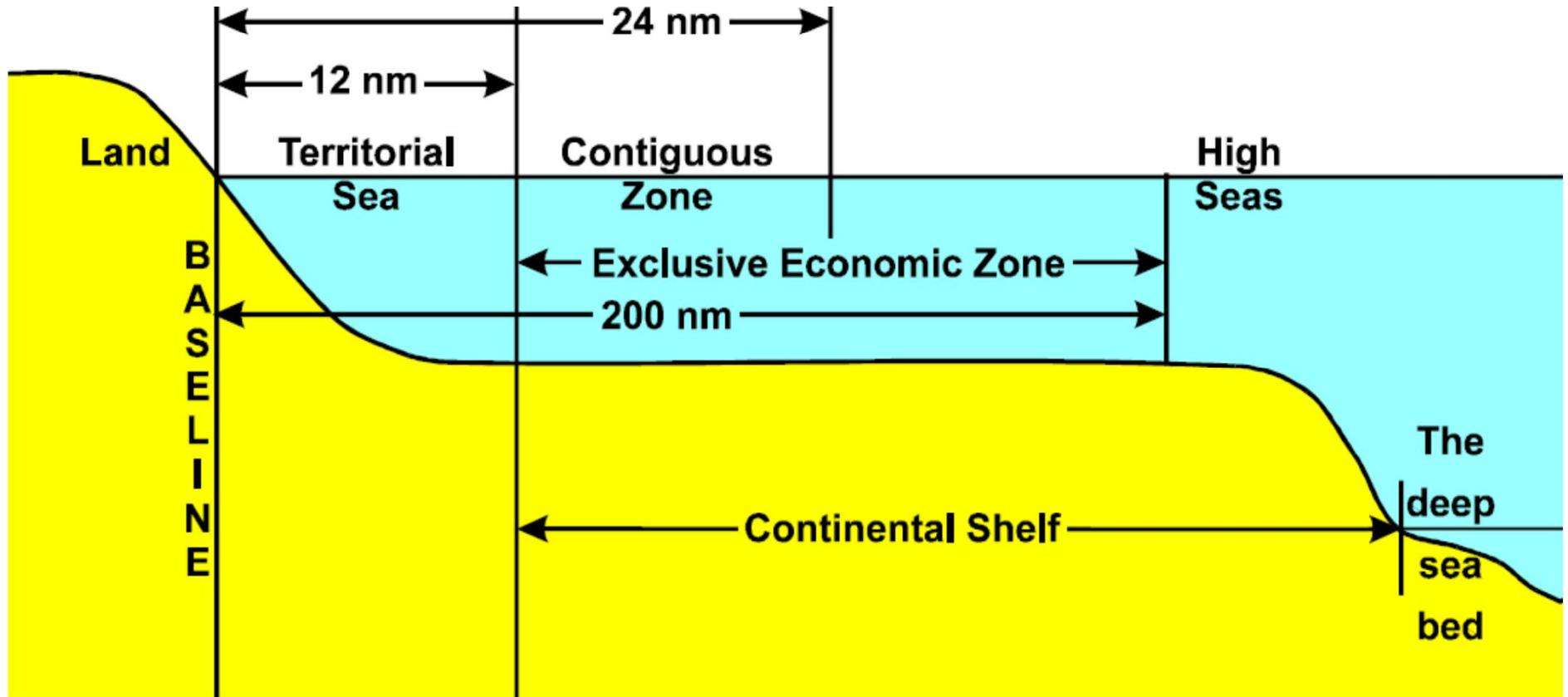
D11. Underwater noise



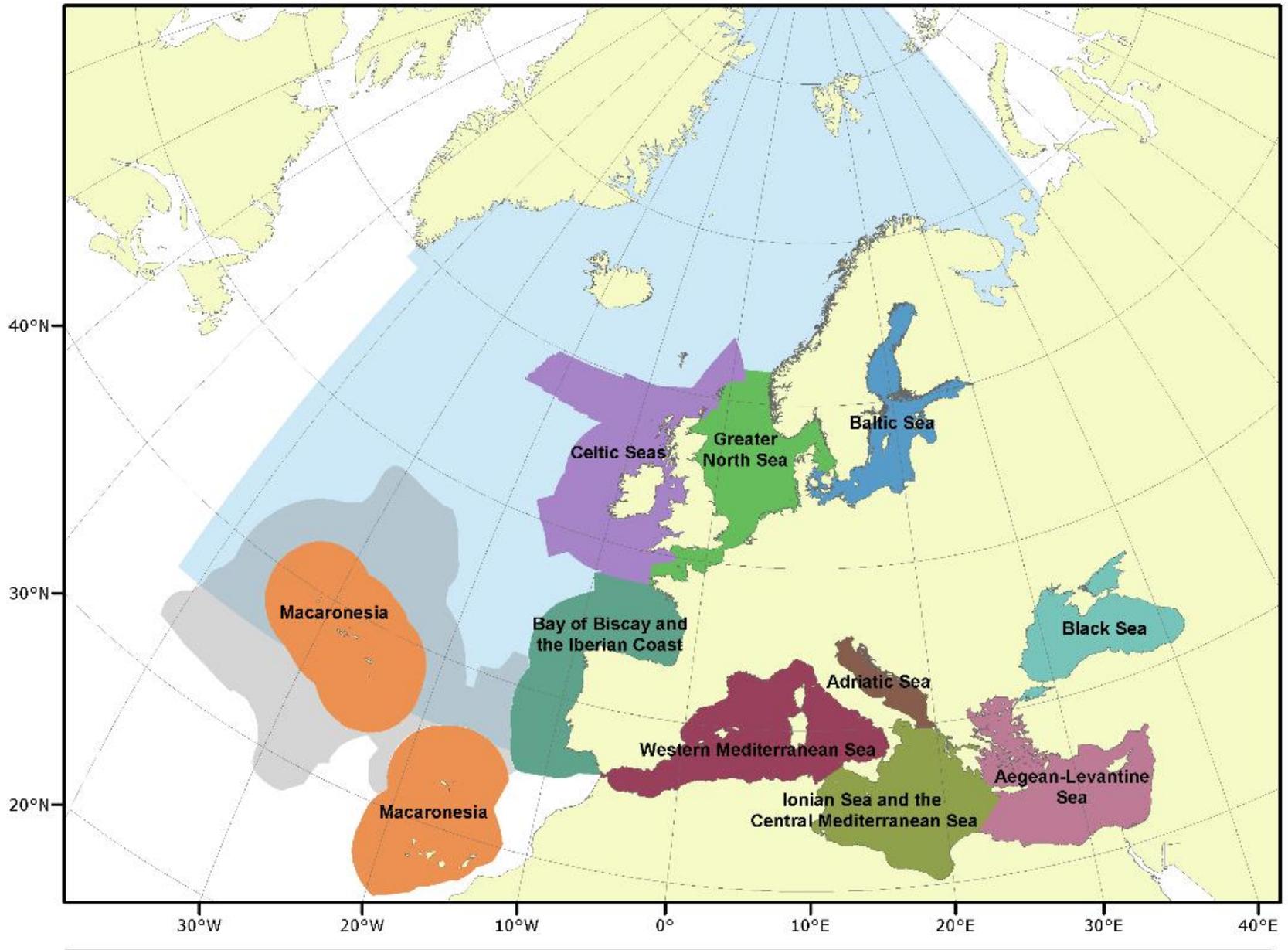
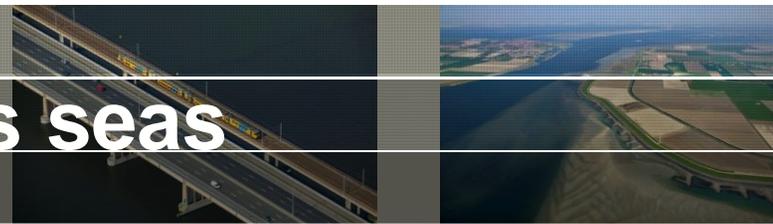
Hierarchy in 11 descriptors

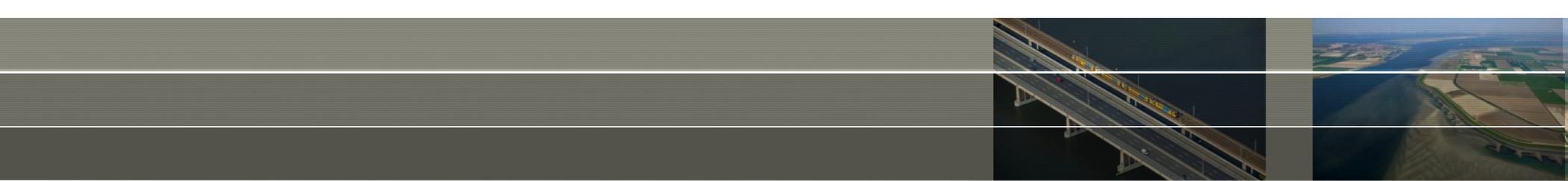


Where do MSFD (and other policies) apply?



Geographical scope: Europe's seas





The Regional Sea Conventions

The Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean: Mediterranean Action Plan defining key priorities and governance, adopting principles such as the ecosystem approach and tools such as integrated coastal zone management (ICZM).



The Bucharest Convention on the Protection of the Black Sea against Pollution: Its Strategic Action Plan for Environmental Protection and Sustainable Management of the Black Sea is a pillar of regional cooperation which includes several elements of a marine strategy.

The Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea: has undertaken considerable public participation and produced a Baltic Sea Action Plan in 2007 in line with MSFD requirements.



The OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic: aims to conserve marine ecosystems and safeguard human health in the North-East Atlantic by preventing pollution.

Strengthen role of RSCs



Who is responsible for good status?

Defining GES under MSFD

MSFD concept

WFD concept

European Union:

Conceptual work (WG GES)

General description

- MSFD Annex I: Descriptors
- MSFD Annex III: Characteristics
- COM Dec 2010/477: Indicators
- CIS: common understanding

Normative definitions

- 2000/60/EC: Quality elements
- 2008/105/EC: EQS chemicals
- Intercalibration: Comparability
- CIS guidance: Assessment and status classification

Member States:

Local and national aspects

Normative definitions

- National strategies
- Existing obligations / commitments
- Regional coherence

Implementation

- Indicators: Quantitative targets

Regional organisations:

Regional aspects / trans-boundary issues

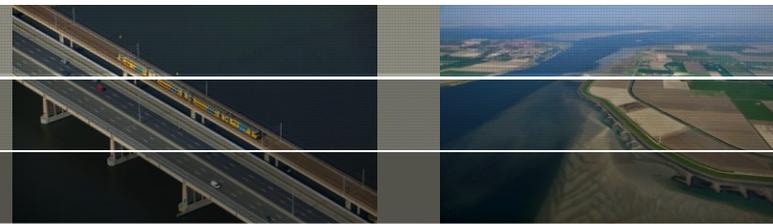
Regional coordination

- Regional GES
- Transboundary issues

Coordinated implementation

- International River Basin Districts

Challenges for MSFD



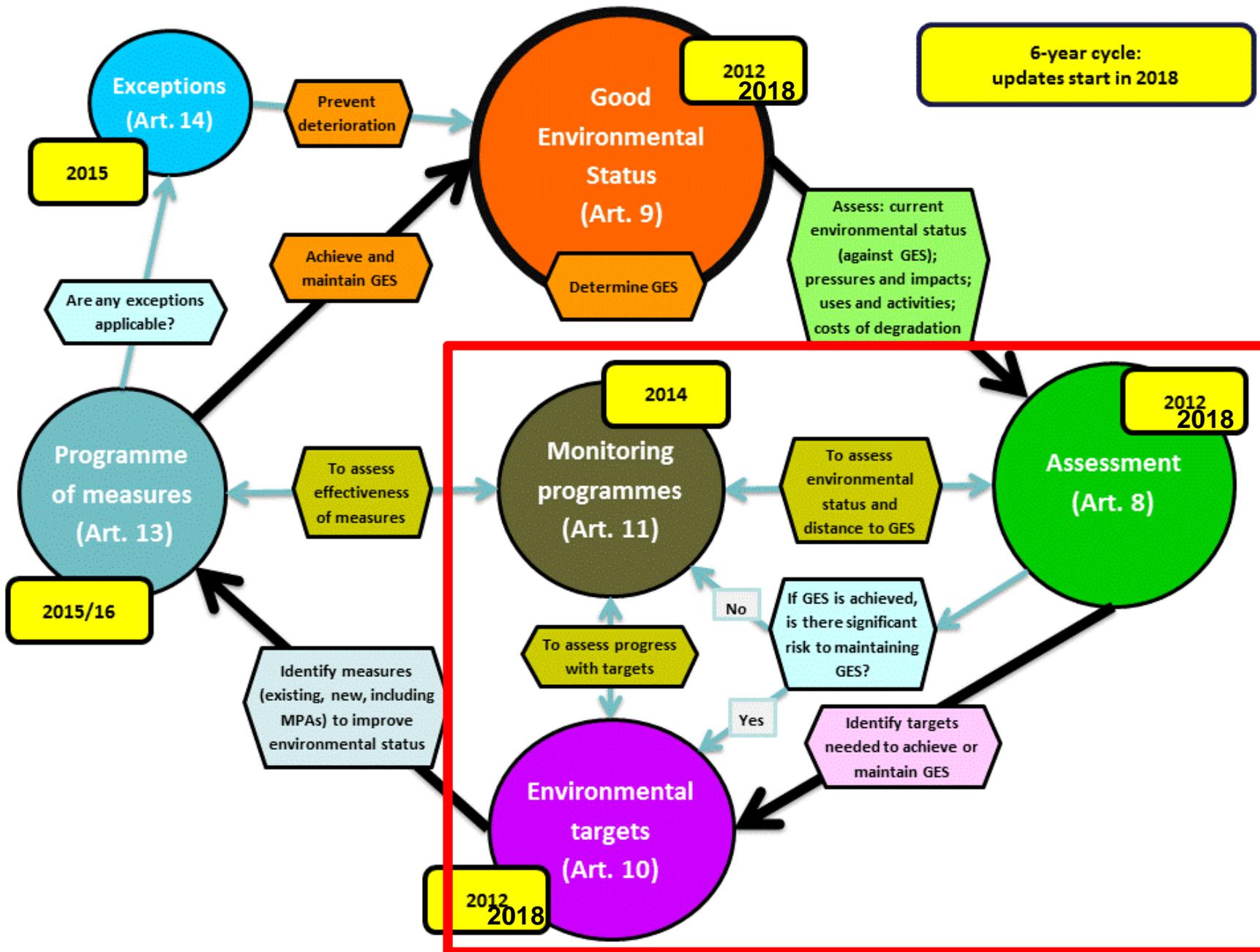
General:

- Coherence and harmonisation
 - Need for coherence across Europe
 - Strong need for cooperation within regional sea
- Transboundary problems
- Large geographic scale, broad range of topics
- New issues (e.g. litter, noise)

WFD <-> MSFD

- Need to align with WFD assessments in coastal waters
- Avoid duplication in monitoring and assessment

Role of monitoring and assessment



Assessments should support implementation

What is GES?

Have I achieved GES?

If not, what is the problem?

So, what are my targets to achieve GES?

And what actions do I take to achieve my targets?

Monitoring of progress

GES criteria A

Element 1

Pressure A

Target 1

Measure A

GES criteria B

Element 2

Measure B

GES criteria C

Element 3

Element 4

GES criteria D

Element 5

Element 6

Element 7

Pressure B

Pressure C

Target 2

Target 3

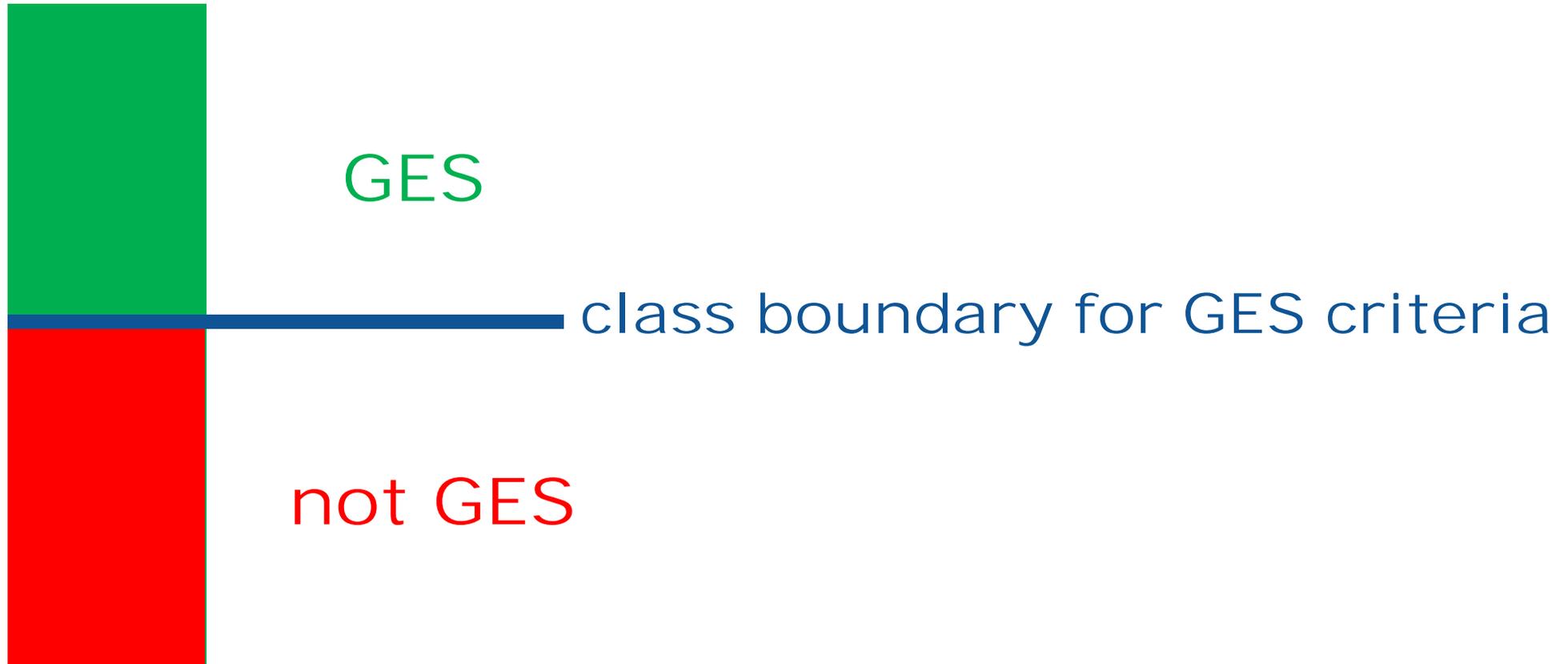
Measure C

Measure D

Measure E

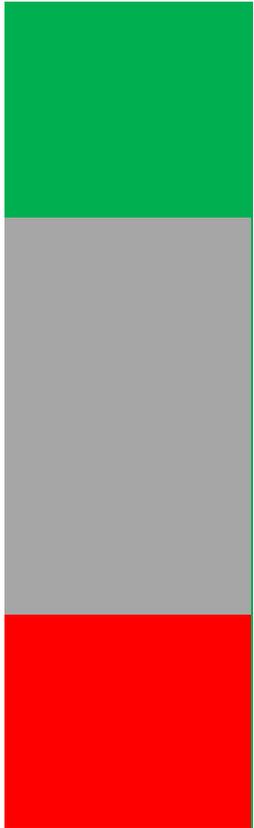
Assessment: is the environment in good status?

GES "classes" – MSFD has two classes



Assessment: is the environment in good status?

GES "classes" – reality today



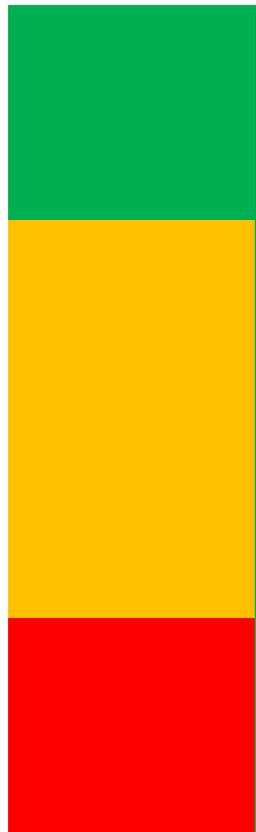
GES

Some GES criteria difficult to quantify
(e.g. no methodology, no data, lack of
knowledge, uncertainty)

not GES

Assessment: is the environment in good status?

GES "classes" – MSFD compatible

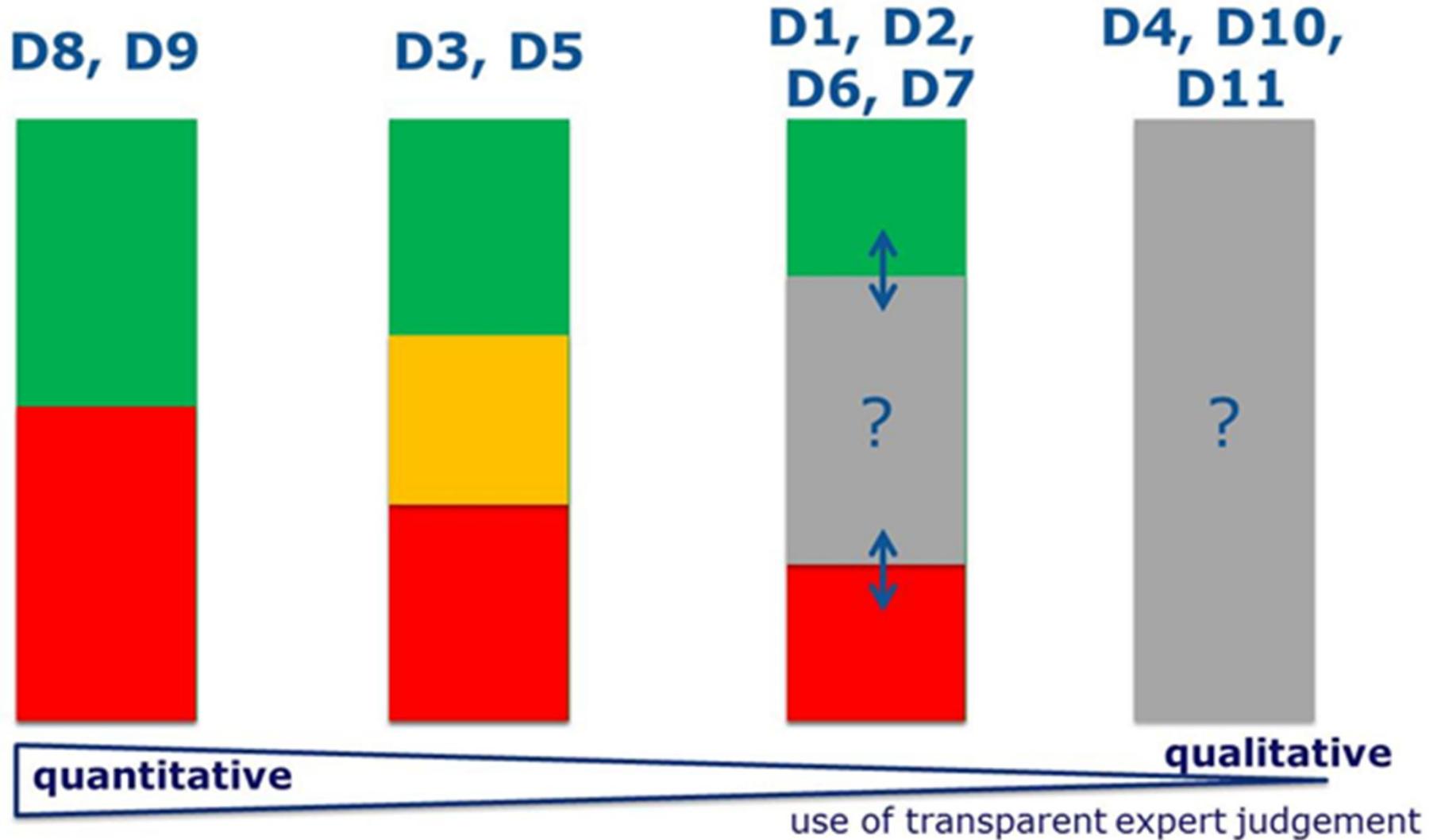


GES

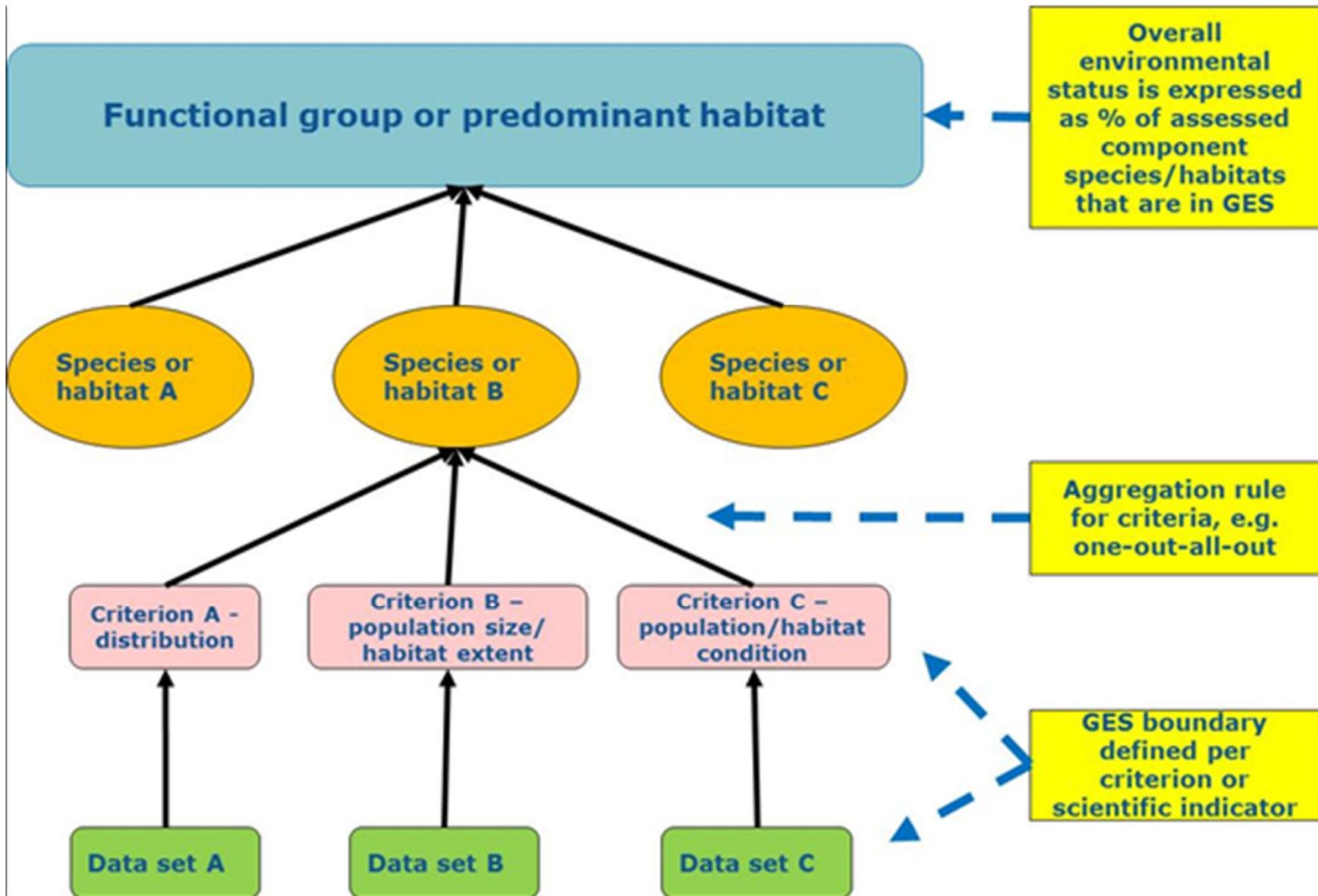
not GES (precautionary principle)

not GES

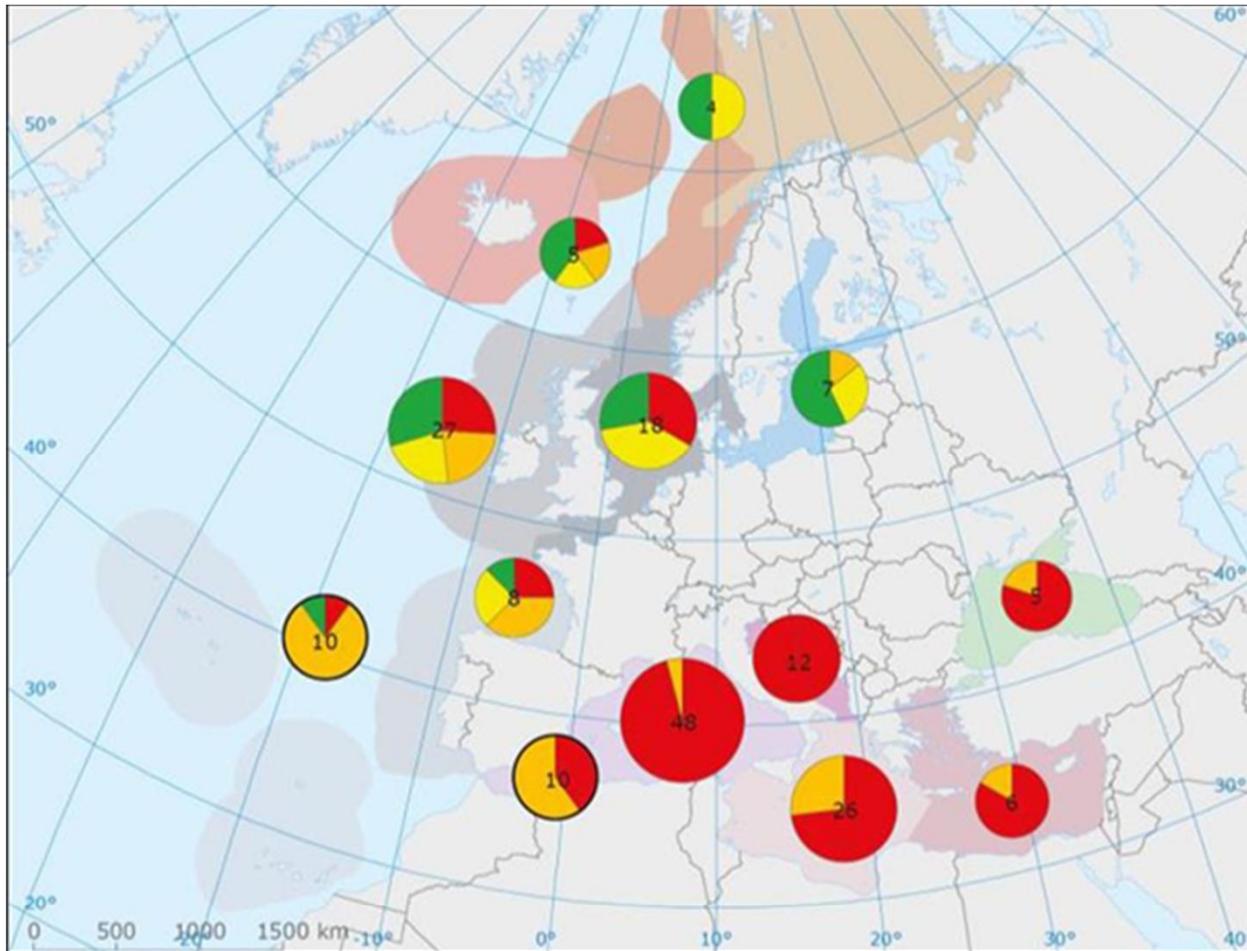
Assessment: is the environment in good status?



Example: integrating assessment results



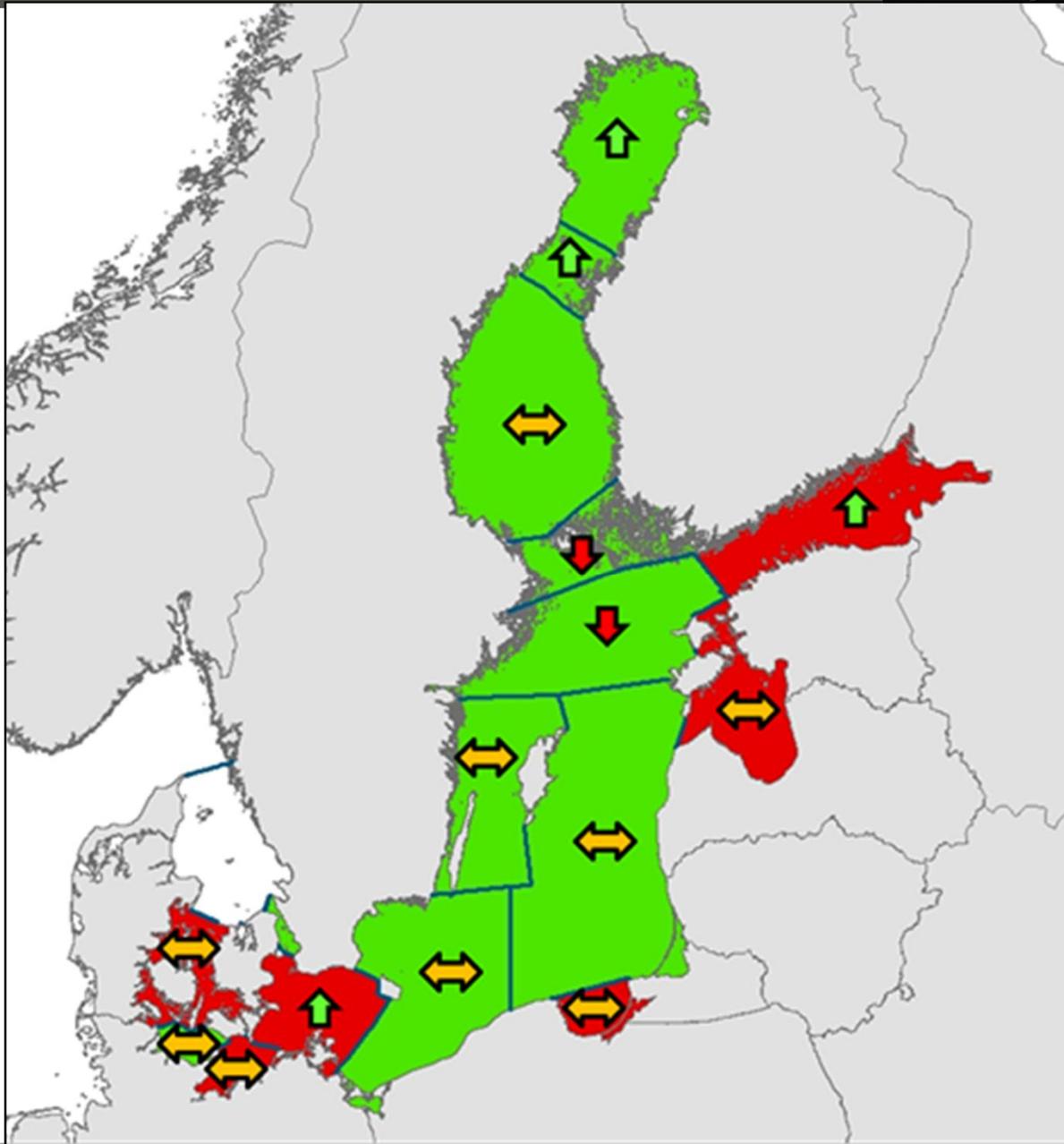
Example: reporting at EU level



Status of assessed fish stocks from regional seas around Europe, with respect to Good Environmental Status (GES). Status refers to fishing mortality (F) and reproductive capacity (SSB) criteria, as defined by the Marine Strategy Framework Directive

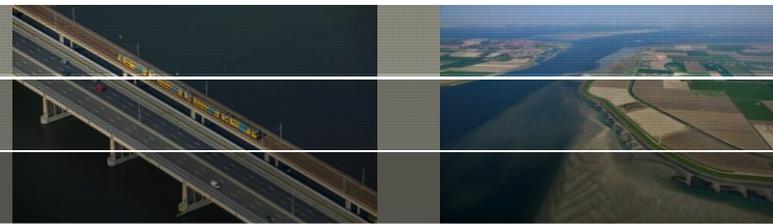


Example: reporting at regional level



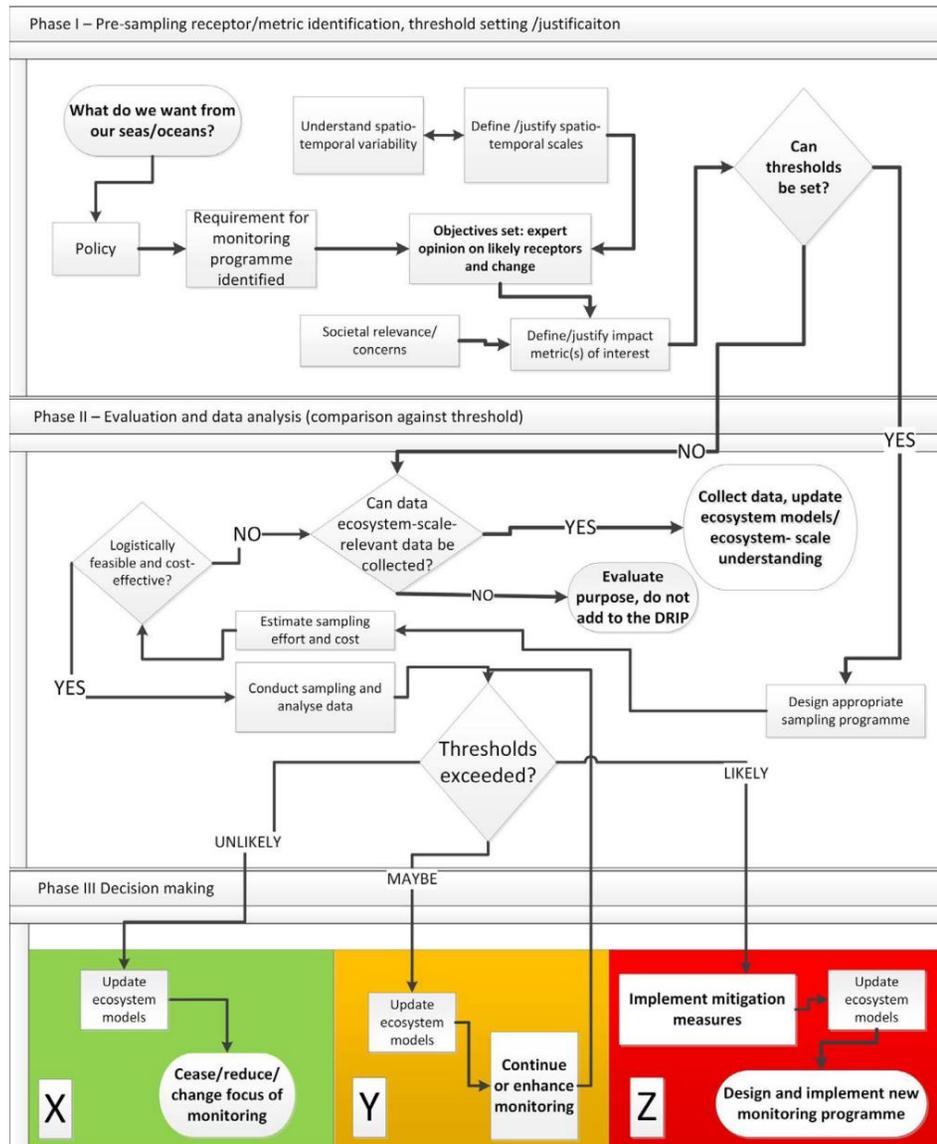
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Monitoring requirements



- Goal MSFD attained through 'ecosystem-based management', and science-based based: need for monitoring and research
- So, monitoring needs a clear, hypothesis-based goal
 - relation between pressure-indicator
 - spatial/temporal variation
 - requirements for monitoring
 - what type and size of effect you want to determine
- Monitoring should focus on
 - assessing the likelihood of (cumulative/integrated) effects of (manageable) activities ~ targeted monitoring
 - system understanding (cause-effect relationships, reducing uncertainty) ~ basic monitoring

Decision making for monitoring

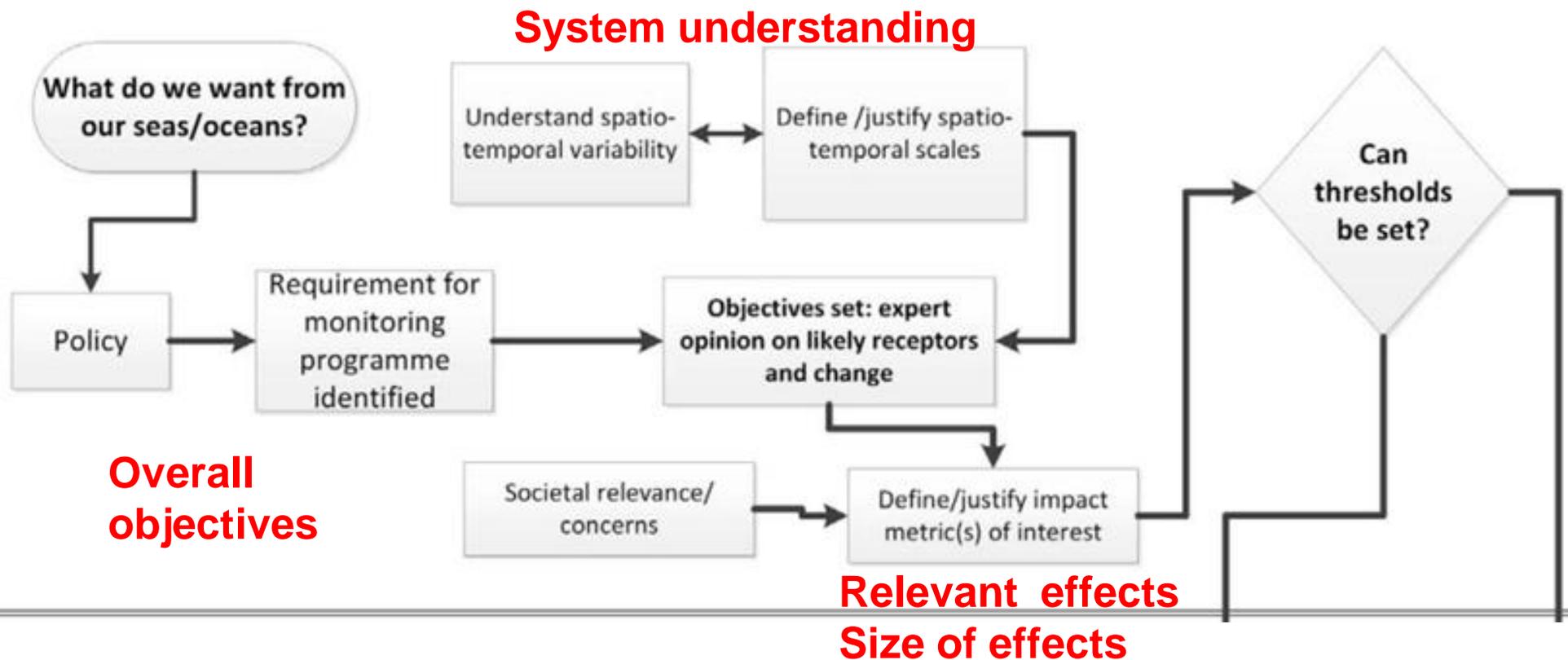


- DRIPpy monitoring (Data-Rich, Information-Poor)
- Effective AND efficient monitoring
- Combine monitoring with modelling to assess effect and management likelihood

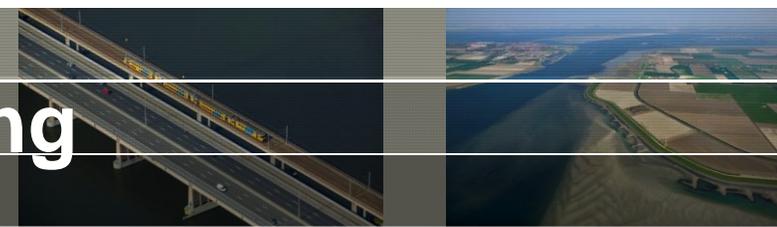
Wilding, Gill, Boon et al. (2017), Turning off the DRIP..., Renewable and Sustainable Energy Reviews 74.

Decision making for monitoring

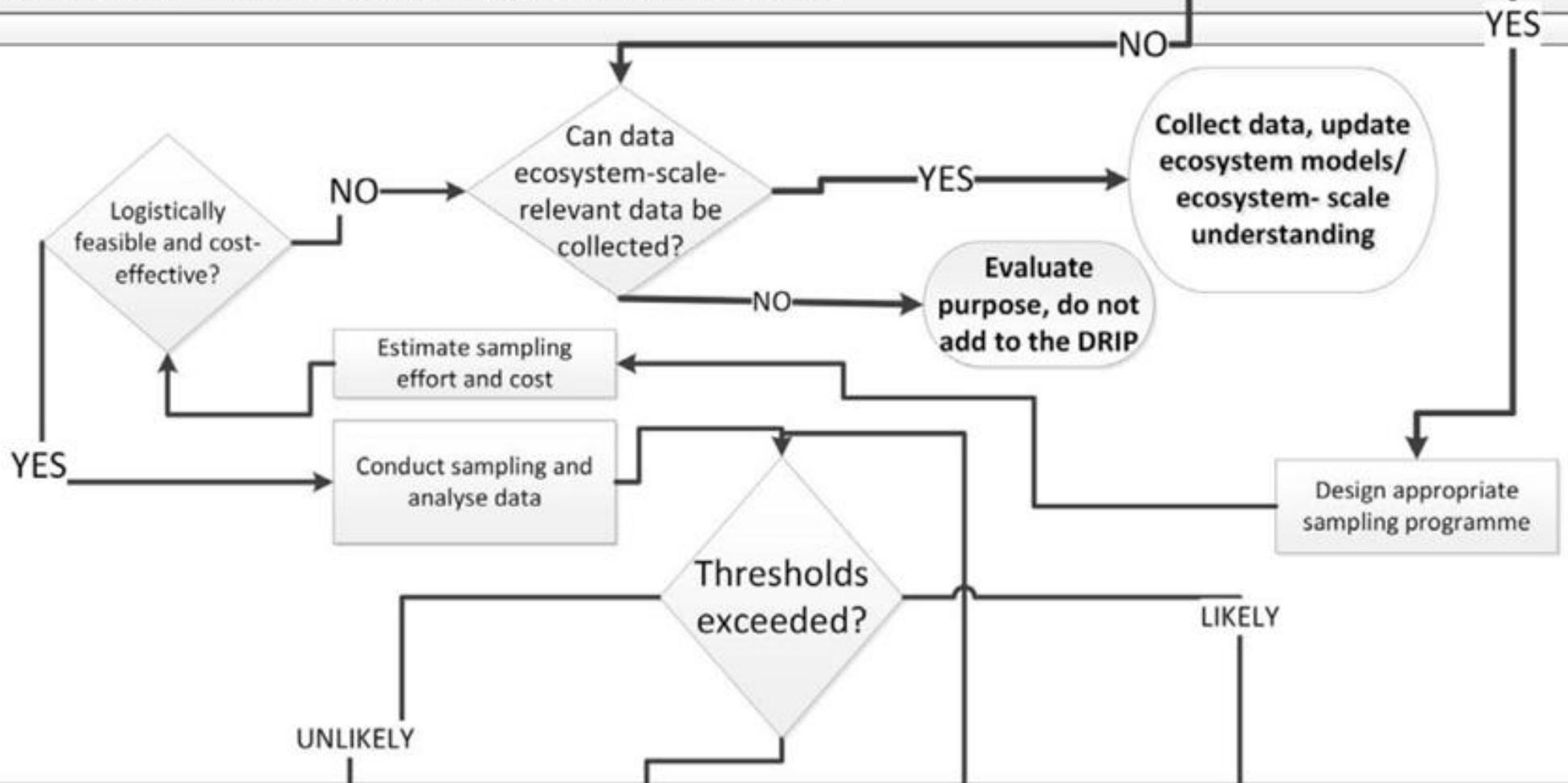
Phase I – Pre-sampling receptor/metric identification, threshold setting /justificaiton



Decision making for monitoring

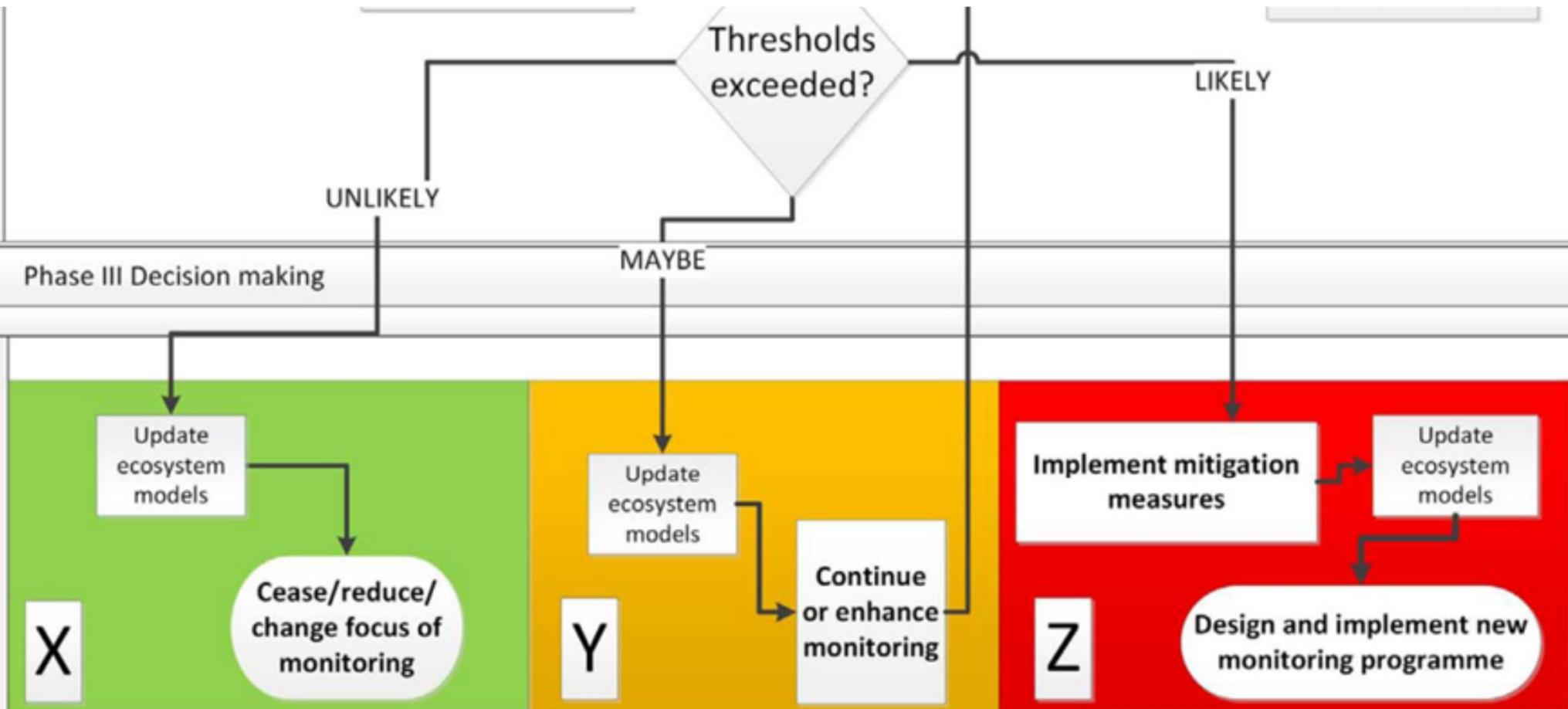
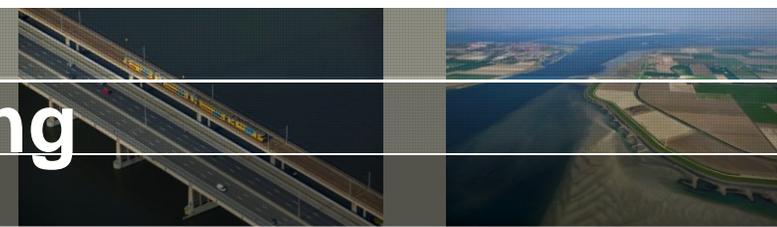


Phase II – Evaluation and data analysis (comparison against threshold)



Budget, logistics, organization

Decision making for monitoring



Basic versus target monitoring



Integrated monitoring aiming multiple goals

Effect monitoring

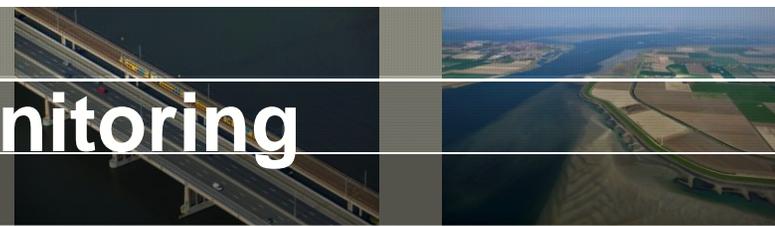
- Focusing at a priori effects due to pre-defined activities (fishing, sand extraction)
- Short-term effects
- Focus on causality
- Spatially explicit
- Legislative monitoring

Trend monitoring

- Focusing at system changes (e.g. climate) and a posteriori effect changes
- Long-term effects
- Focus on system behaviour
- Spatially (more) generic
- Non-legislative monitoring

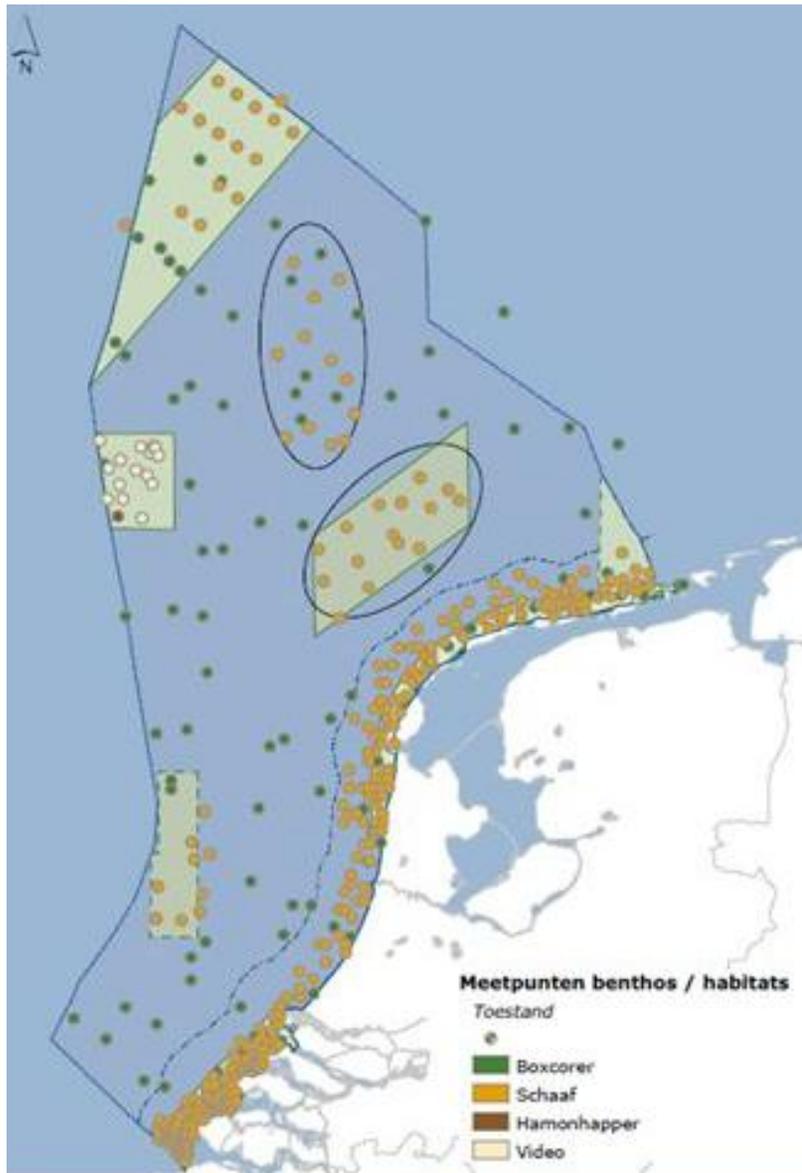
Adapted from Boon (2014) Monitoring of marine ecological projects - a plea for an integrated approach in monitoring (in Dutch) Landschap 2014/4

Example – Benthos MSFD monitoring



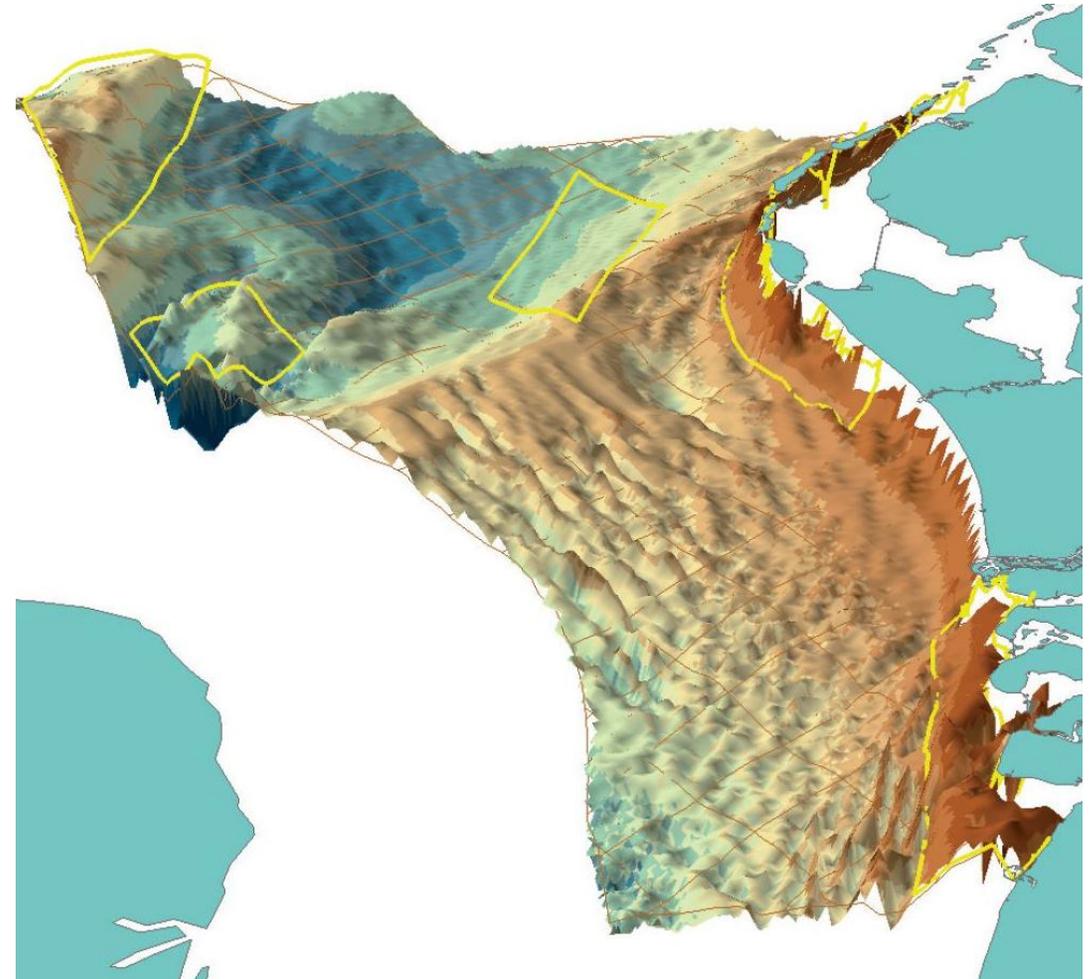
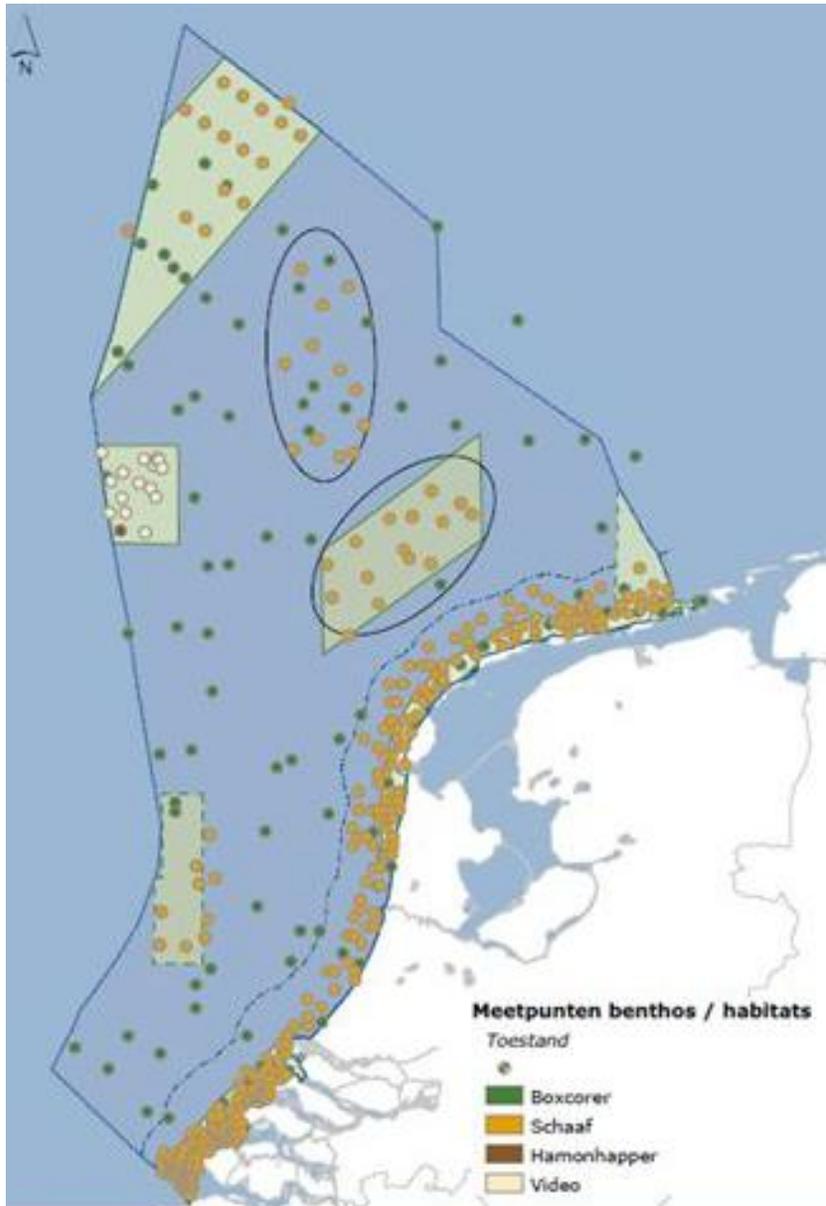
- Current Dutch MSFD monitoring for benthos:
 - a sampling grid that increases in density in the near-coastal area
 - using mainly two different devices, targeting different sizes and distribution of animals
 - meiobenthos (<1 mm) and smaller metazoans are not sampled.
- Box corer or grab
 - sampling ca. 0.7 m², targeting smaller macrobenthos that occurs in an more evenly-spaced distribution
- Sledge
 - sampling several square meters, targeting larger macrobenthos and epibenthos, that occur more clustered
- Boulders and cobbles
 - sampled through video monitoring

Example – Benthos MSFD monitoring - 2



- Sampling for trend monitoring
 - Fixed sampling grid
 - mostly offshore
 - once per year
 - box core
- Near-shore sampling and sledge sampling is mostly based on project monitoring (~effect monitoring)
- Power of sampling strategy
 - low for relatively sudden changes
 - good for long-term trends
- Other parts of the North Sea (outside Dutch continental shelf)
 - sampling grid is different
 - often lower in resolution
 - sometimes other sampling methods

Example – Benthos MSFD monitoring - 3



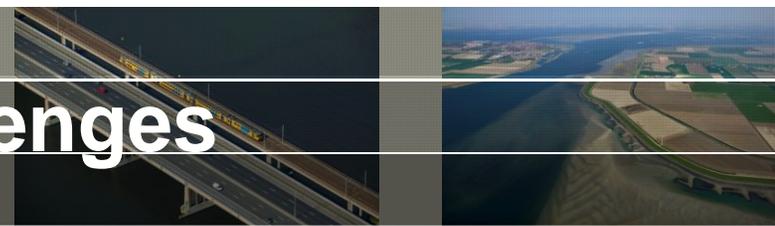
Above, the seabed morphology as derived from side-scan sonar images (Deltares Wiki): many more details visible. Does monitoring cover the spatial variability?

Possibilities for improving MSFD Benthos



- Calculate actual power to assess sudden and gradual changes in benthos diversity, abundance and biomass, and adapt monitoring accordingly (avoid D-R-I-P).
- Adapt sampling resolution to fit heterogenic and variable habitats
- Applying high-resolution side-scan and multi-beam sonar in effect studies to improve sampling focus and improve understanding between habitat sedimentology, morphology, and benthic ecology.
- Develop conceptual understanding and combine modelling with monitoring to improve understanding benthic (production) processes, linkages to plankton and fish, and large-scale and long-term effects. Biodiversity alone does not cover effects of pressures on benthic ecosystem functioning.
- Combine effect monitoring with trend monitoring.
- Co-ordinate and co-operate in sampling with neighbouring countries to improve cost-efficiency

In summary: Monitoring challenges



- Major challenges in
 - new issues: e.g. underwater sound, marine litter
 - new techniques: remote sensing, environmental DNA, dedicated modelling
- Dealing with uncertainty
 - limited budgets: effective AND efficient?
 - Integrated monitoring for mixed assessment purposes
 - spatial scale and resolution
 - ‘moving’ targets: temporal variability and autonomous trends
- Combining project monitoring with MSFD monitoring?
- Strengthen comparability between EU Member States