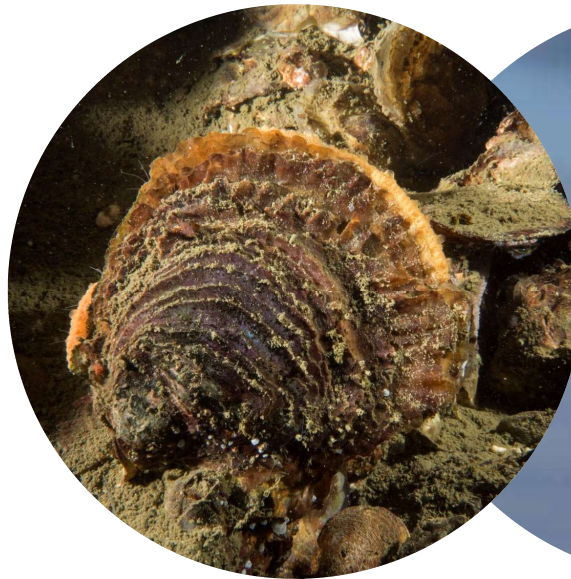


# Ecology in relation to the energy ambitions

An overview - EBN workshop 09/02/2023

**Josien Steenbergen**, Mardik Leopold, Floor Soudijn, Steve Geelhoed, Oscar Bos, Sander Glorius, Luca van Duren\*

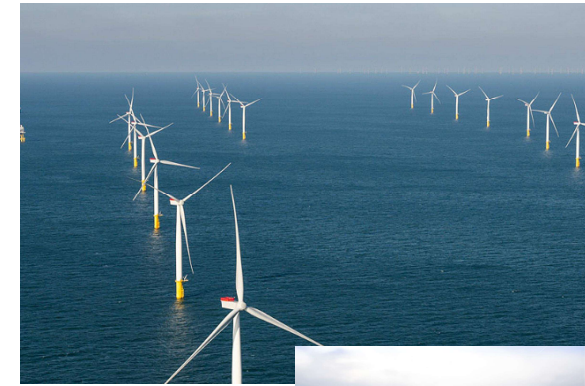
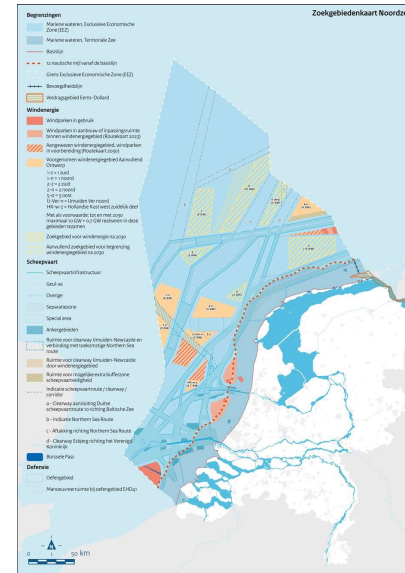
\* *Deltares*



# 1 North Sea. 3 ambitions



# Energy



Ecosystem  
=  
Healthy &  
Resilient



# Nature



# Food



MFSD



# Energy v.s. Ecology

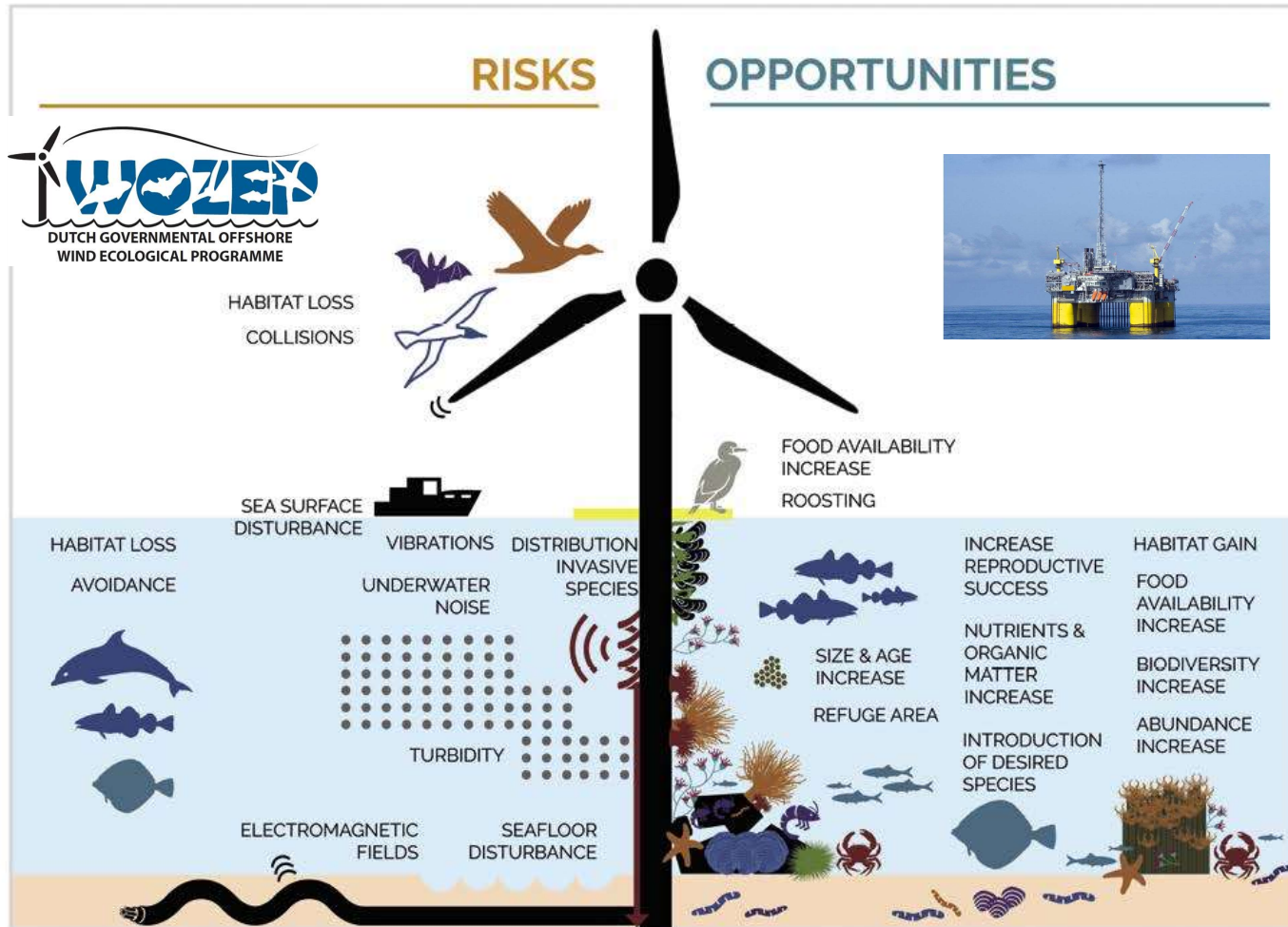


Foto Tennet, uit Schuttevaer

Energy Hubs  
- Artificial Islands  
- H2 production

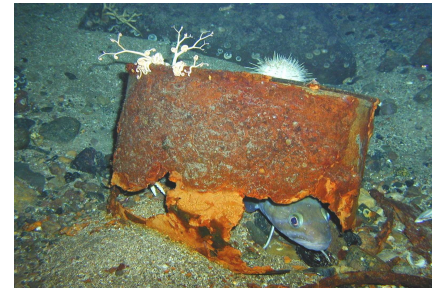
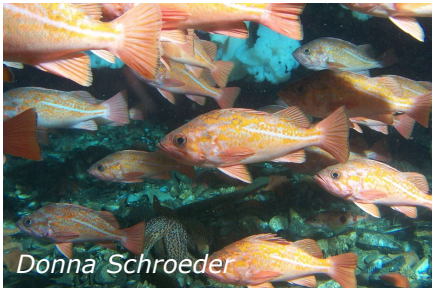


Sunlight



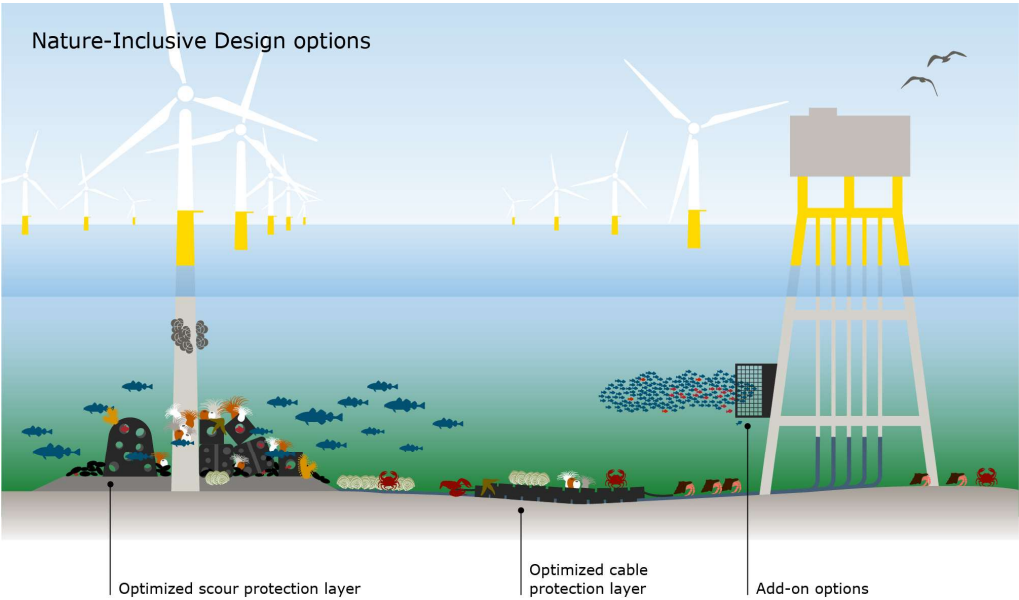
Algae

# Hard structures full of life









# Nature enhancement



Target species

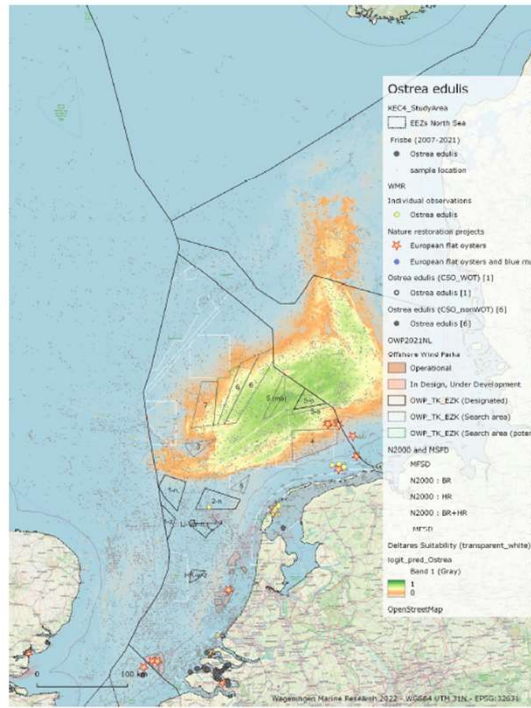
Threatened or declining species		Commercial species	
			
Atlantic cod & poor cod	European flat oyster	Edible crab	European lobster

Hermans et al. (2020). Nature-Inclusive Design: a catalogue for offshore wind infrastructure (<https://edepot.wur.nl/518699>) | Design: Wageningen University & Research 2020



# Research

### *Area suitability*



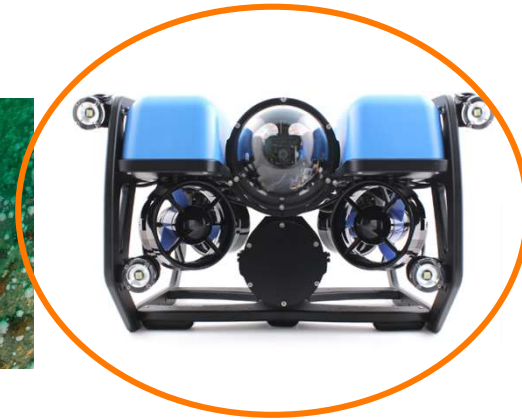
Map 1a. Flat-oyster (*Ostrea edulis*) Suitability Logit + point data.

*Ostrea edulis, Bos et al in prep*

### *Fish biodiversity (eDNA)*



## Biodiversity



### *Fish behaviour (tags)*



*oyster growth*

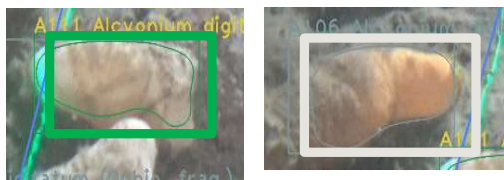




# Automatische kwantificatie van taxa in videomonitoring Klaverbank (RWS)

## Monitorregels

Positie tussen laserlijnen



Id's die **wel**  
meetellen  
(groen)

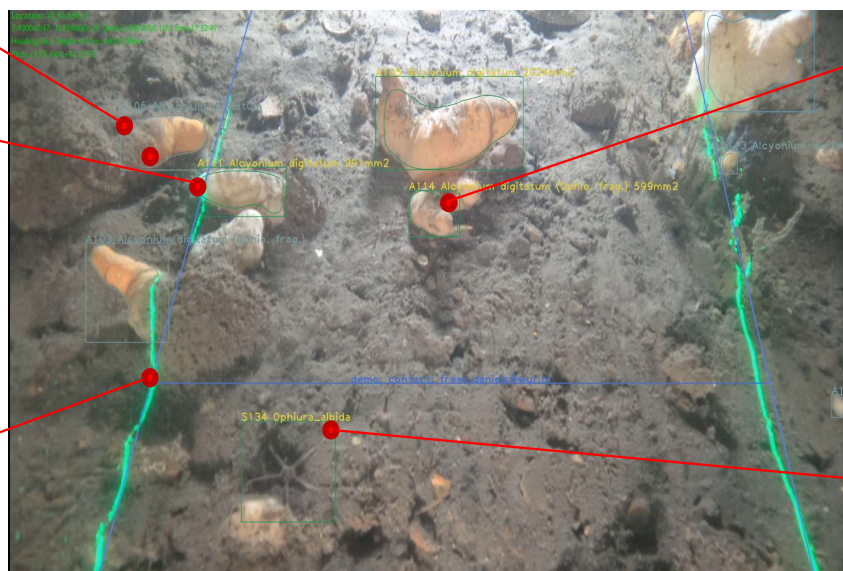
Id's die **niet**  
meetellen  
(grijs)

## Monitorregels

Detectie laserlijnen & horizontale lijn 1/3  
vh beeld



Frame uit demo-video



## kwantificeren

Berekening van het oppervlak



## kwantificeren

ID nr's voor het tellen van individuen



# OWF & impact Sea Mammals

## 1. Preparation phase: (seismic) location surveys

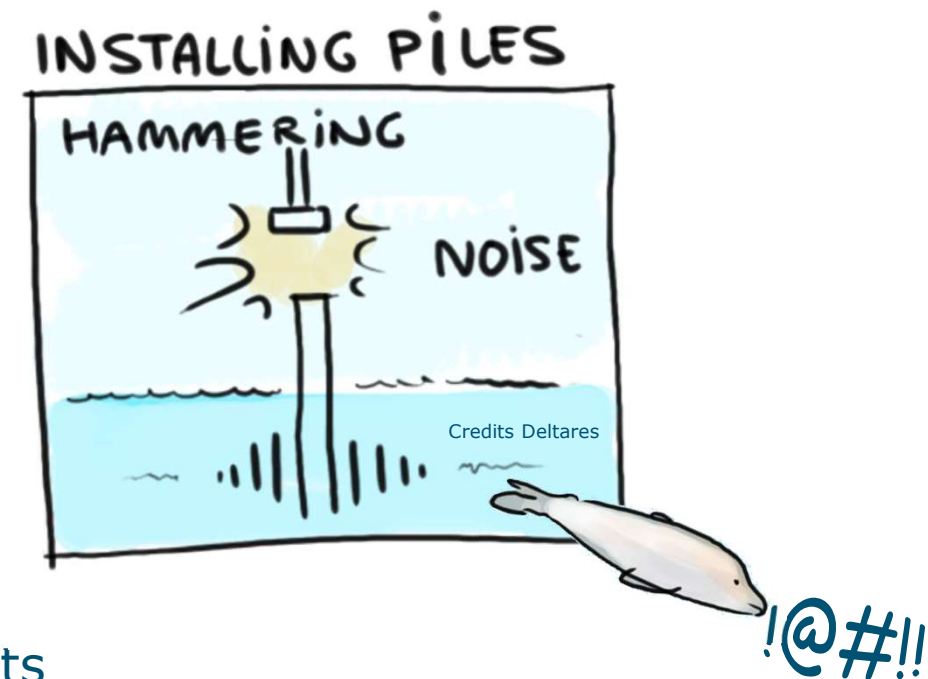
- Sound (impulsive)
- General disturbance

## 2. Building phase

- Underwater sound
- Ship movements

## 3. Operational phase

- Continuous sounds, ship movements
- Habitat loss / change / prey availability





# Sea mammals research

## 1. Passive acoustic monitoring (PAM)

- Measure harbour porpoise clicks (presence); 24/7
- Measure under water sounds → patterns & effects?

## 2. Tagging study's

- Follow movements of seals in and around OWF (construction)

## 3. System approach

- Quantification prey availability (of fish), IBM development
- Simultaneous measure presence of fish & harbour porpoise (Apelafico)



# OWF & Impact Birds & Bats

Impact is depending on the species

- Direct → collisions
- Indirect
  - Barrier
  - Habitat displacement

Need to pass: migratory species



Hate them: Northern Gannet



Ignore them: Gulls



Love them: Cormorants





# Bird/Bat Research (field)

Radar



Batdetector



Tagging & motus

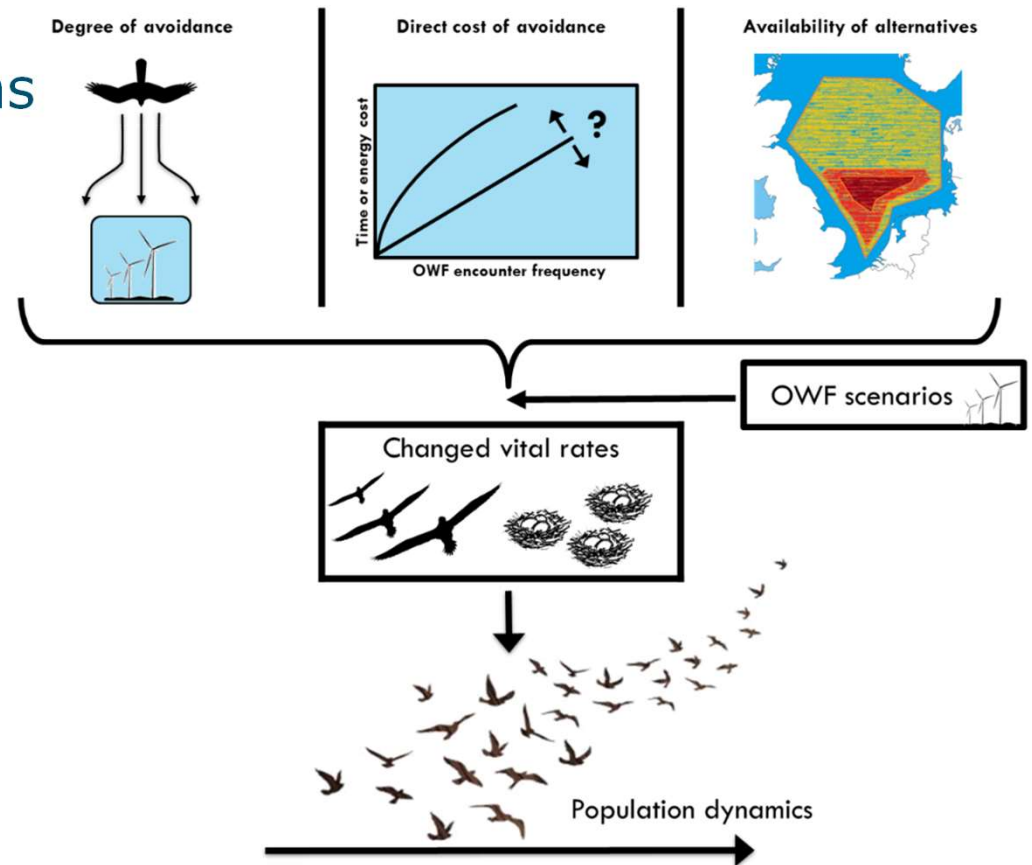


AI Image recognition



# Bird research: model studies

- Cumulative effect on populations
- Acceptable level of impact



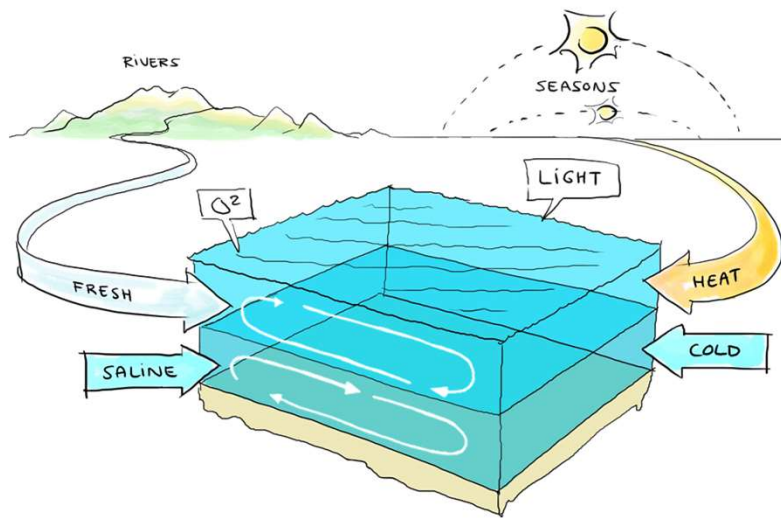


# Ecosystem effects: competition

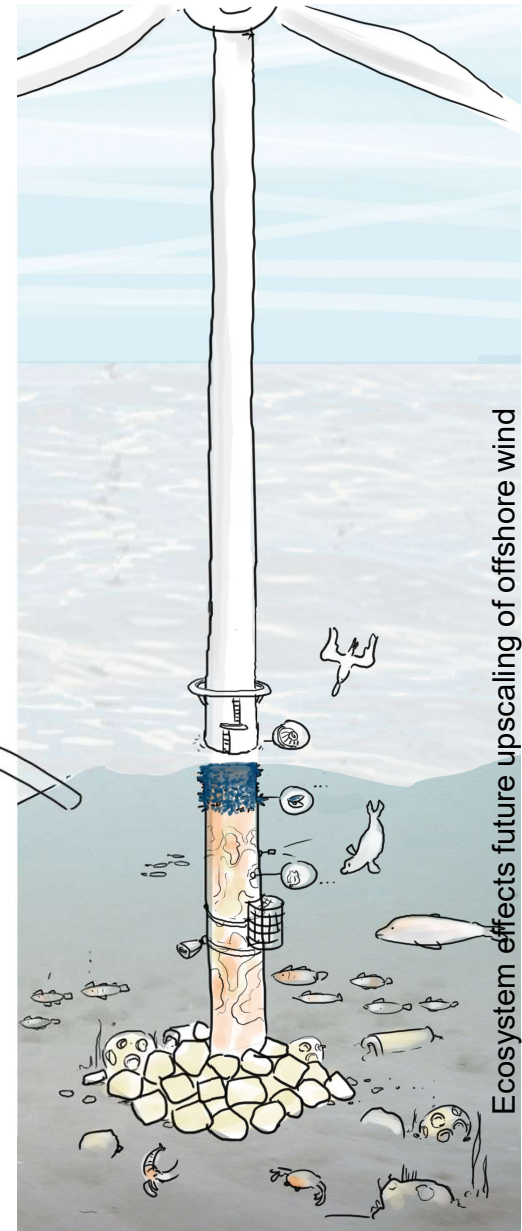
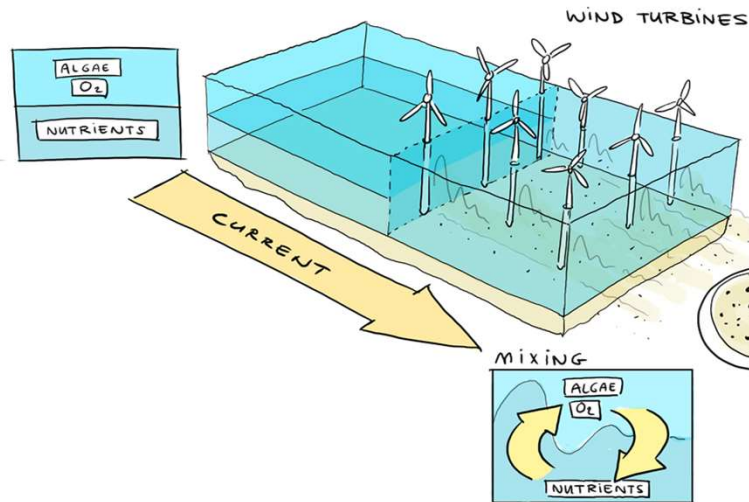


# Ecosystem effects: destratification

## STRATIFICATION



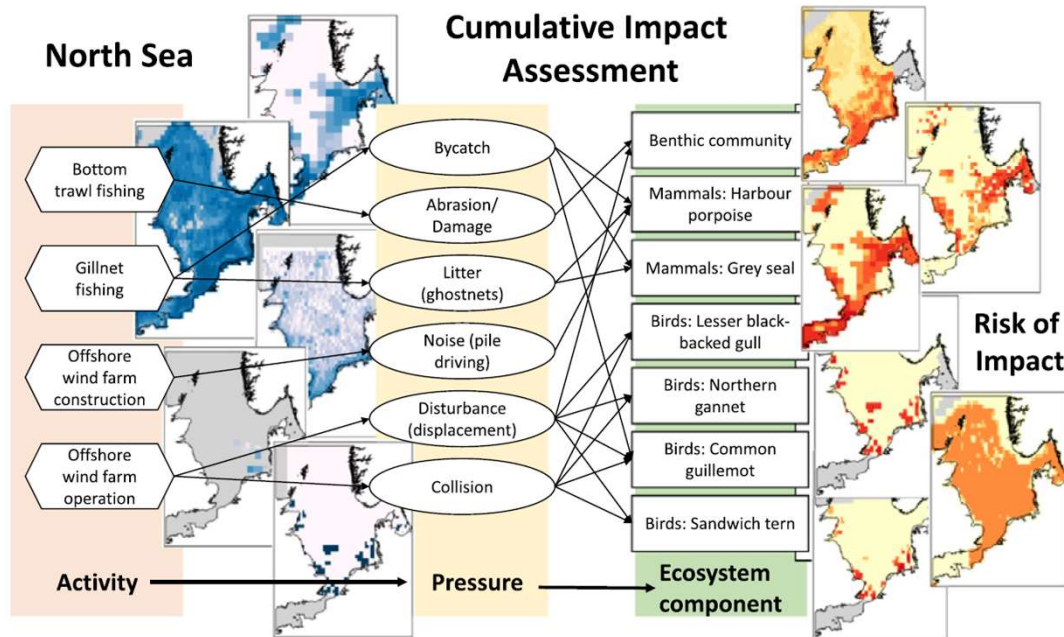
## STRATIFICATION



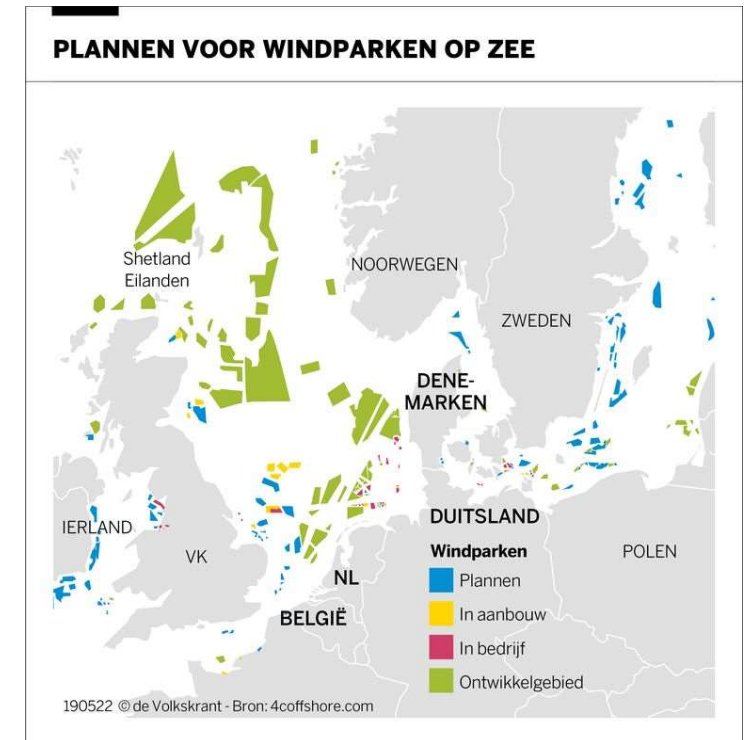
Ecosystem effects future upscaling of offshore wind



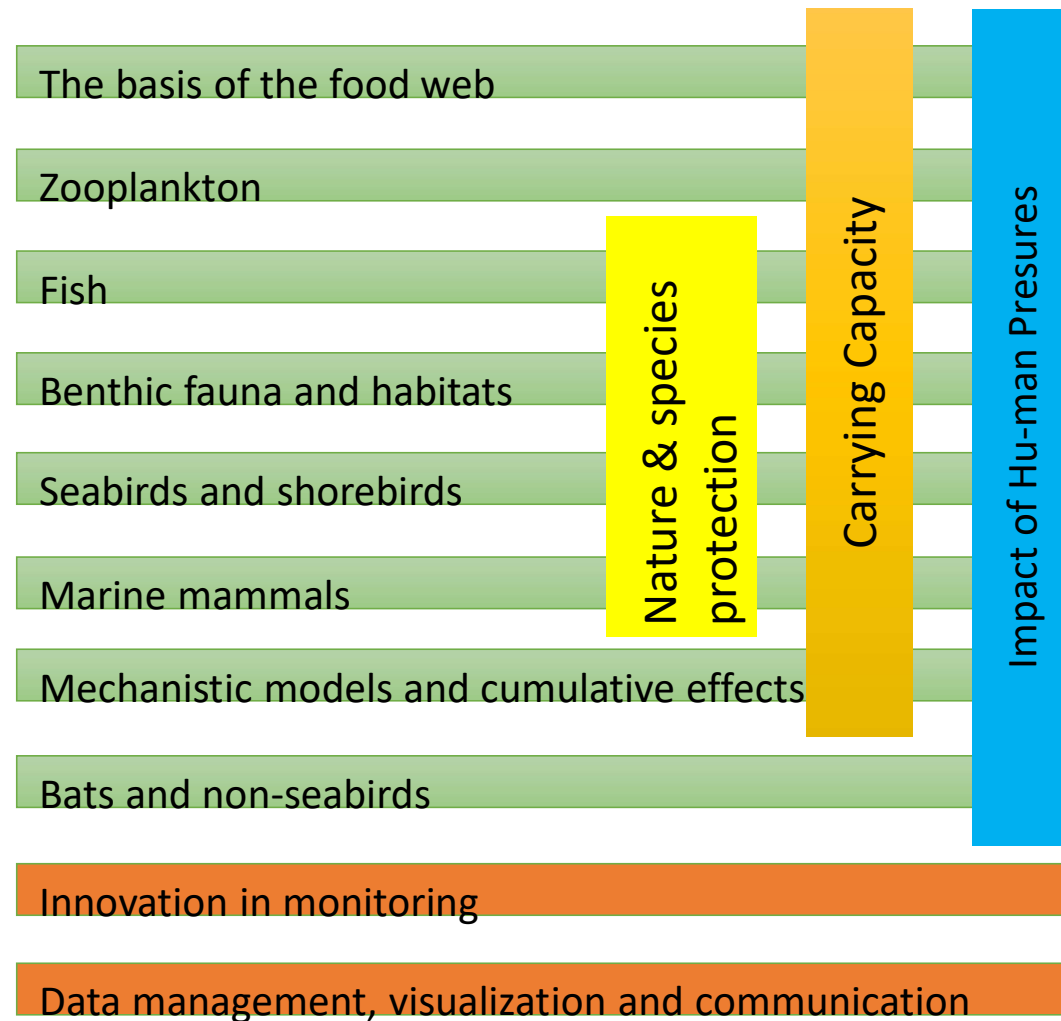
# Cumulative impact & International



*Piet et al, 2021*



# MONS: understanding the ecosystem





# Thank you!

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<https://www.wur.nl/nl/Onderzoek-Resultaten/Onderzoeksinstituten/marine-research/Themas/Wind-op-zee.htm>

