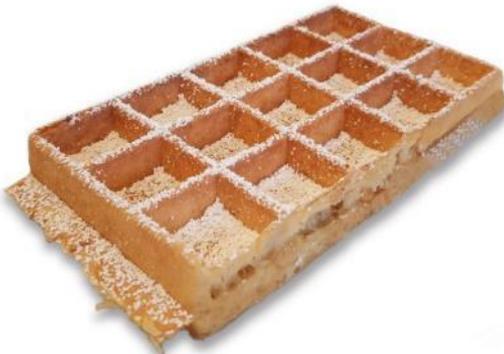




Offshore wind in Belgium: licensing and monitoring

Bob Rumes, R. Brabant, L. Vigin & S. Degraer

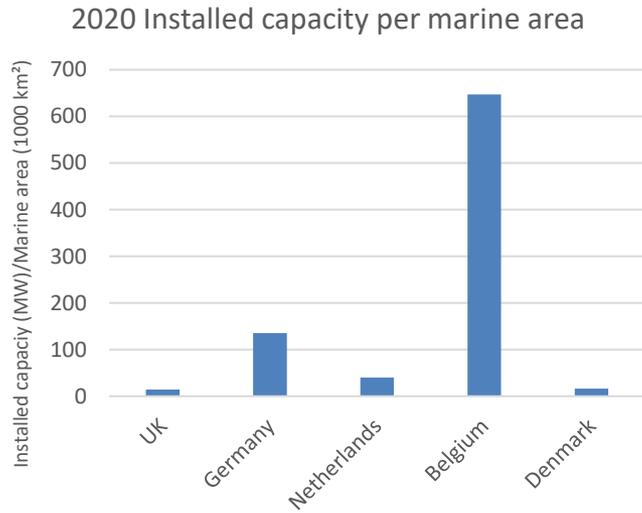
Belgium?



Belgium!

Cumulative installed capacity (MW) and number of turbines by country

UK	42%	10,428 MW / 2,294 Turbines
Germany	31%	7,689 MW / 1,501 Turbines
Netherlands	10%	2,611 MW / 537 Turbines
Belgium	9%	2,261 MW / 399 Turbines
Denmark	7%	1,703 MW / 559 Turbines
Others	1%	322 MW / 112 Turbines



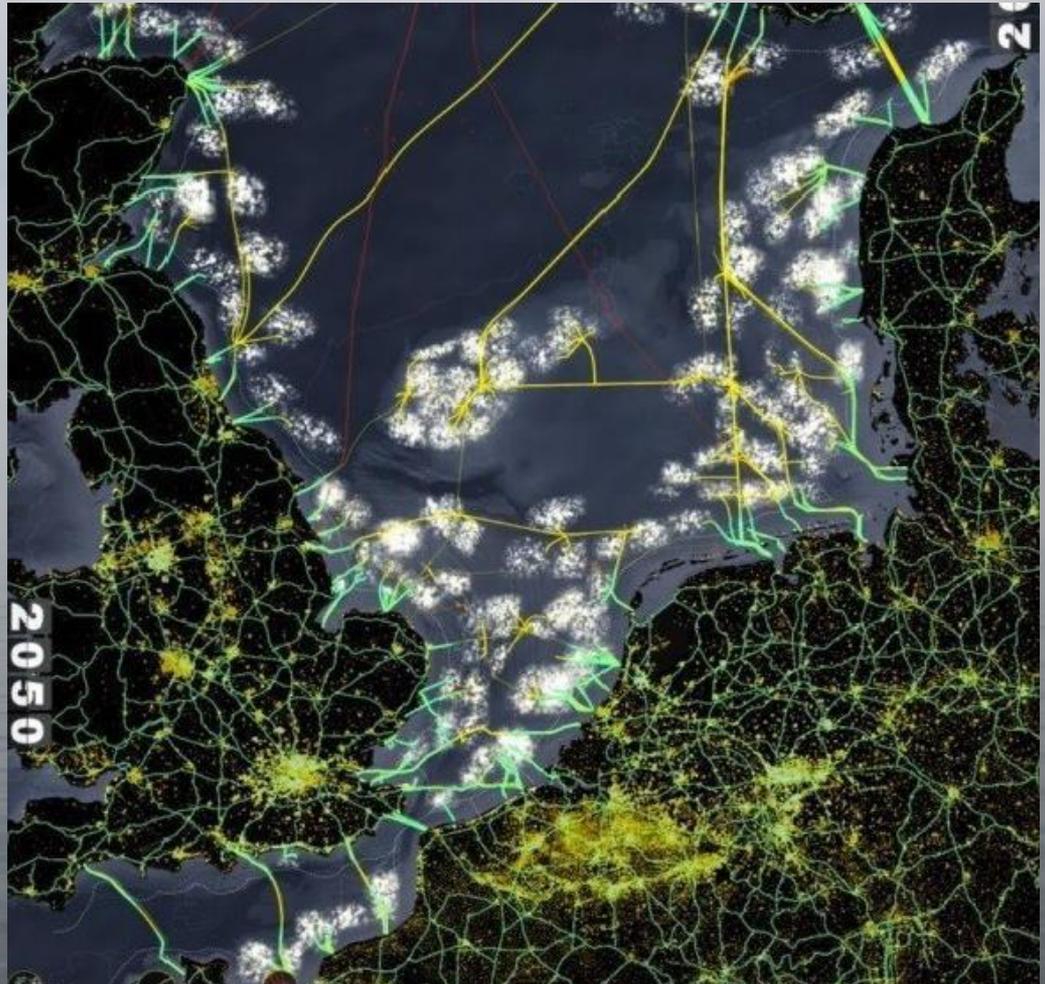
TOP 5 REPRESENT
99%
OF ALL CAPACITY
CONNECTED

Source: WindEurope



~~Belgium~~ Europe!

+ 250 GW by 2050
Grid reinforcement
Grid integration
Energy Storage

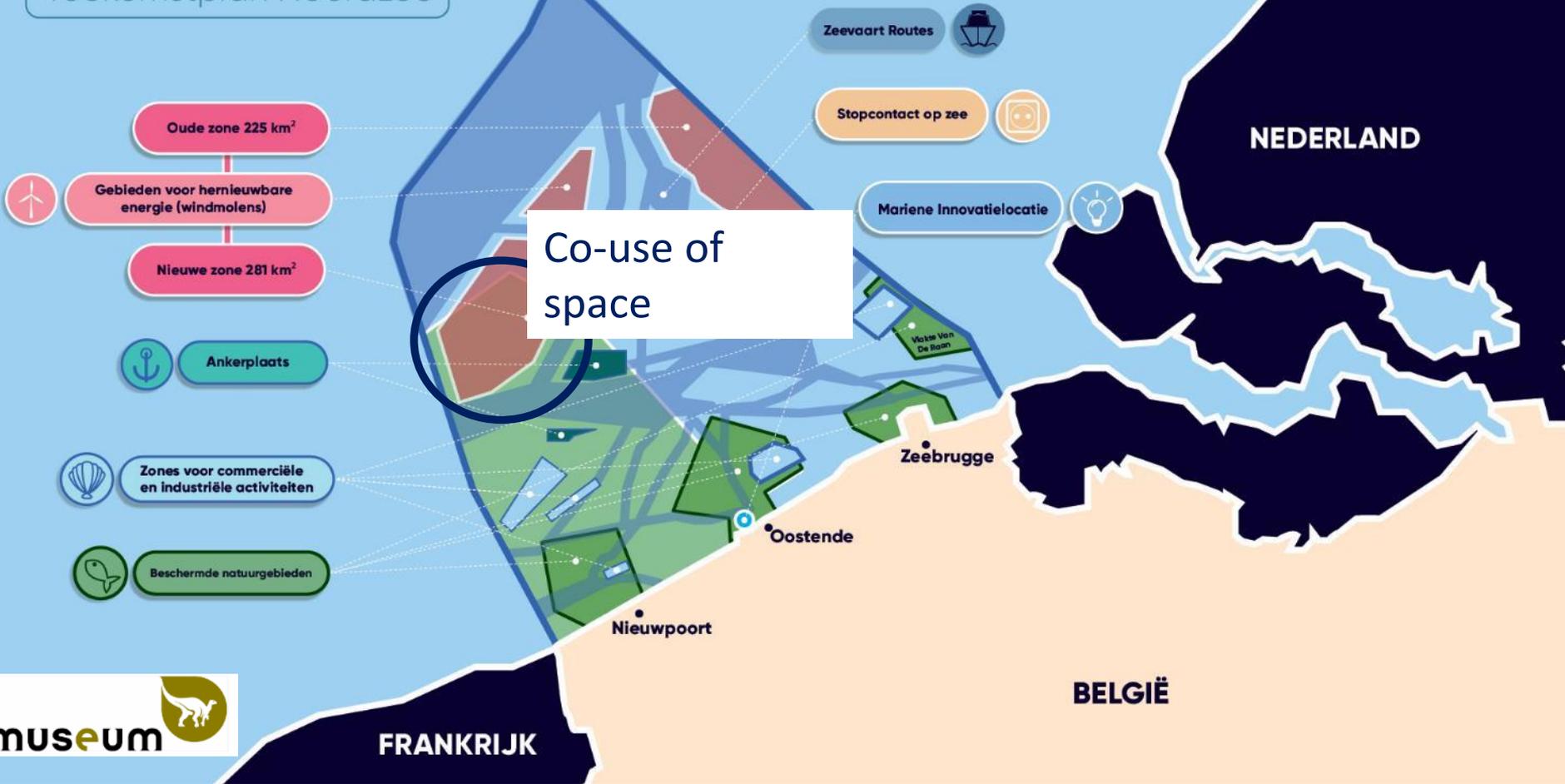


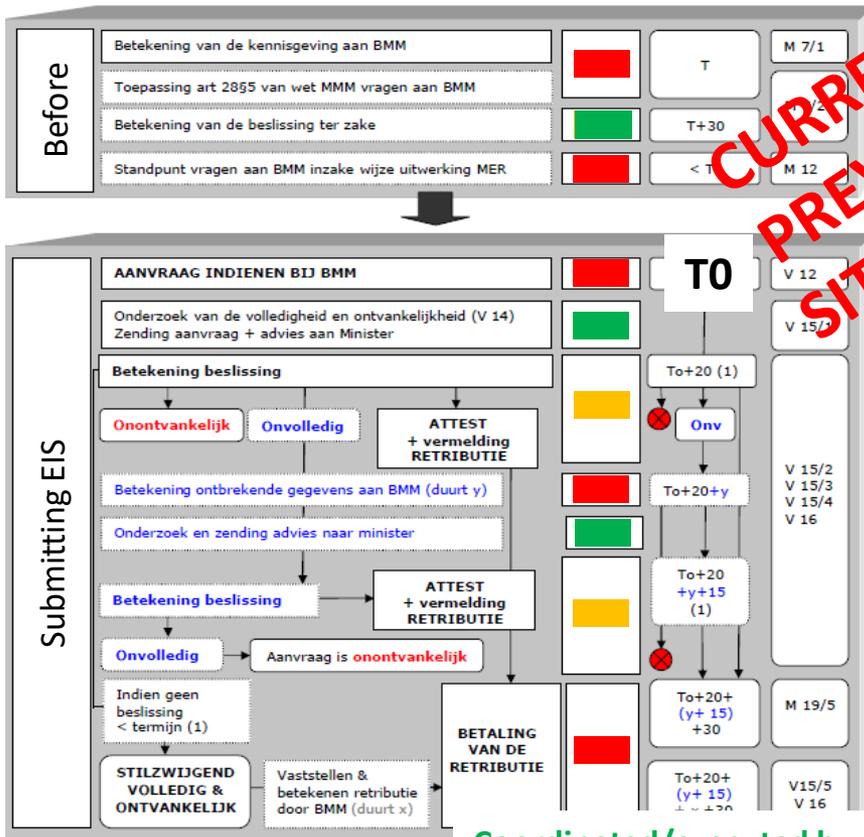
Licensing

Procedures and issues



Toekomstplan Noordzee



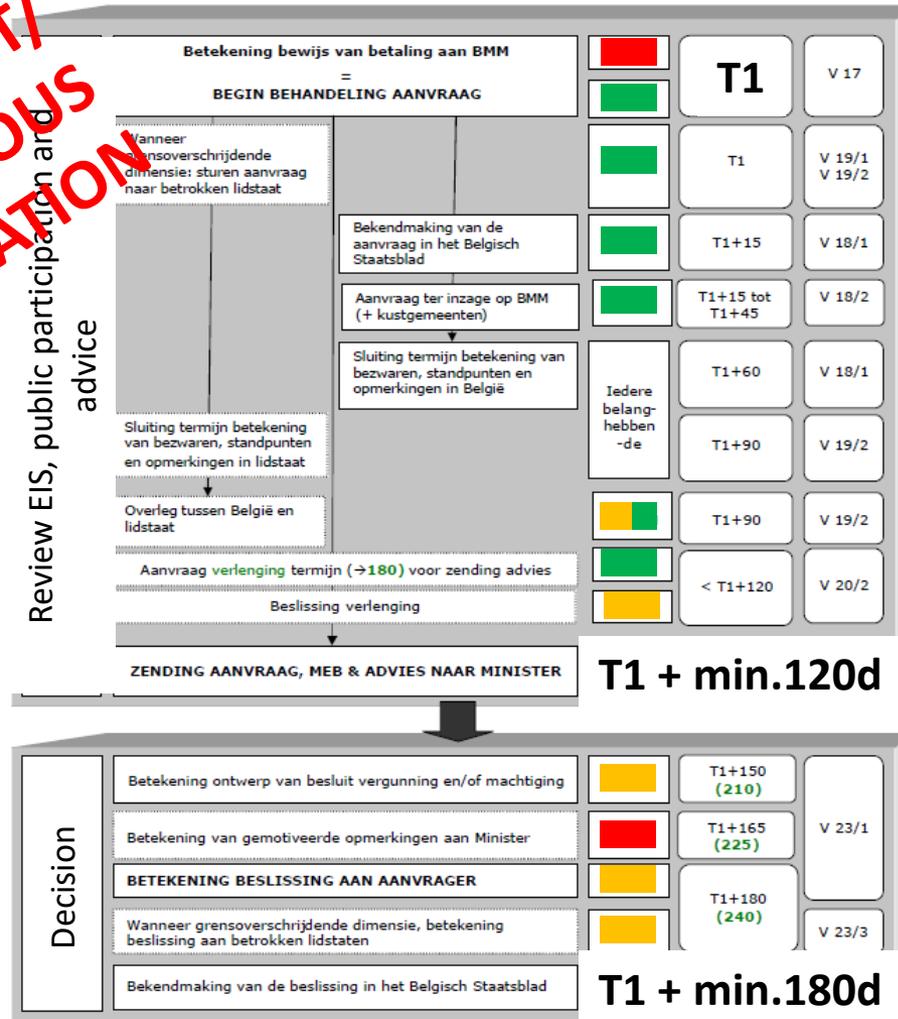


Coordinated/executed by Advising authority

Post-decision monitoring

- Developer
- Advising authority
- Ministry

CURRENT/ PREVIOUS SITUATION



Review EIS, public participation and advice



Monitoring

The WinMon.BE philosophy

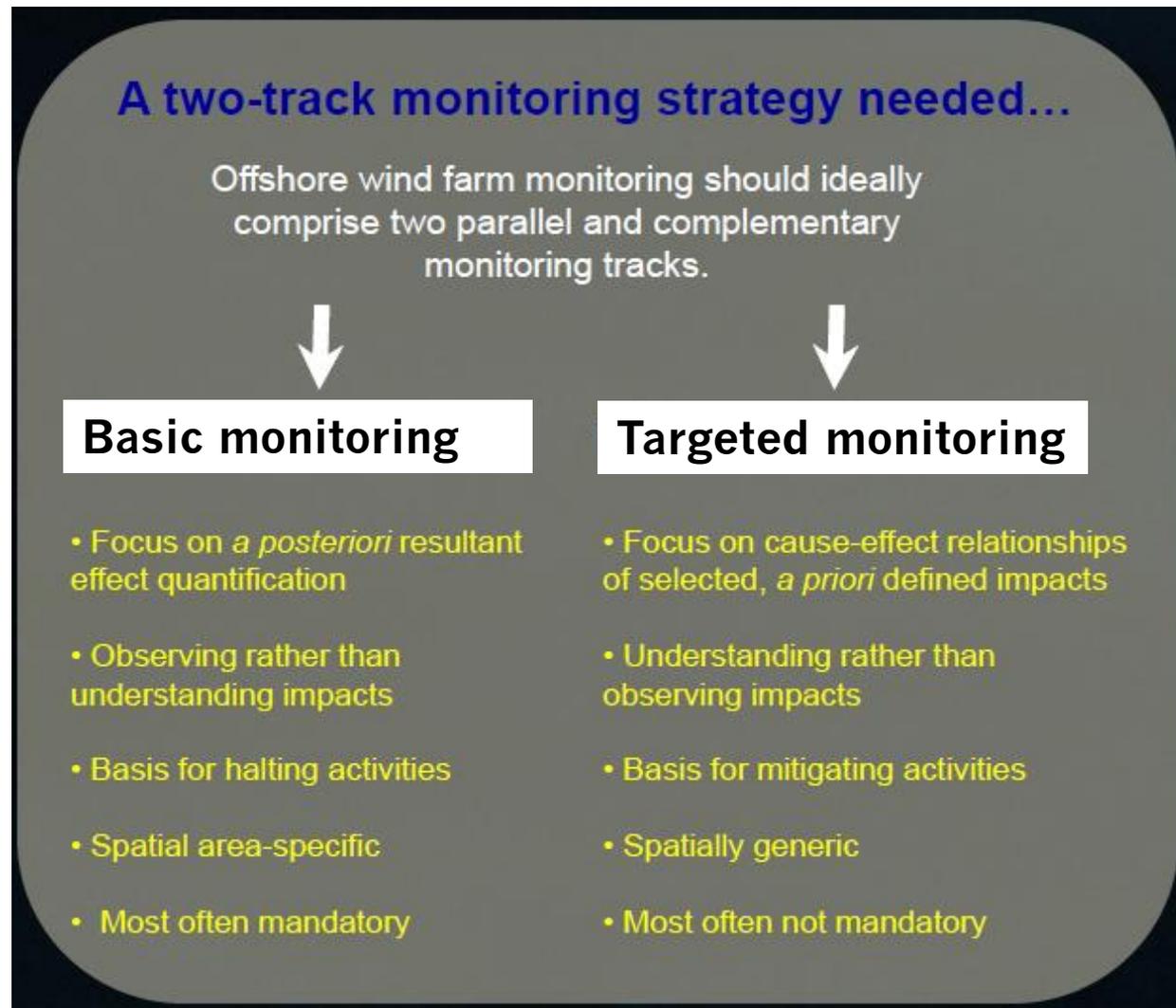


1. Observing and understanding impacts
2. Coordinated long-term program
3. Adaptive management
4. Regional (international) coordination of efforts
5. Public right to environmental information



1. Observing and understanding impacts

1. Combine *in situ* BACI and gradient design data collection, *in situ* experiments and lab experiments
2. Selection of most pertinent operational questions.
3. Smart and well-considered data collection needed.





1. Observing and understanding impacts

**Offshore wind turbines:
The kingdom of suspension feeders**

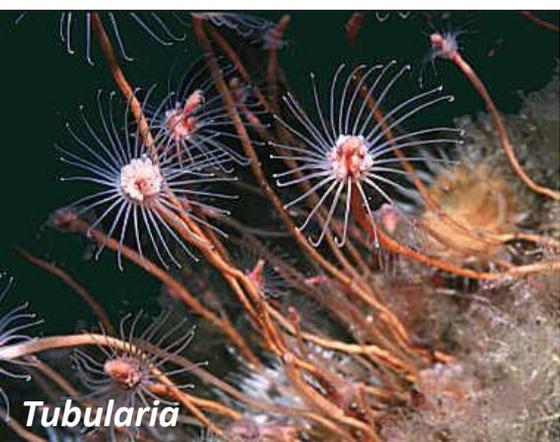
Jassa herdmani



Brittle star



Tubularia



Anemone



Blue mussel





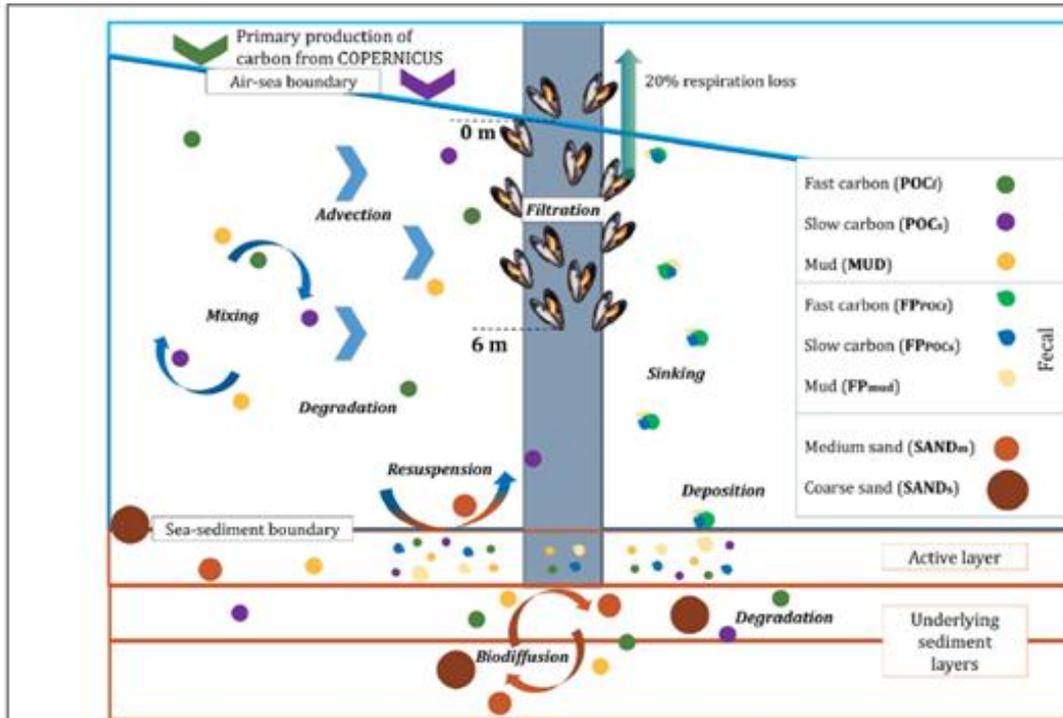
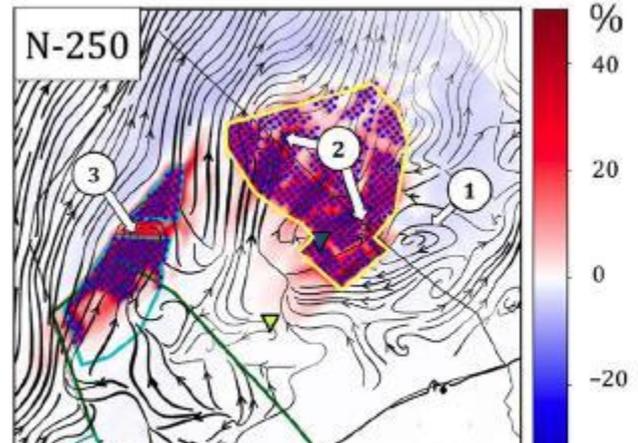
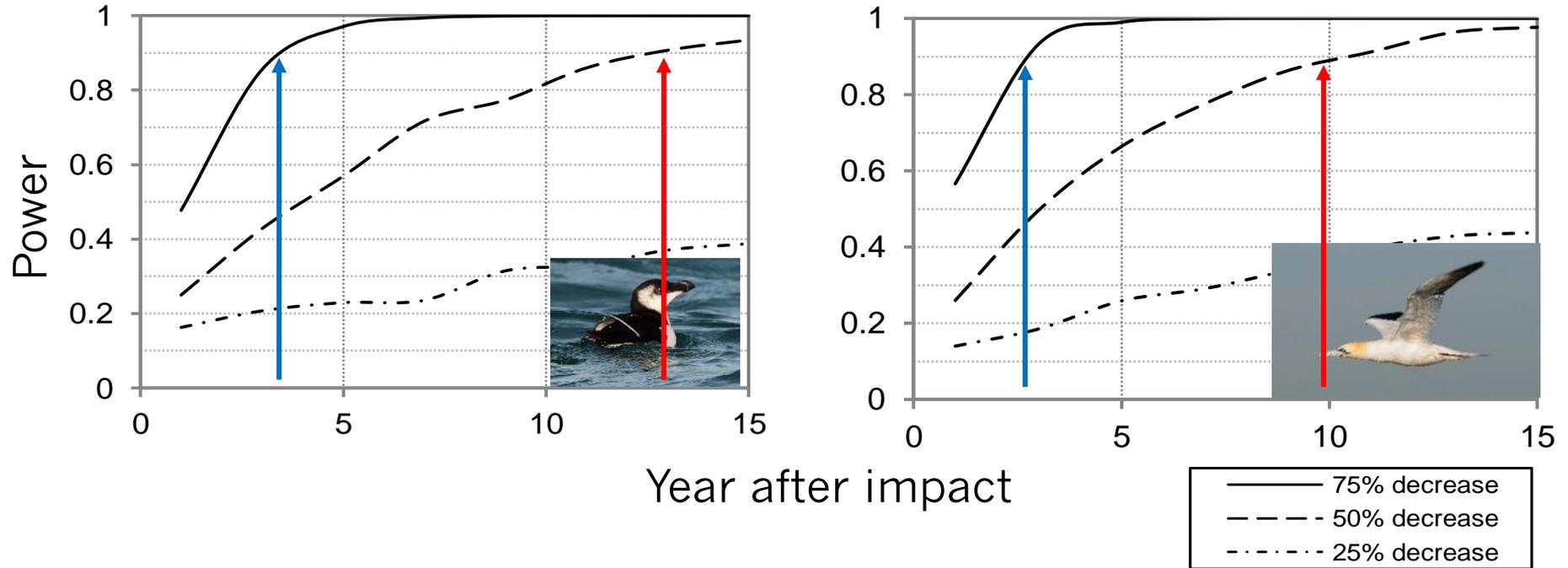


FIGURE 3 | Schematic representation of the carbon and mineral particle model including the filtration model. The filtration model describes the transform organic and inorganic materials into fecal pellets that sink to the bottom to feed the sedimentary compartment.



2. Coordinated long-term program: increase power



- power to detect reduction in seabird densities within monitoring framework was low
- But... not being able to detect an effect \neq no effect!
- Increase power \rightarrow increase monitoring effort and/or monitor for longer period

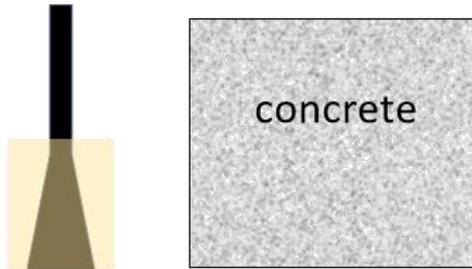


2. Coordinated long-term program

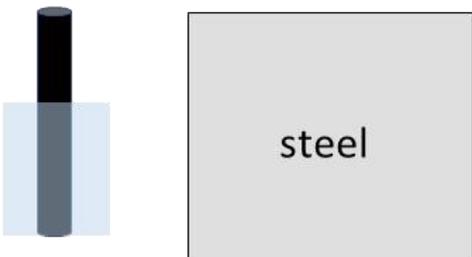
Y_0

Installation

Thorntonbank - 2008 



Bligh Bank - 2009 



Y_{1-7}

Intermediate succession

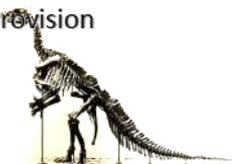
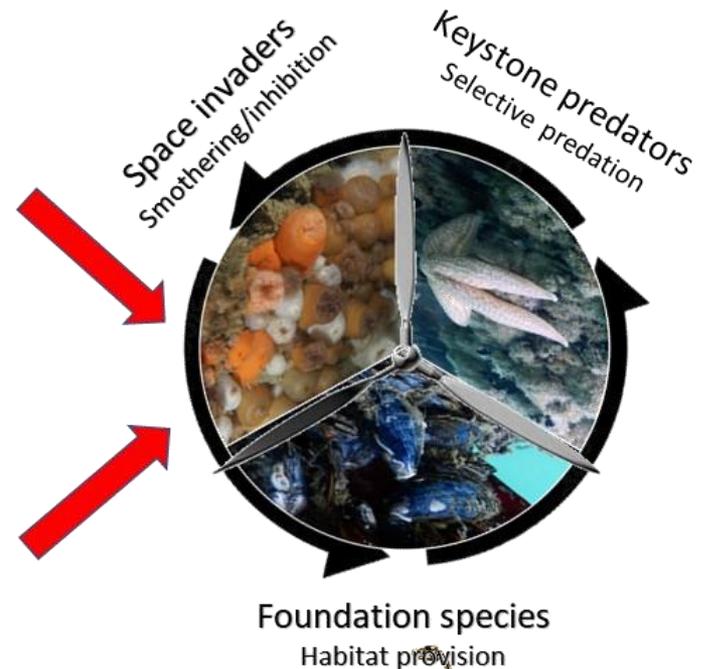


≠



$Y_{8-...}$

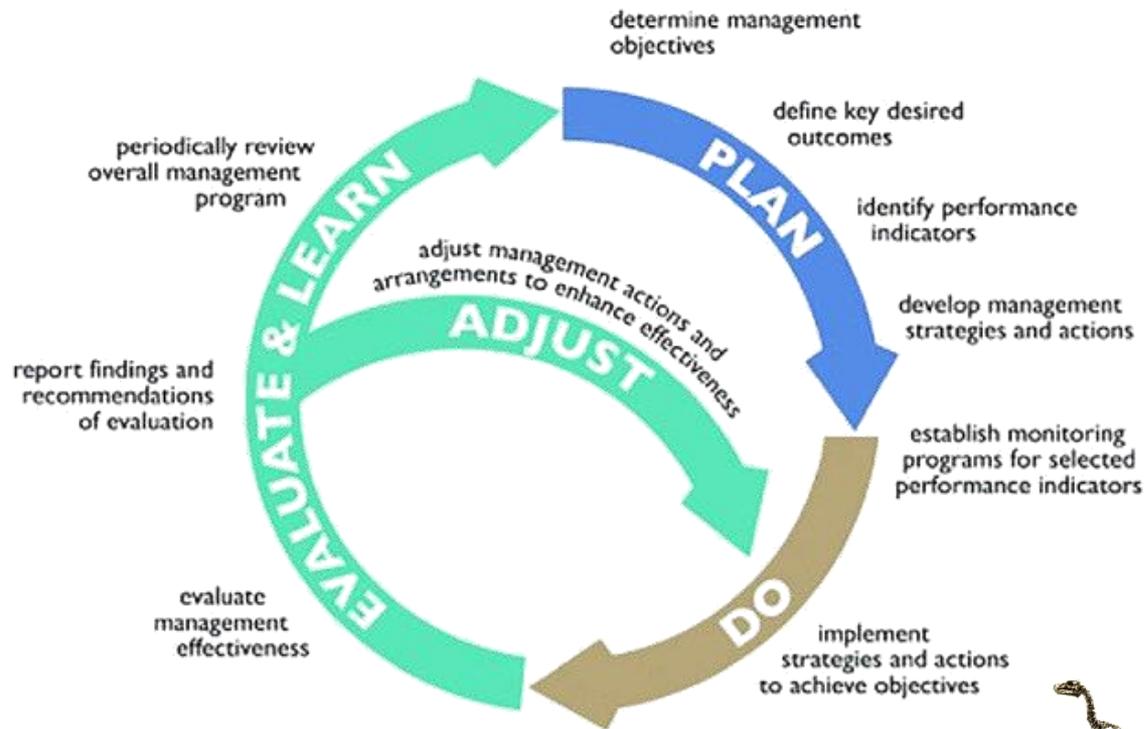
Multiple similar stable
climaxes driven by



3. Adaptive management

Periodic review of permit conditions and monitoring strategy

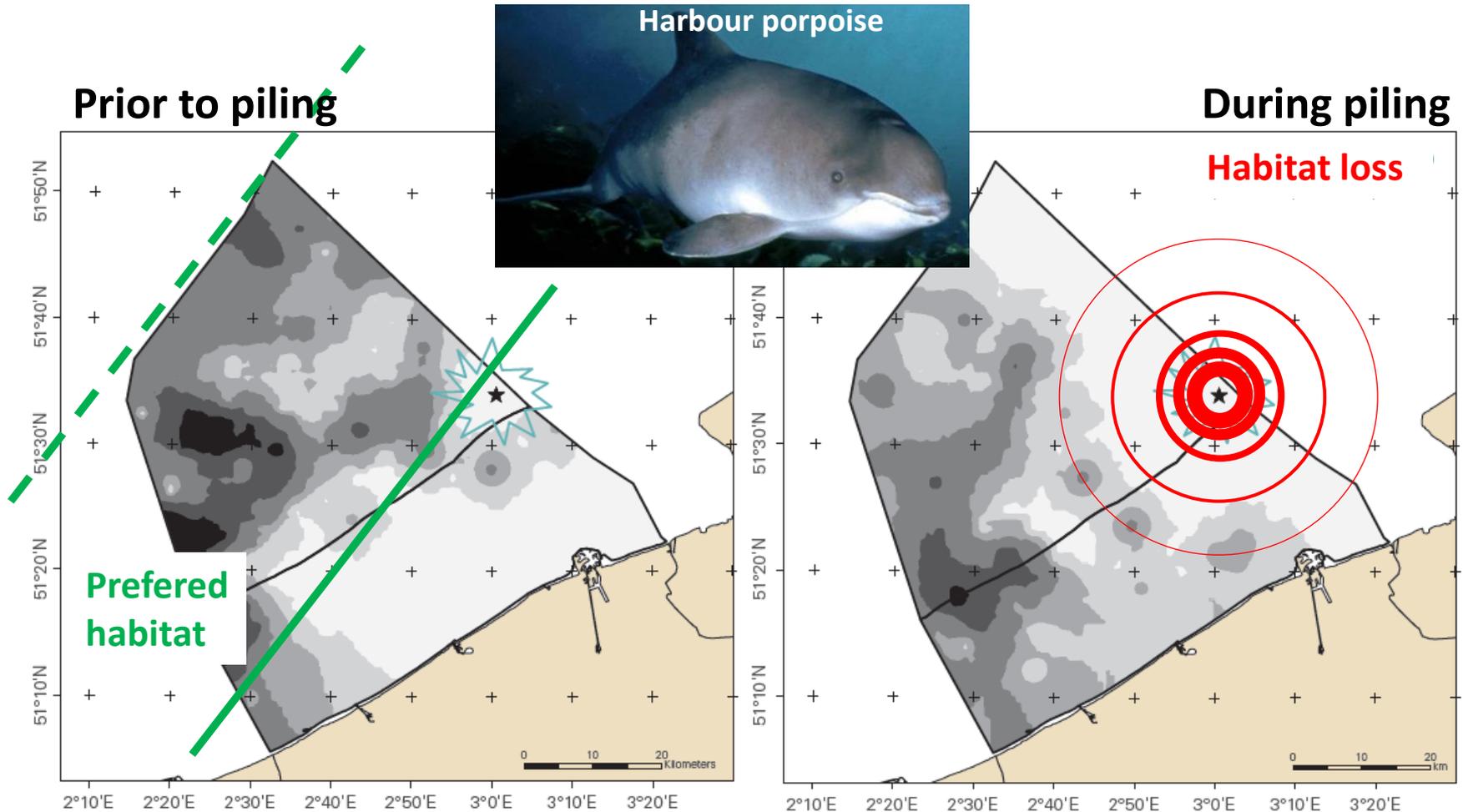
The adaptive management cycle



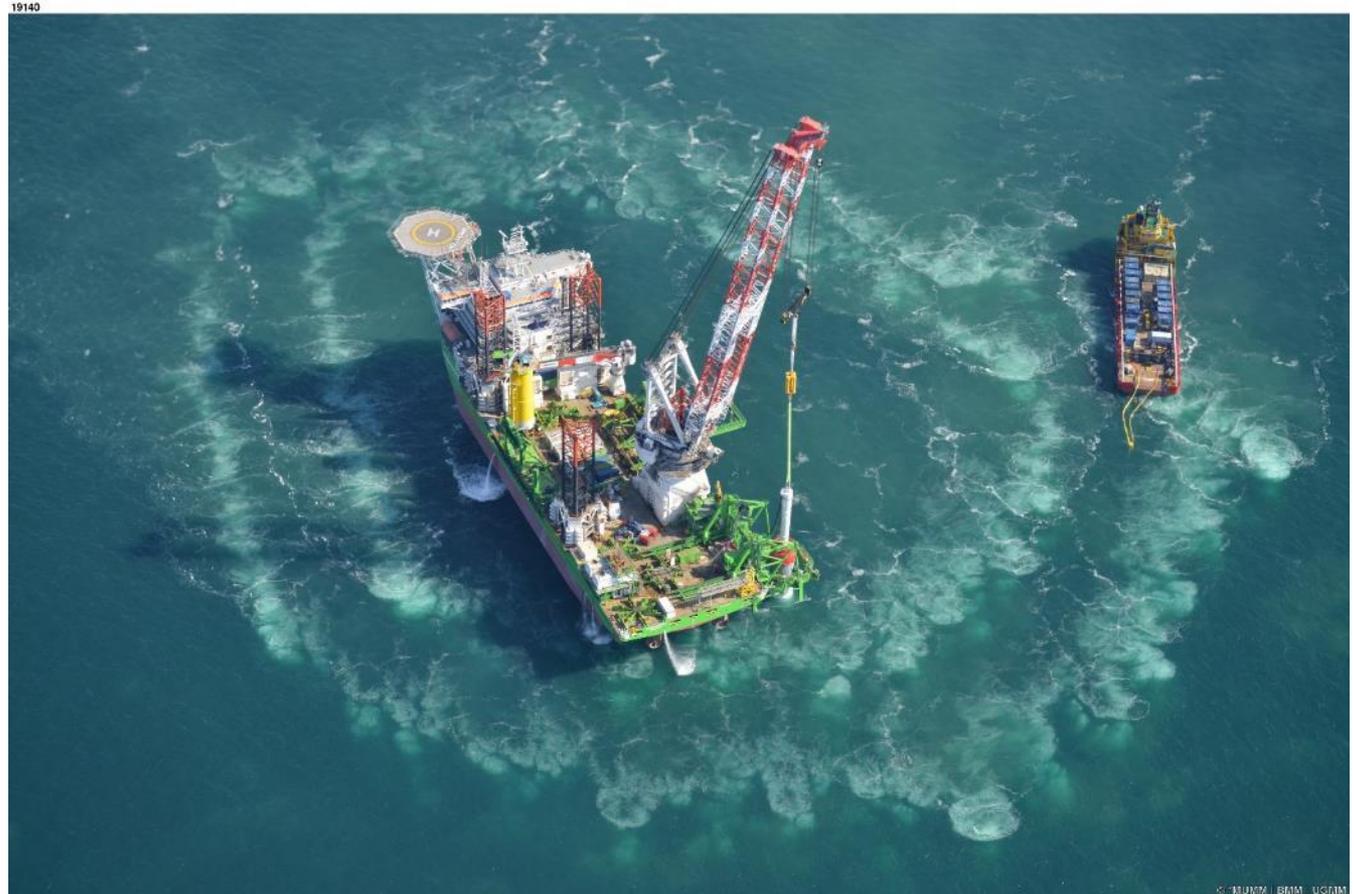
Source: DPI/PWE 2014 after Jones 2005, 2009



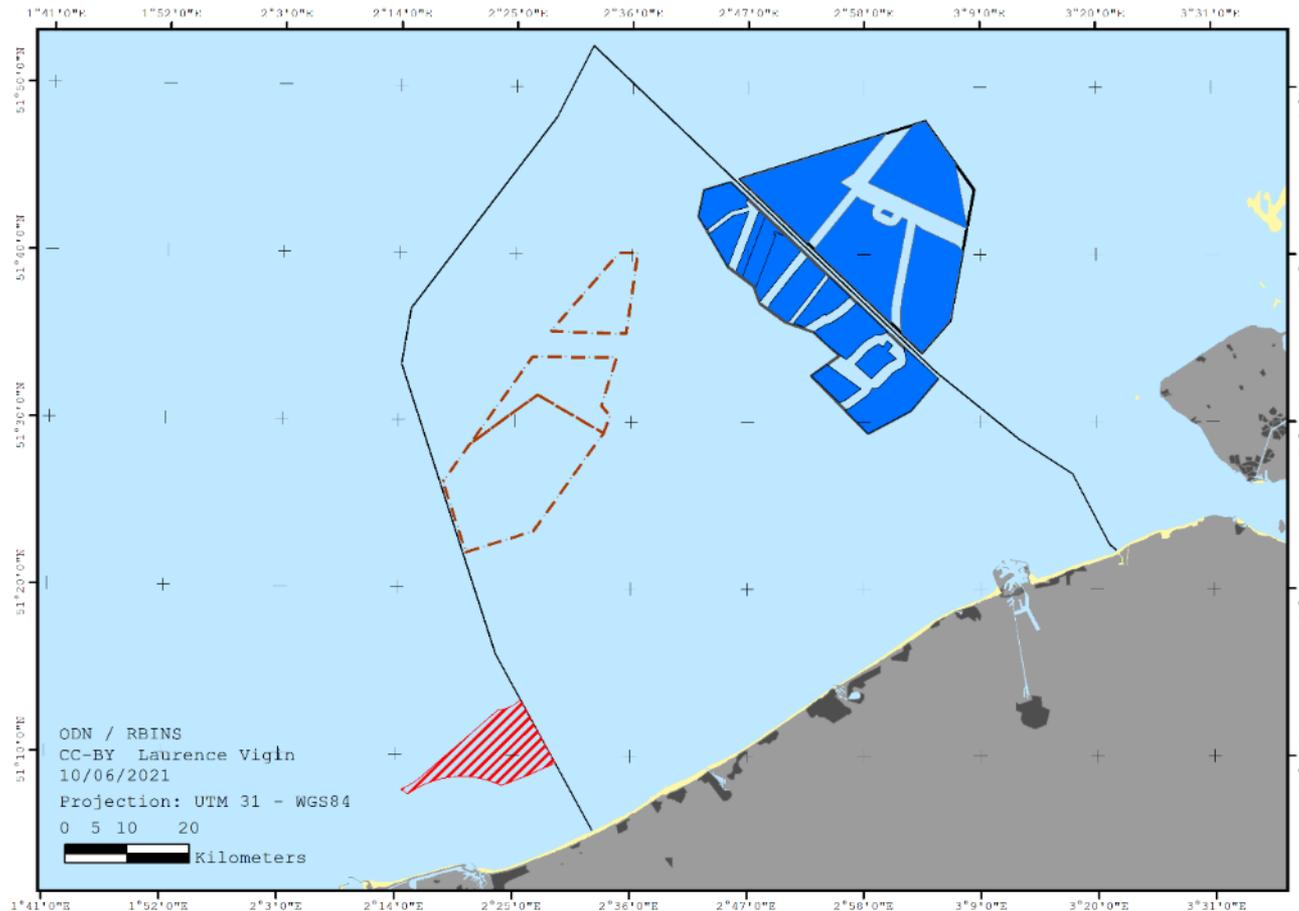
3. Adaptive management



3. Adaptive management



4. Regional (international) coordination of efforts



4. Regional (international) coordination of efforts



**North Seas Energy
Cooperation**

CEAF

SEA  NSE



Winmon.be

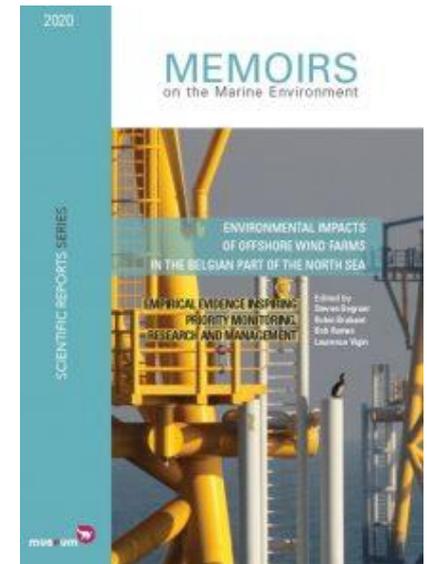
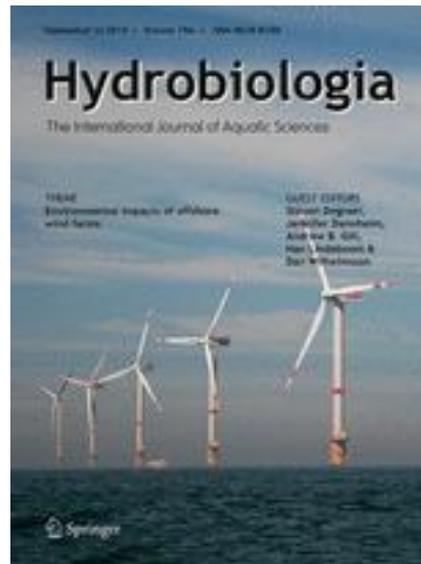


5. Public right to environmental information

- All environmental data available through a data-platform



- Yearly reporting in freely available and widely distributed publications



A photograph of an offshore wind farm at sunset. The sky is a mix of dark blue and orange, with the sun low on the horizon. Numerous wind turbines are silhouetted against the sky. In the foreground, the dark structure of a ship or platform is visible on the right side, with a rope hanging down. The water is dark and calm.

Thank you for your attention!

These reports are freely available through our website
or find us on researchgate (WinMon)