CAN MARINE BIOLOGICAL VALUATION MAPS SHOW THE ECOLOGICAL VALUE OF THE BELGIAN COASTLINE ?

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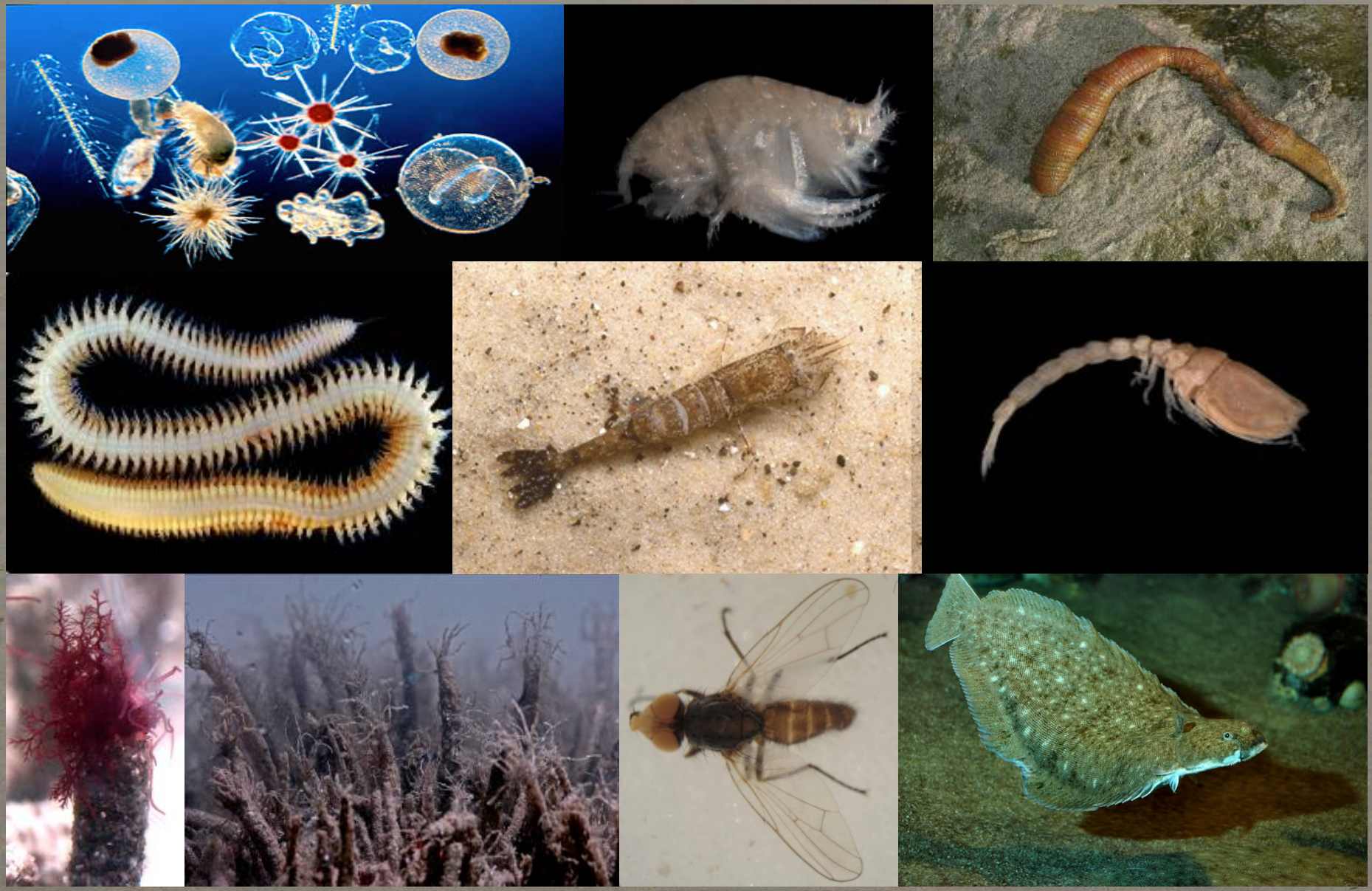
?

What you can see

‘Animals’ washed up on the shore:
Food source for birds (low tide) and fish (high tide)

Ensis directus



What you can’t see

Impacts by nature due to

sea level rise **storms** **erosion** **climate change** **...**

Many human activities

tourism **beach fishery** **beach cleaning** **coastal defense** **...**

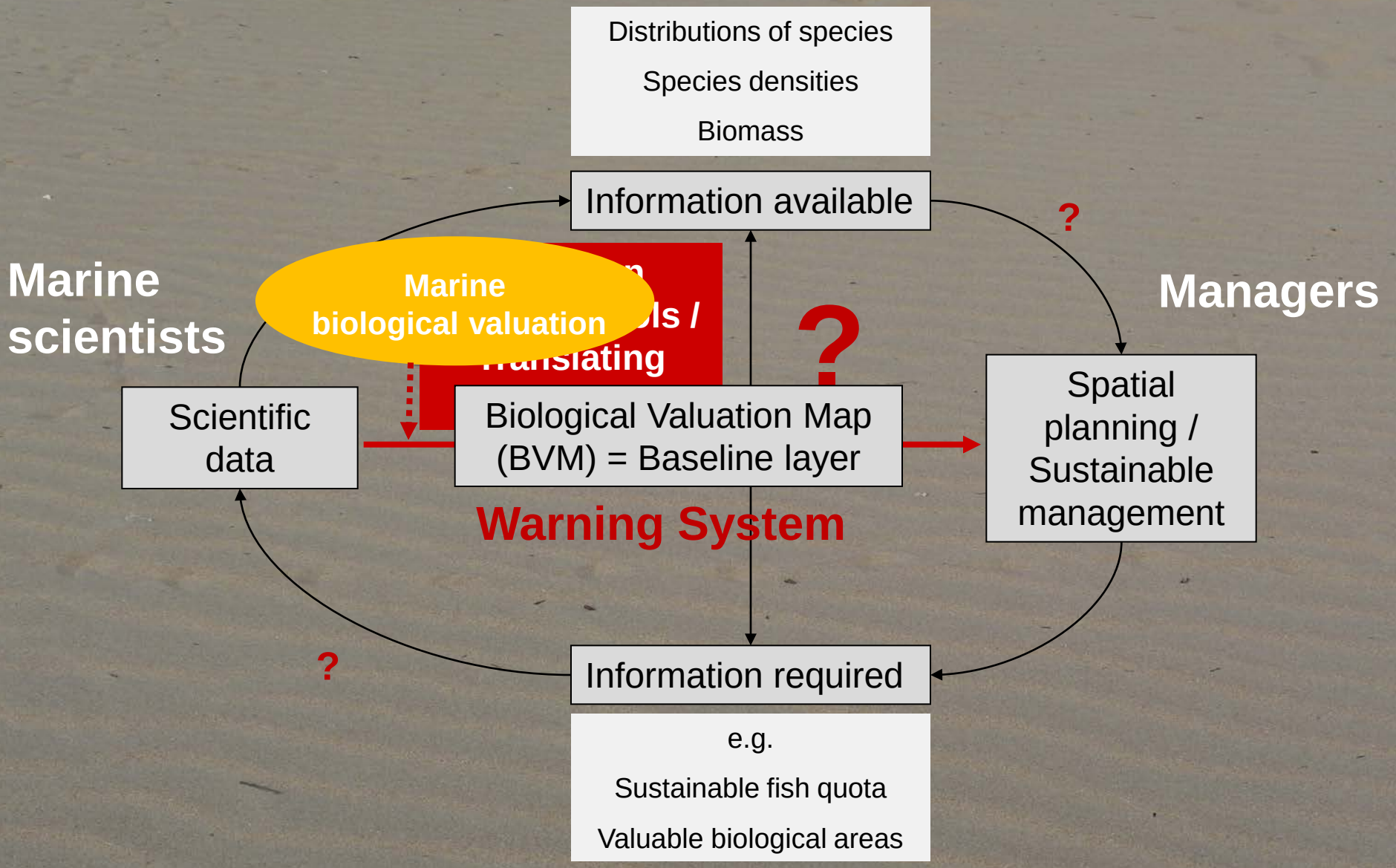





Can we protect ourselves and the beach ecosystem at the same time?

Ecosystem-based Management & Marine Spatial Planning

What we have ≠ what we need?

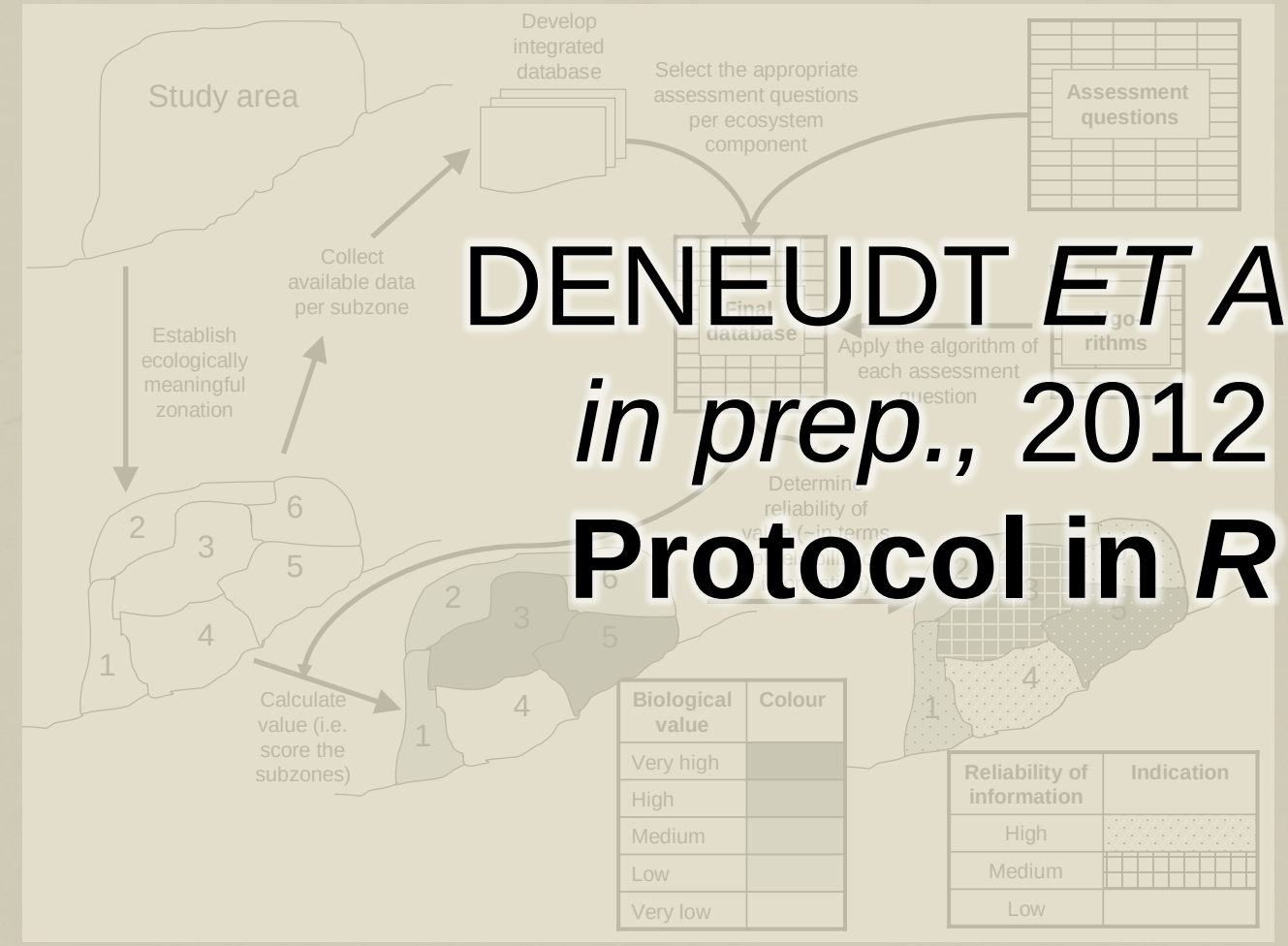


Biological valuation

BWZee project: 2004-2007

→ Marine biological valuation map of the Belgian part of the North Sea (BPNS)

→ The beaches were not included



DENEUDT *ET AL.* *in prep.*, 2012

Protocol in *R*

Scoring of subzones against 2 biological valuation criteria:

1. Rarity
2. Aggregation/fitness consequences

↓

How?

Assessment questions

↓

Algorithms

↓

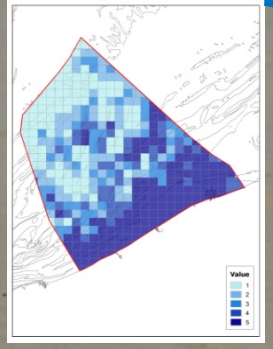
Scores

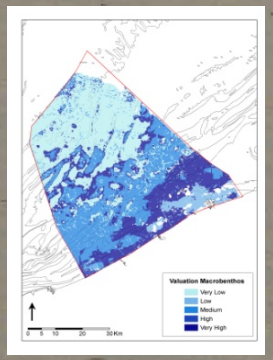
SEABIRDS

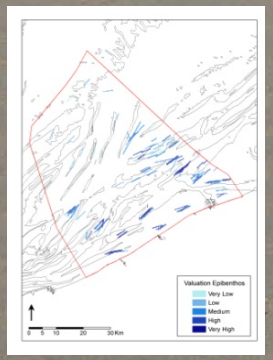
MACROBENTHOS

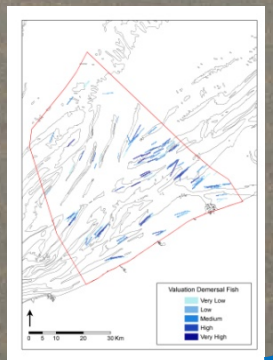
EPIBENTHOS

DEMERSAL FISH

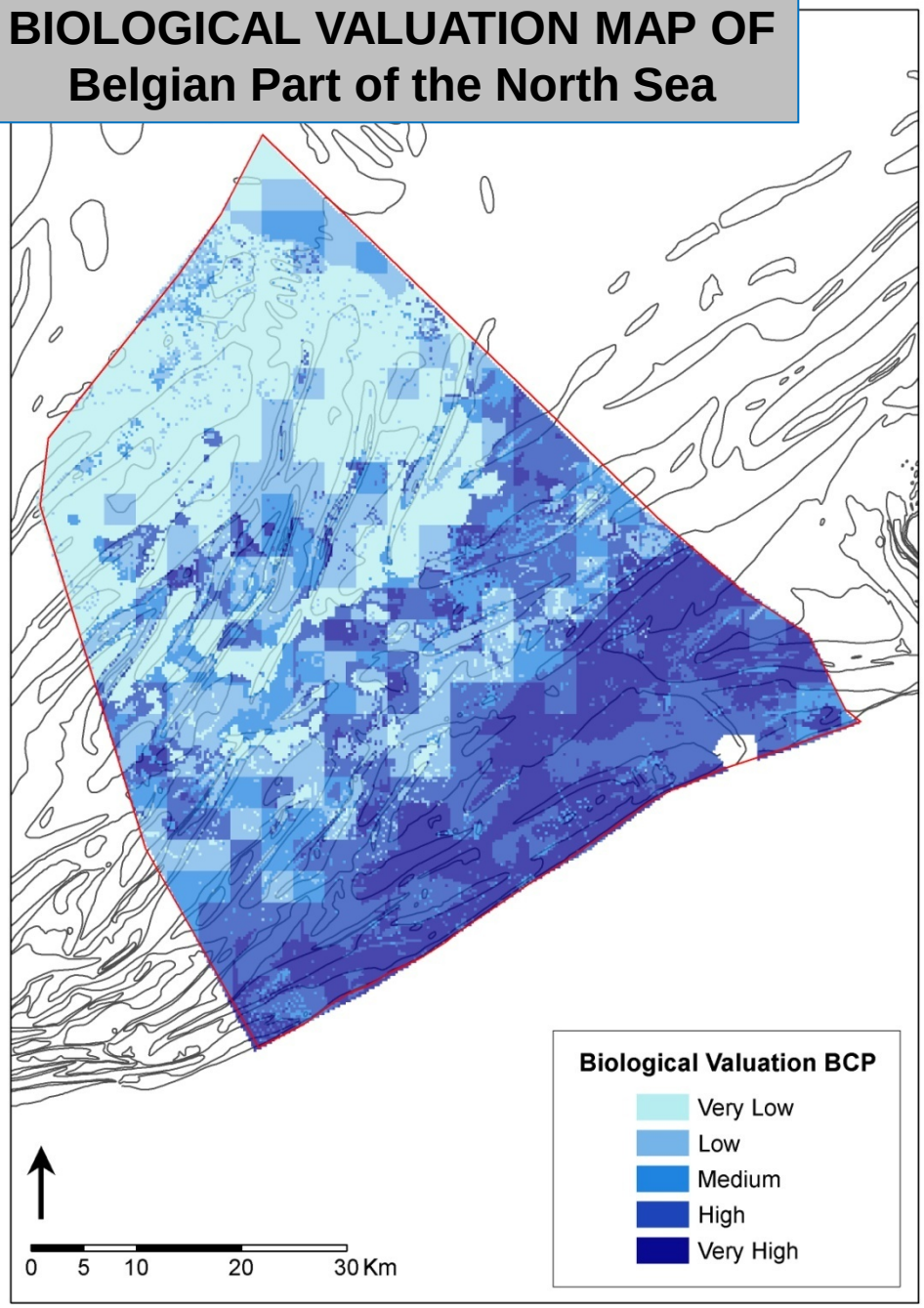




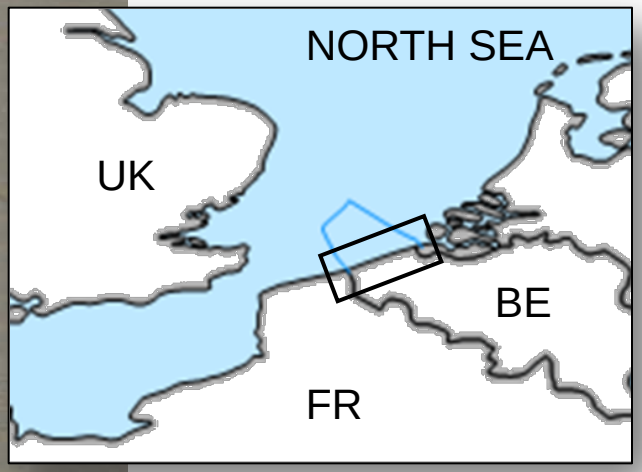


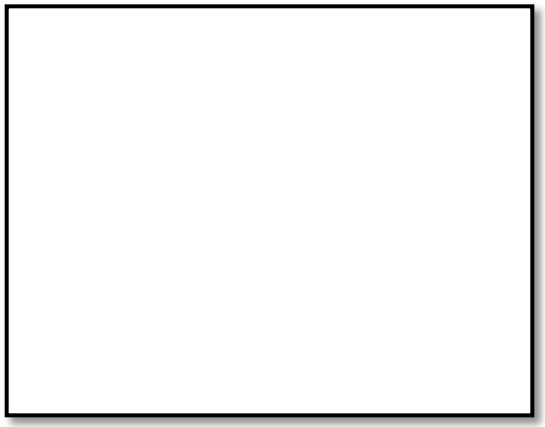


BIOLOGICAL VALUATION MAP OF Belgian Part of the North Sea



Marine Biological Valuation
→ Belgian coastline ???





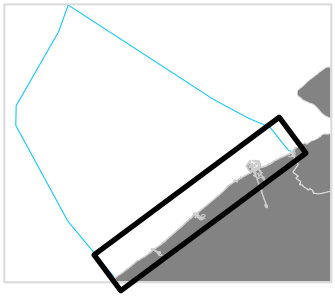
- Subzones = raster of fixed width
  → **250m =** 463 subzones: benthos
  → **3km =** 42 subzones: highly mobile species
- Biological data: from 1995 to 2011
- Data coverage:

	# of Subzones with data (%)
MACROBENTHOS	124 (27%)
EPIBENTHOS	11 (2%)
HYPERBENTHOS	14 (3%)
AVIFAUNA	10 (24%)
TOTAL VALUATION	**216 (47%)**

Zwin

Baai van Heist

Oostende



Nieuwpoort

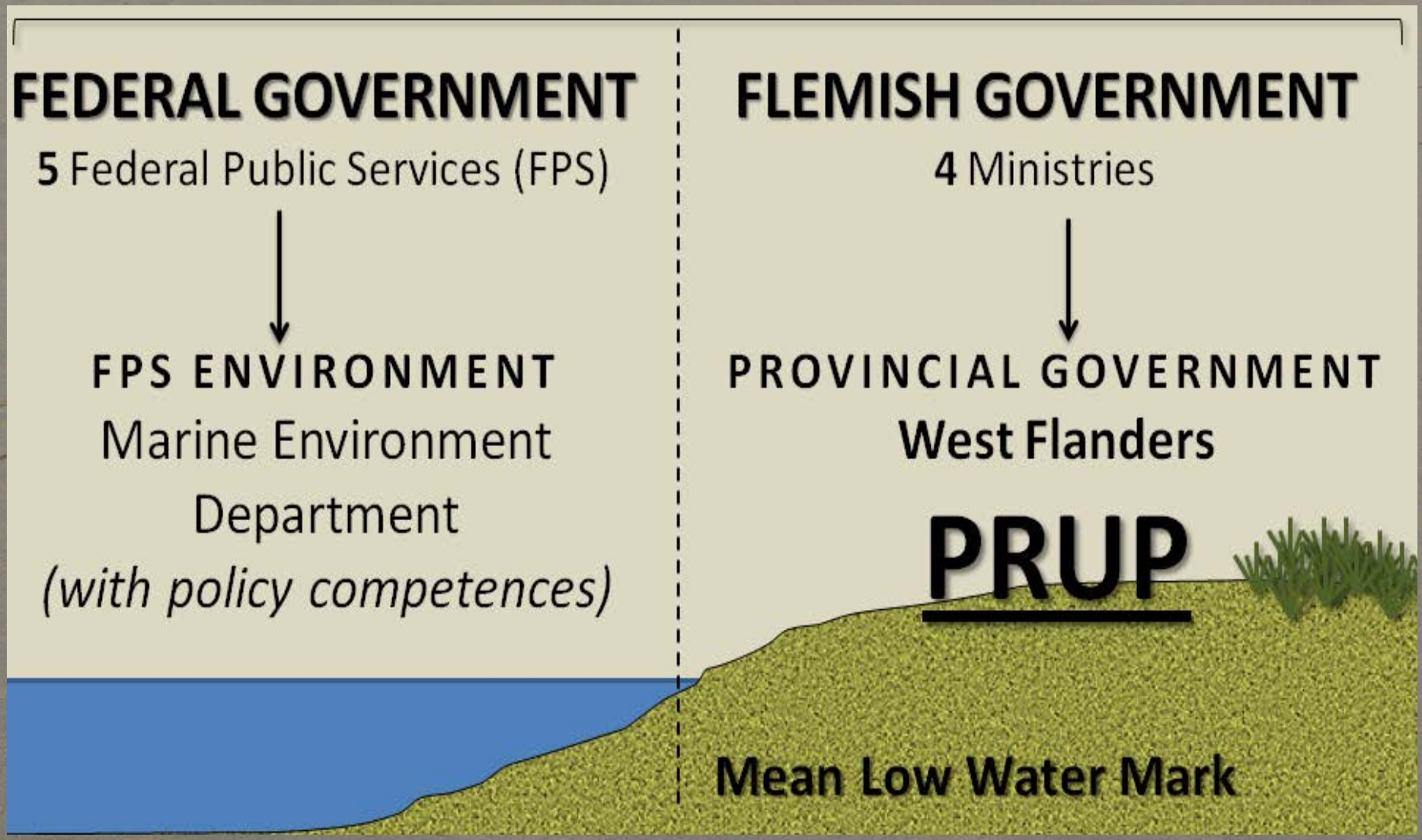
De Panne

Zwin

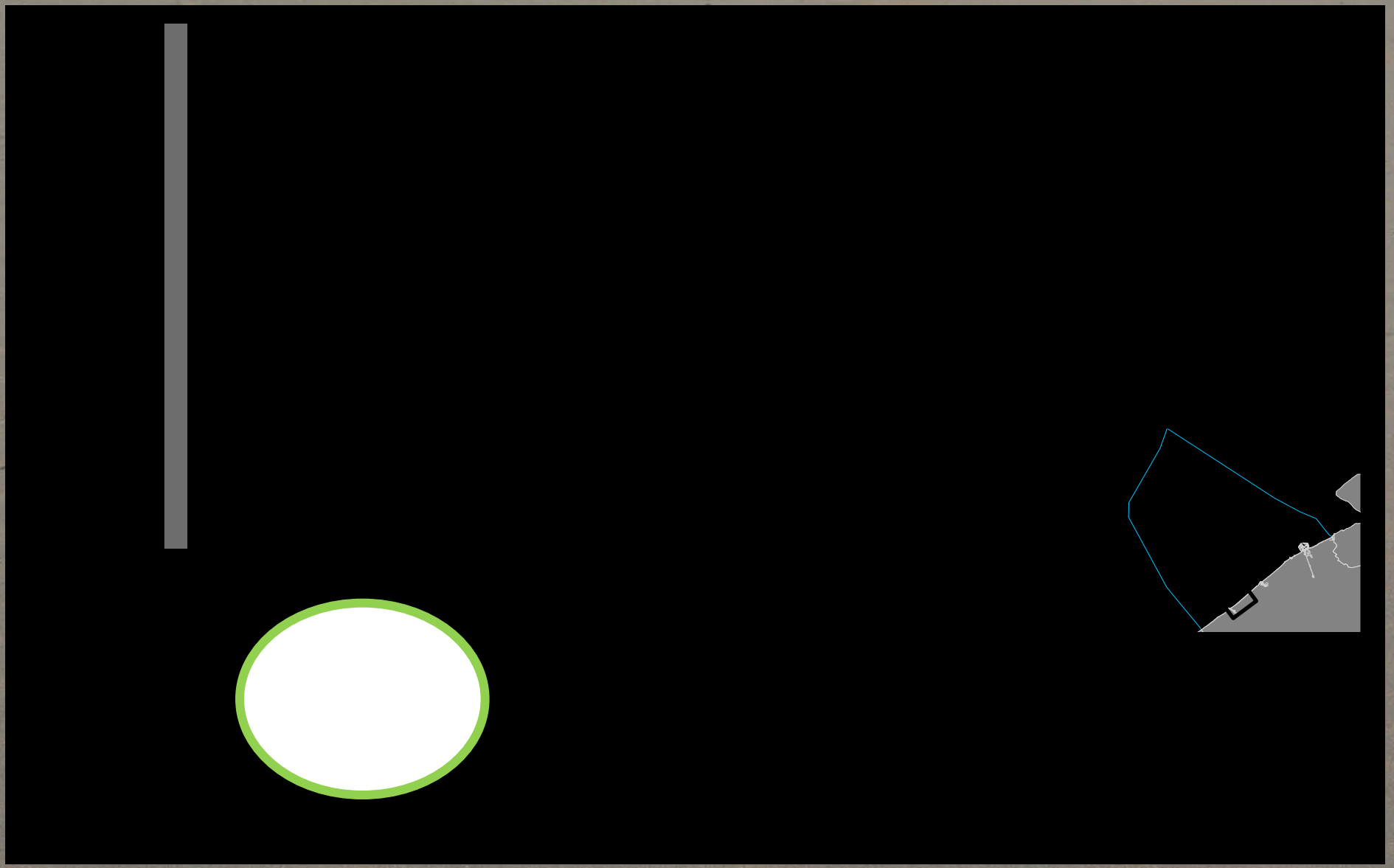
Heist

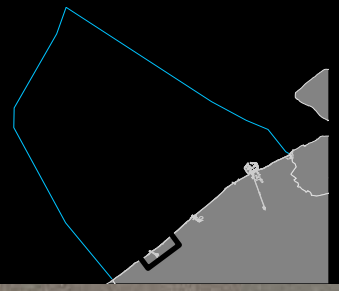
De Panne

Applications of BVM: Legal perspective

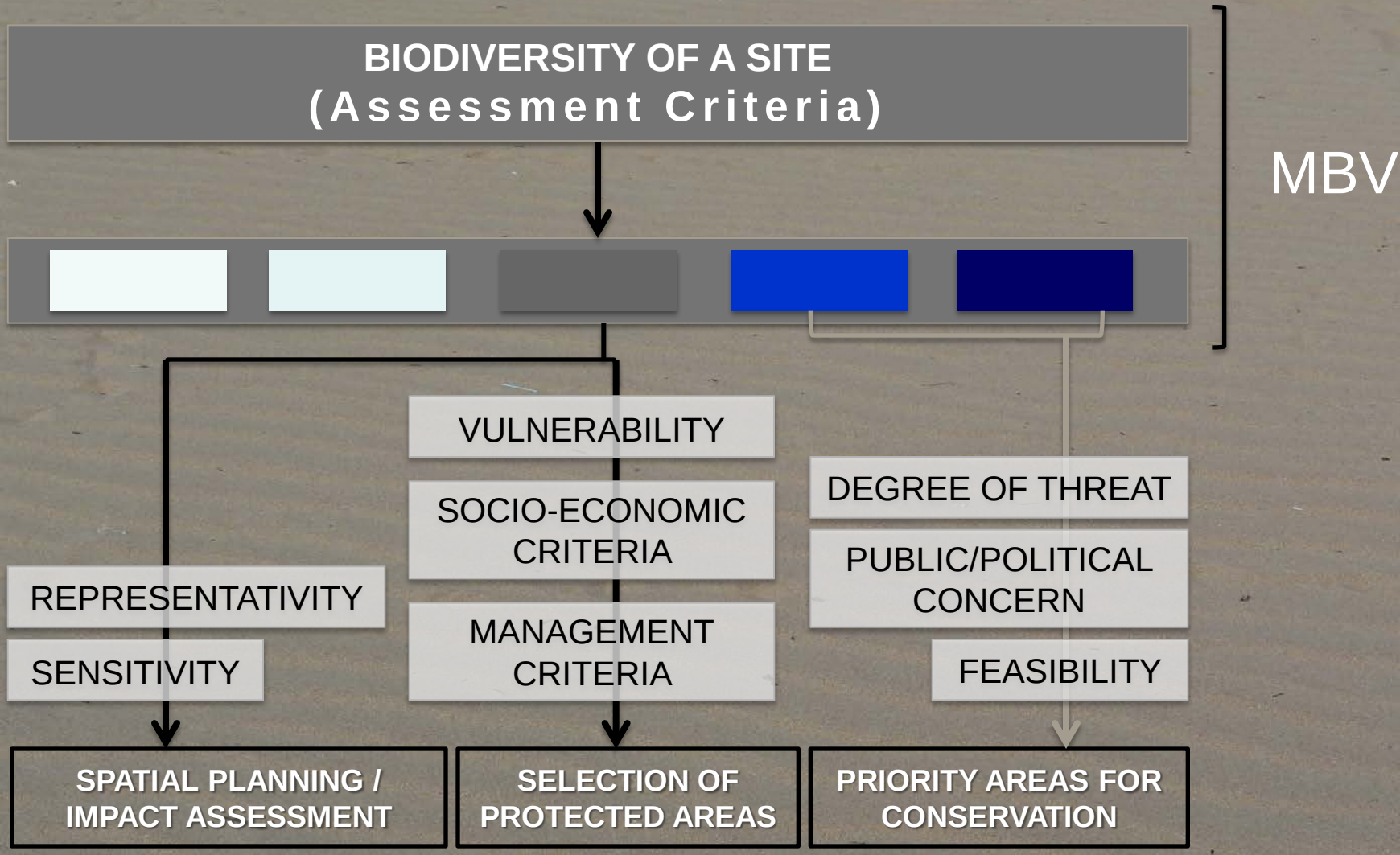


Applications of BVM: Beach nourishment





Applications of BVM: Nature conservation



DEROUS *ET AL* 2007

Conclusions

MBV is flexible, integrative and promising!

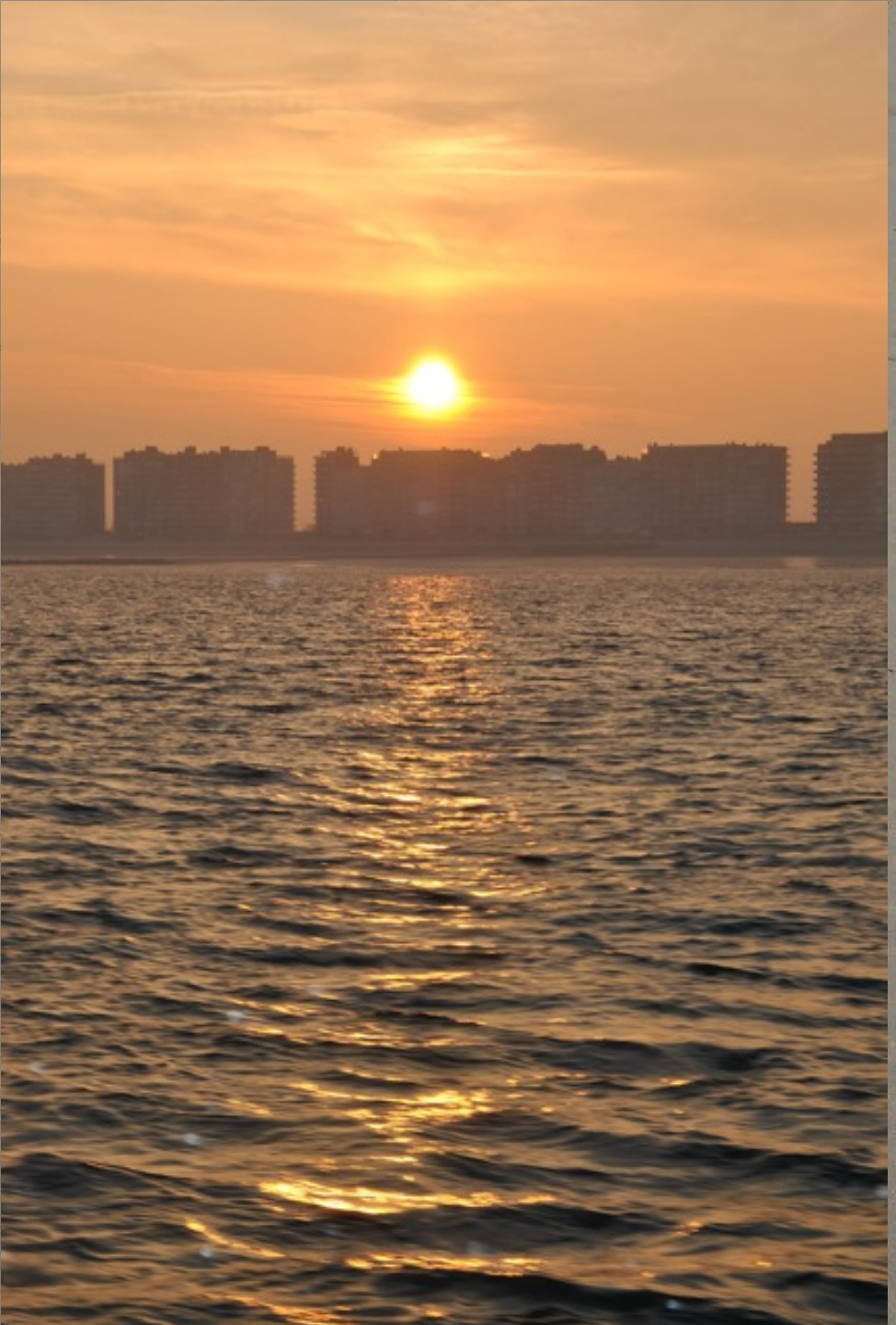
- ✓ Future MBV of the Belgian coastline:

  More data and components

  Performed with experts

  Beach dunes

- ✓ MBV should be considered with other criteria under a decision-support system



Thank you for your attention

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Dr. An Cliquet,
Dr. Eric Stienen,
Dr. Steven Degraer,
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Organizational level of biodiversity	Valuation criteria	
	Rarity	**Aggregation-Fitness consequences**
Species/ population level - structure	- Is the subzone characterised by many **rare species**? - Is the subzone characterised by high abundances of **rare species**? - Are there habitats formed by **keystone species** present in the subzone? - Are there certain **indicator species** or **indicator conditions** present in the subzone? - Is the abundance of an **umbrella species** high in the subzone? - Are there ecologically significant **(keystone) species** with a controlling influence on other species present in the subzone?	- Is a **high percentage of a species population** located within the subzone? - Is the **abundance** of a certain species very high in the subzone (= is there a concentration/ aggregation of the species in the subzone)? - Is the subzone characterised by **high counts of many species**? - Is a **species** (with an otherwise restricted **distribution** within the study area) present in high densities within the subzone? - Is the abundance of **focal species** (as a surrogate for biodiversity in general?) high in the subzone?
Species/ population level - processes	- Is the species **retention** high in the subzone?	- Are there important **migration routes** for certain species located within the subzone? - Are there sites present in the subzone that provide **refuge** during adverse conditions? - Are there **wintering/resting/ feeding sites** located in the subzone? - Are there critical (key) **sites for reproduction (spawning/breeding)** present in the subzone? - Are there critical (key) **sites for recruitment (nursery/rearing)** present in the subzone?
Community level - structure	- Are there **distinctive/unique communities** present in the subzone (with respect to their species richness and abundance)? - Are there **endemic species** present in the subzone? - Are there unique **biomes** present in the subzone? - Is there a high level of ecological **heterogeneity** present in the subzone?	- Is the **species richness** in the subzone high? - Are there species living in **symbiosis** with each other present in the subzone? - Is the total **biomass** high in the subzone?
Community level - processes		- Are there species living in **mutualism** with each other present in the subzone? - Is the natural **productivity** in the subzone high?
Ecosystem level - Structure	- Is the subzone characterised by a **complex topography** or **seabed morphology**? - Is the **substrate diversity** in the subzone high? - Is the subzone an outstanding example representing **significant geological processes** in the development of landforms? - Are there **distinctive/unique ecosystems** located in the subzone? - Are there subzones present which are critical for **nutrient cycling**? - Are there any **unique/distinctive oceanographic features** (with respect to temperature, salinity, stratification, anoxia, natural boundaries,…) located in the subzone?	- Are there oceanographic features located in the subzone, which are causing species to aggregate (e.g. **natural refugia**)?
Ecosystem level - processes	- Are there **upwelling** sites located in the subzone? - Are there any **unique/distinctive oceanographic processes** located in the subzone (e.g. unique tidal systems, gyres, entrainment, natural erosion and deposition, other natural disturbance…)?	- Are there oceanographic processes occurring in the subzone, which are causing species to aggregate (e.g. **nutrient retention**, **upwelling**,…)?

Abundance of Ecological Significant Species (ESS)

- ✓ Select ESS
- ✓ Create 5 density classes (1 to 5)
- ✓ Class 1 = no EFS
- ✓ Repeat for each EFS, and average

1= Top predators (for benthos only)

2= Important food source

3= Species present in conservation lists
(IUCN Red List, Bird Directive Annex I, Bern Convention, Belgian Birds Red List)

4= Species most exclusively linked to the presence of *L. conchilega*

5= Most important species of the *A. alba* community

6= Coastal birds occurring in > 1% of the Belgian coastal zone

S. squamata

L. conchilega

A. marina

J. falcata

O. fusiformis

Macrobenthos

Avifauna