



The use of an ecosystem engineer in coastal defense

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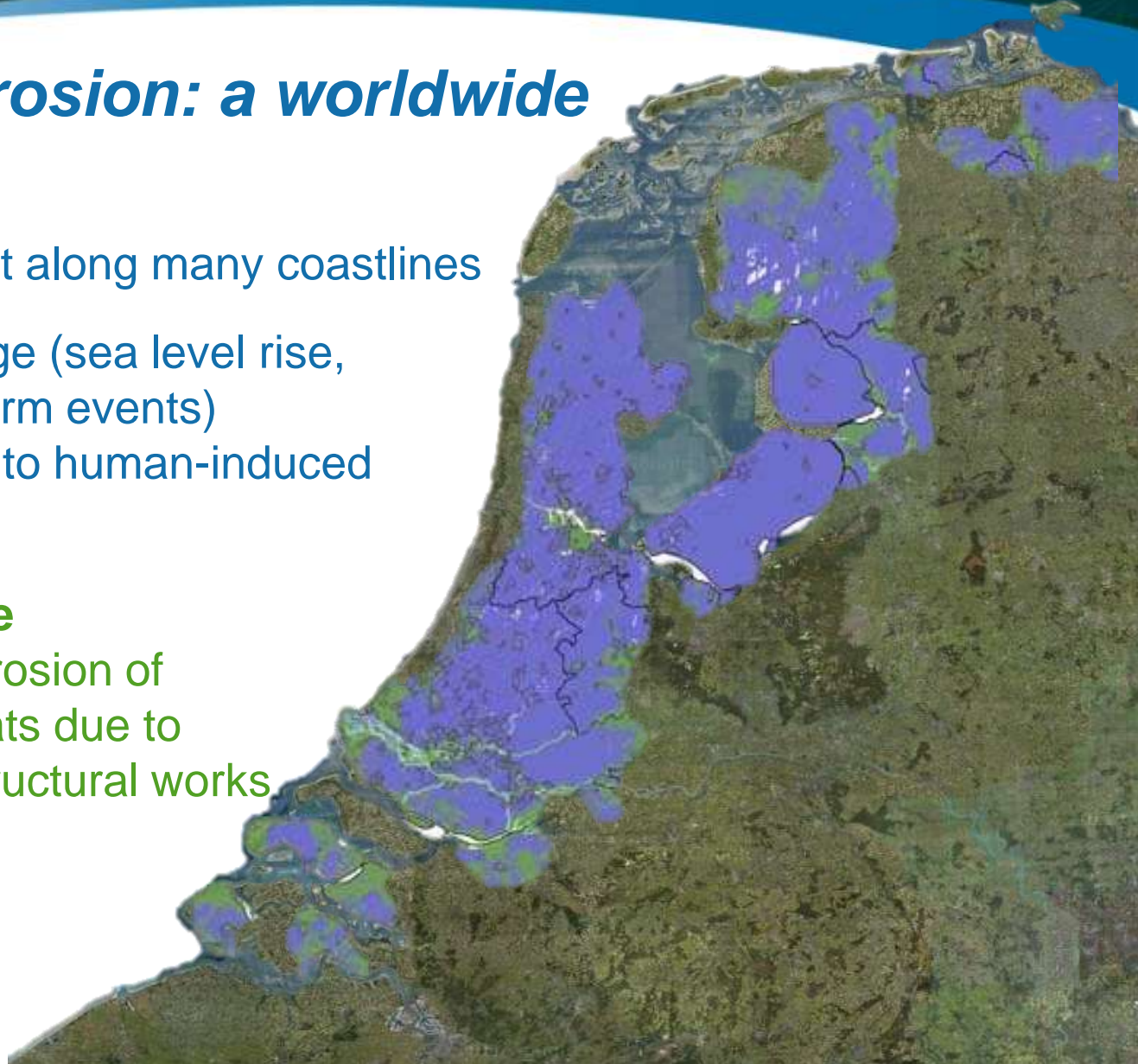
Coastal erosion: a worldwide problem

A serious threat along many coastlines

- climate change (sea level rise, increased storm events)
- increase due to human-induced changes

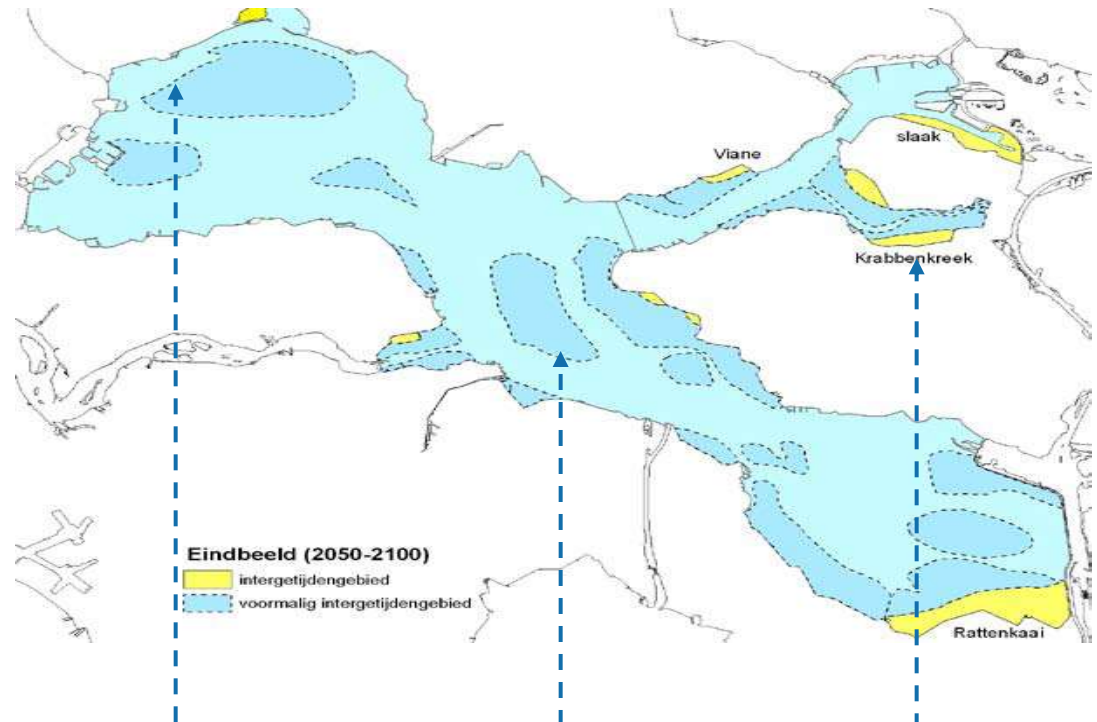
Oosterschelde

Fast erosion of tidal flats due to infrastructural works



Consequences for nature and safety

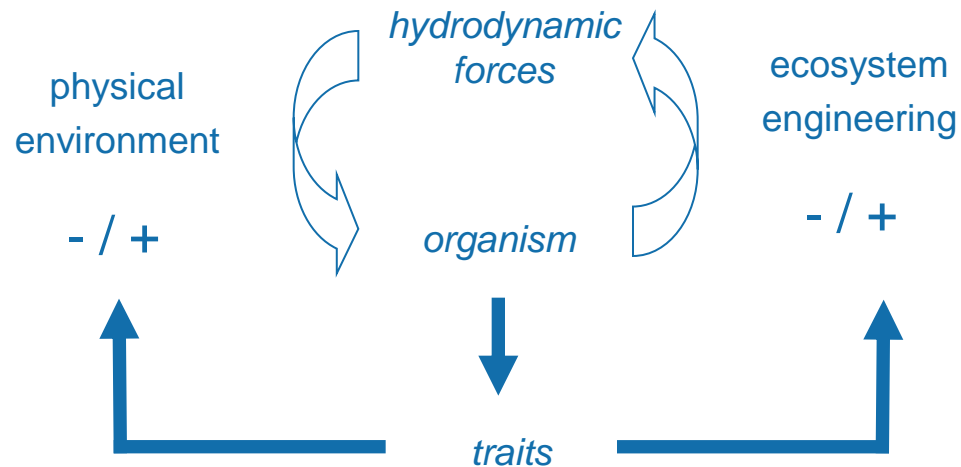
- Loss of intertidal foraging habitats for birds and resting areas for seals
- Loss of protecting foreland (mudflats, marshes) for dike



Ecosystem engineers

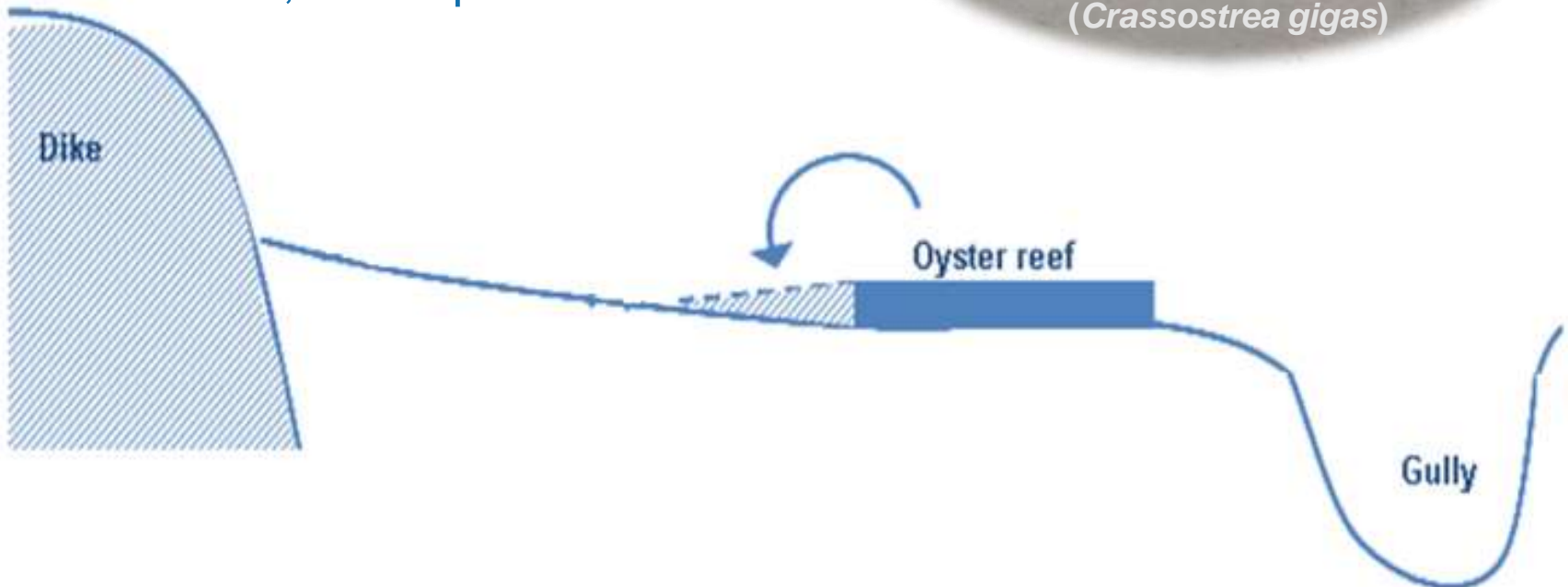
“an organism that directly or indirectly modulate the availability of resources to other species, by causing physical state changes in biotic or abiotic materials”

[Jones *et al.* 1994]



Applying the concept of ecosystem engineers

Ecosystem engineers such as reef building oysters can protect tidal flats from erosion, reduce wave energy, trap sediment, ...and protect dikes

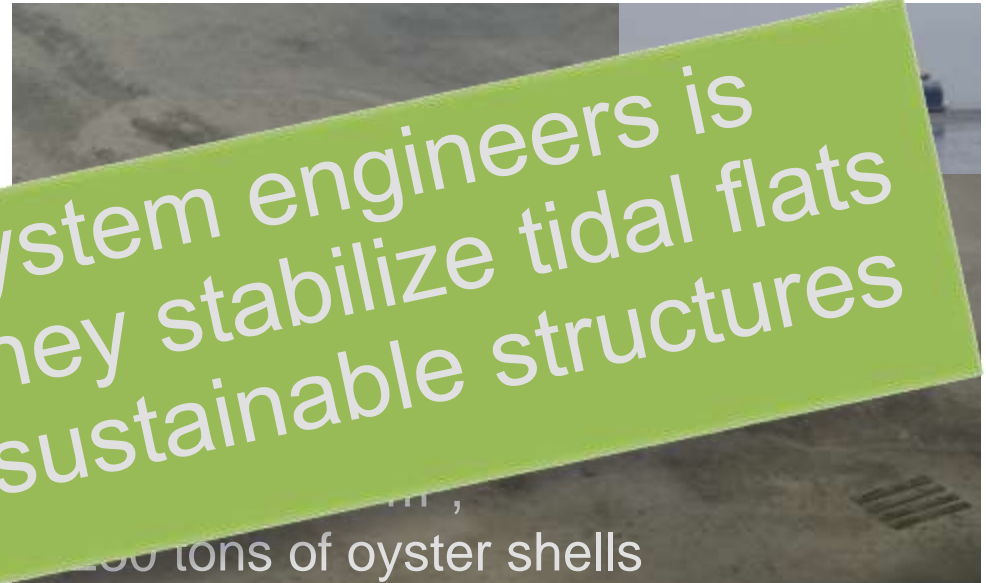


Artificial oyster reefs

Small scale pilot 2009



Large scale pilot 2010



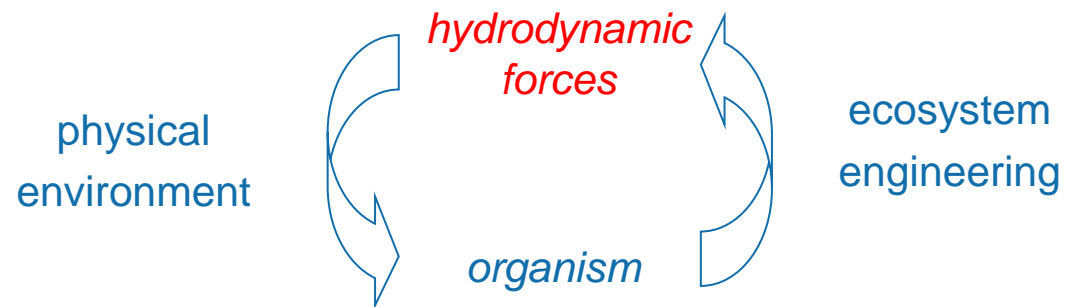
(4x) 12 x 1 m



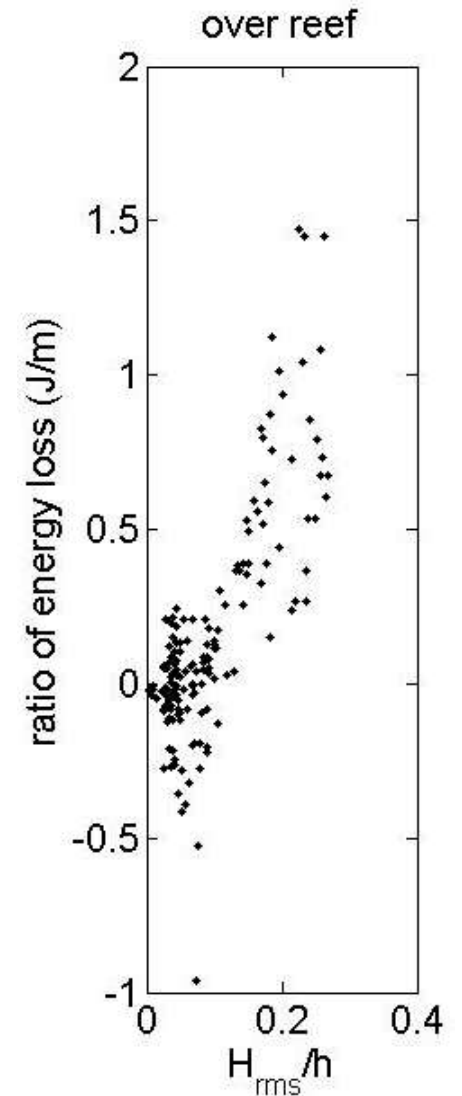
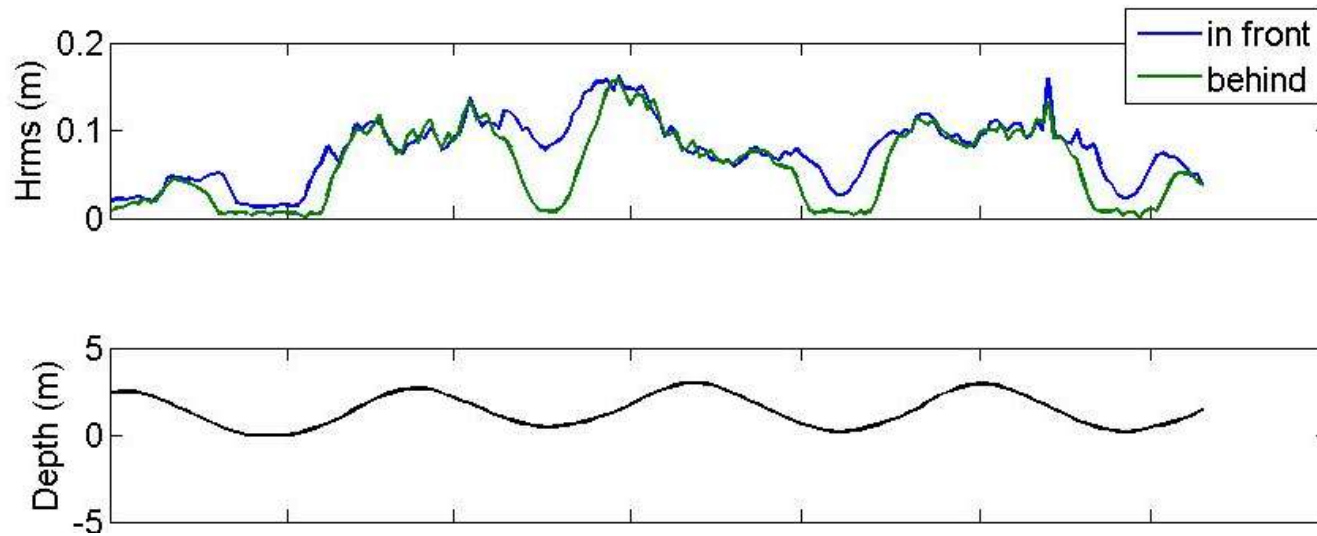
12 x 4 m

200 x 10 m

Ecosystem engineering

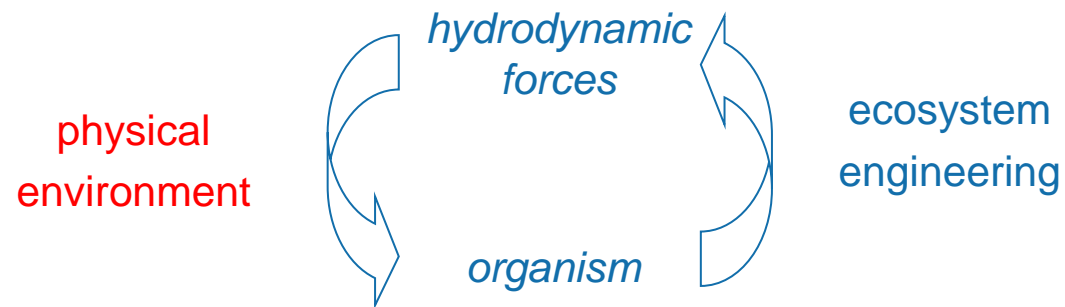


Hydrodynamic forces

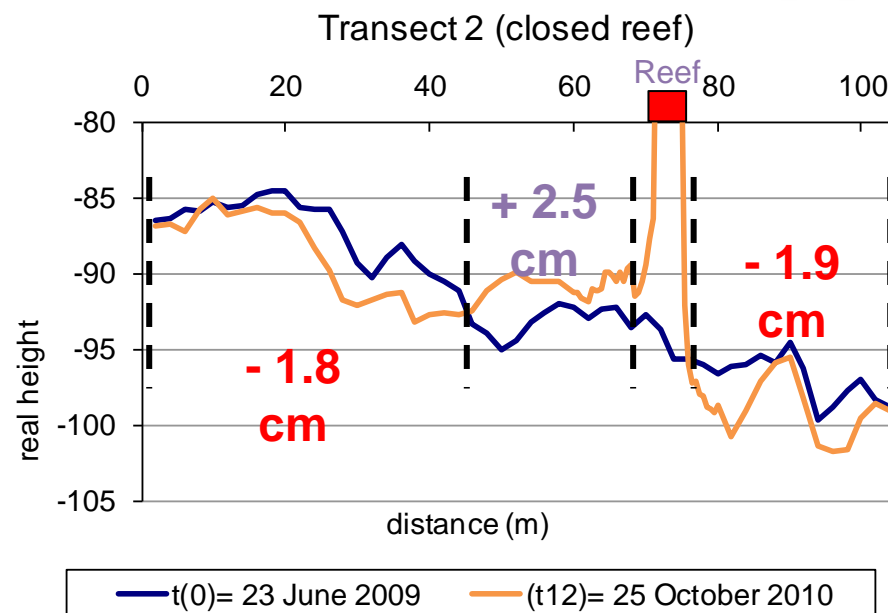
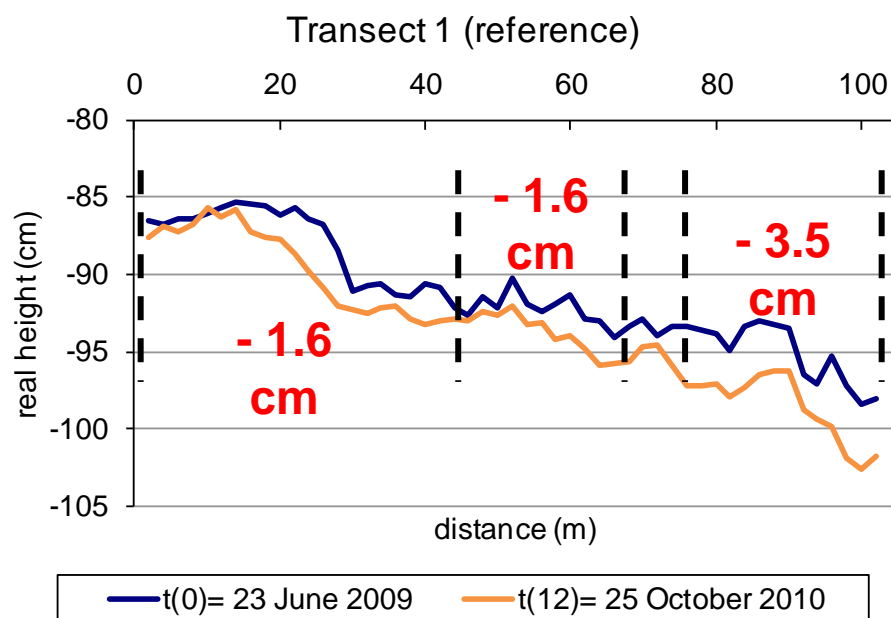


H_{rms} = root mean square wave height

Ecosystem engineering



Physical environment

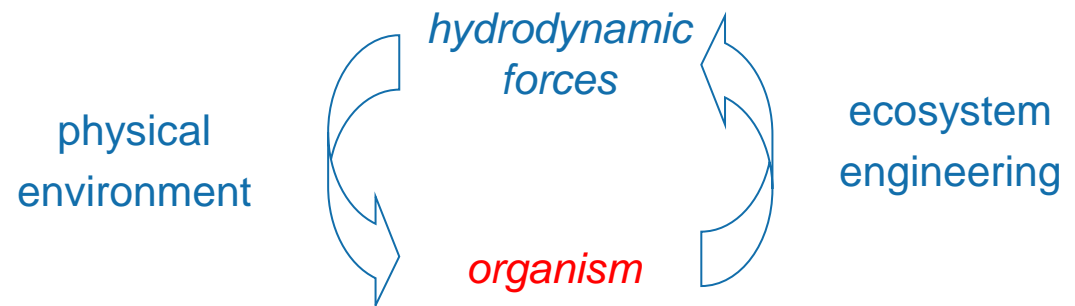


Self-sustainable?

To become self-sustainable,
oysters need to

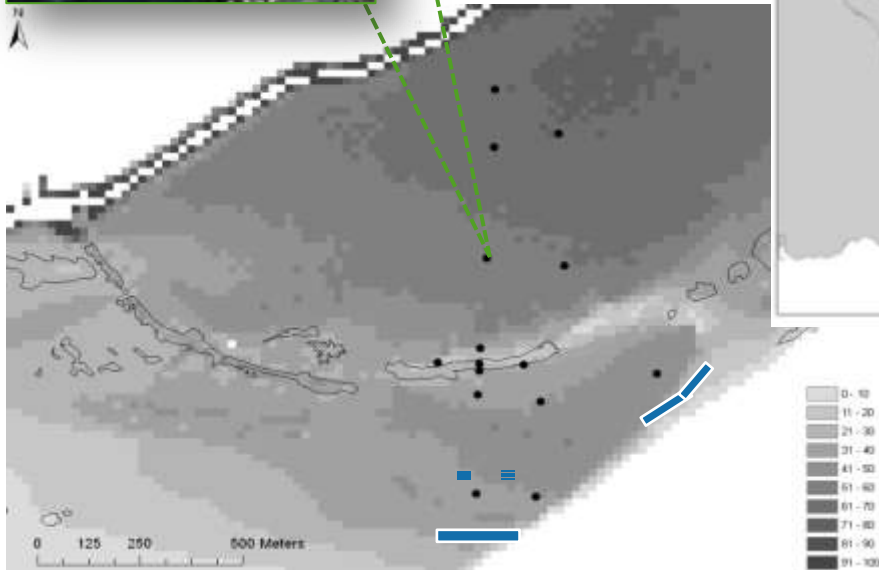
- settle
- grow
- survive

at the prevailing
hydrodynamic conditions.

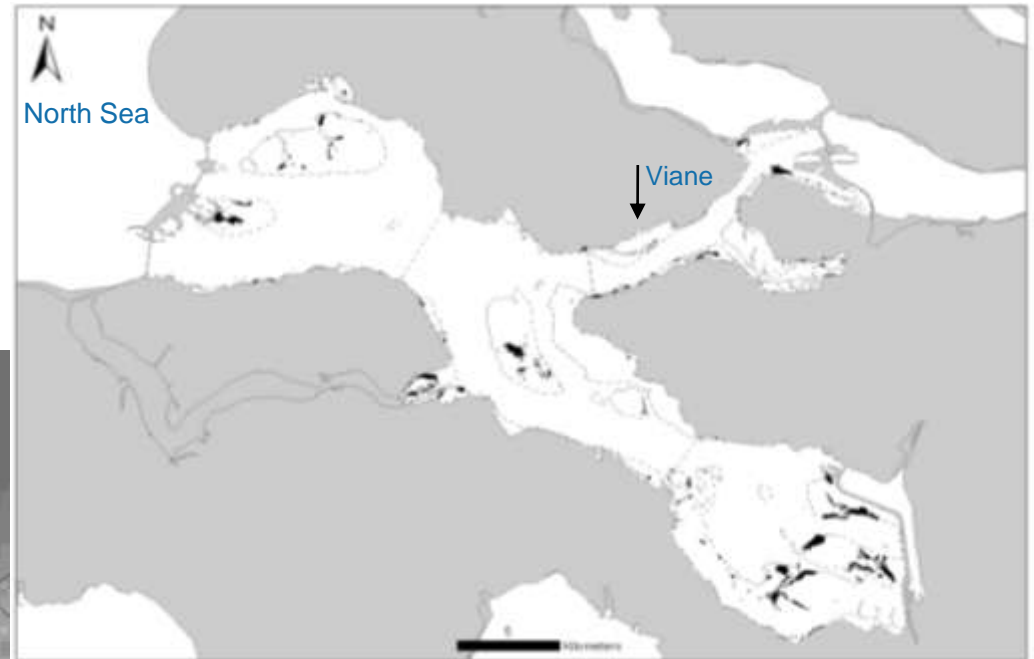


grow out to a living reef (and provide habitat)

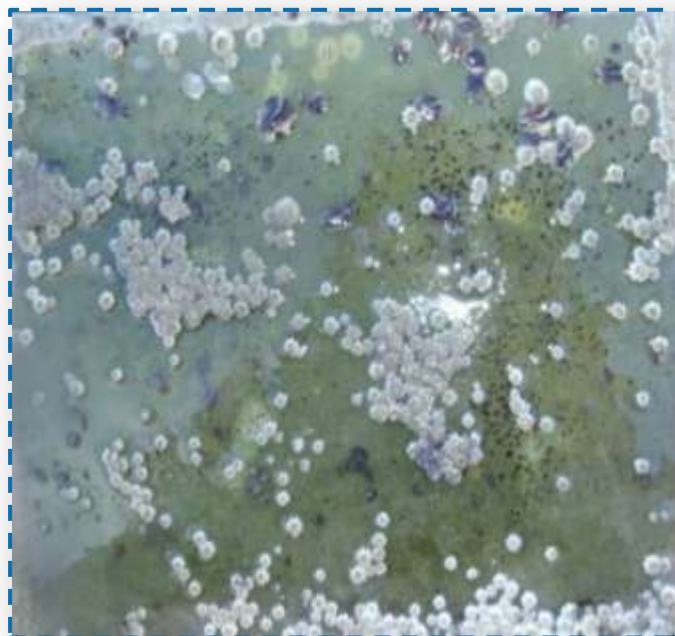
Experimental design



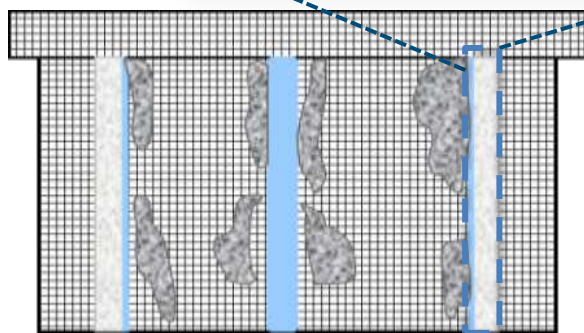
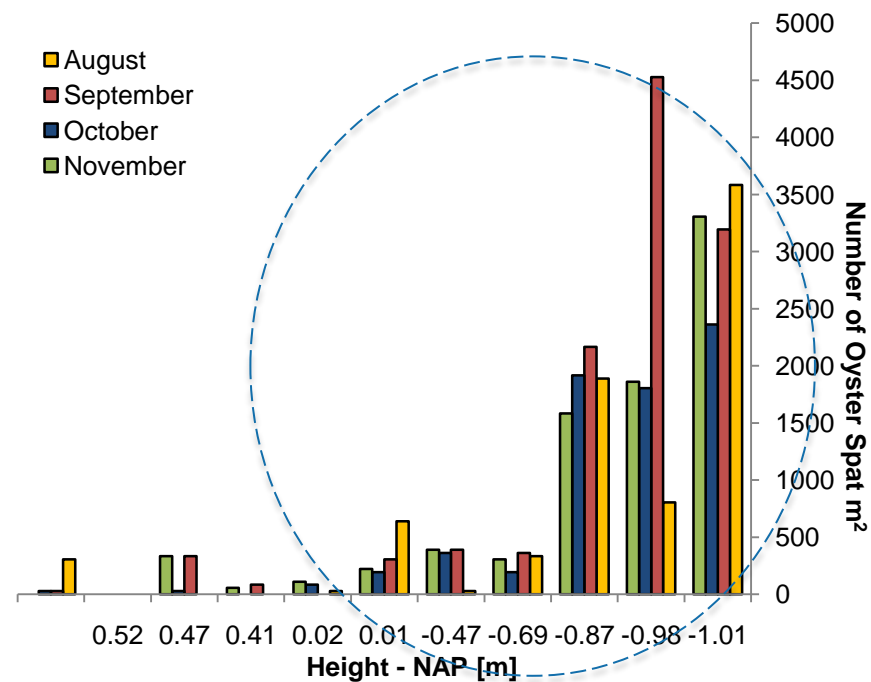
Viane



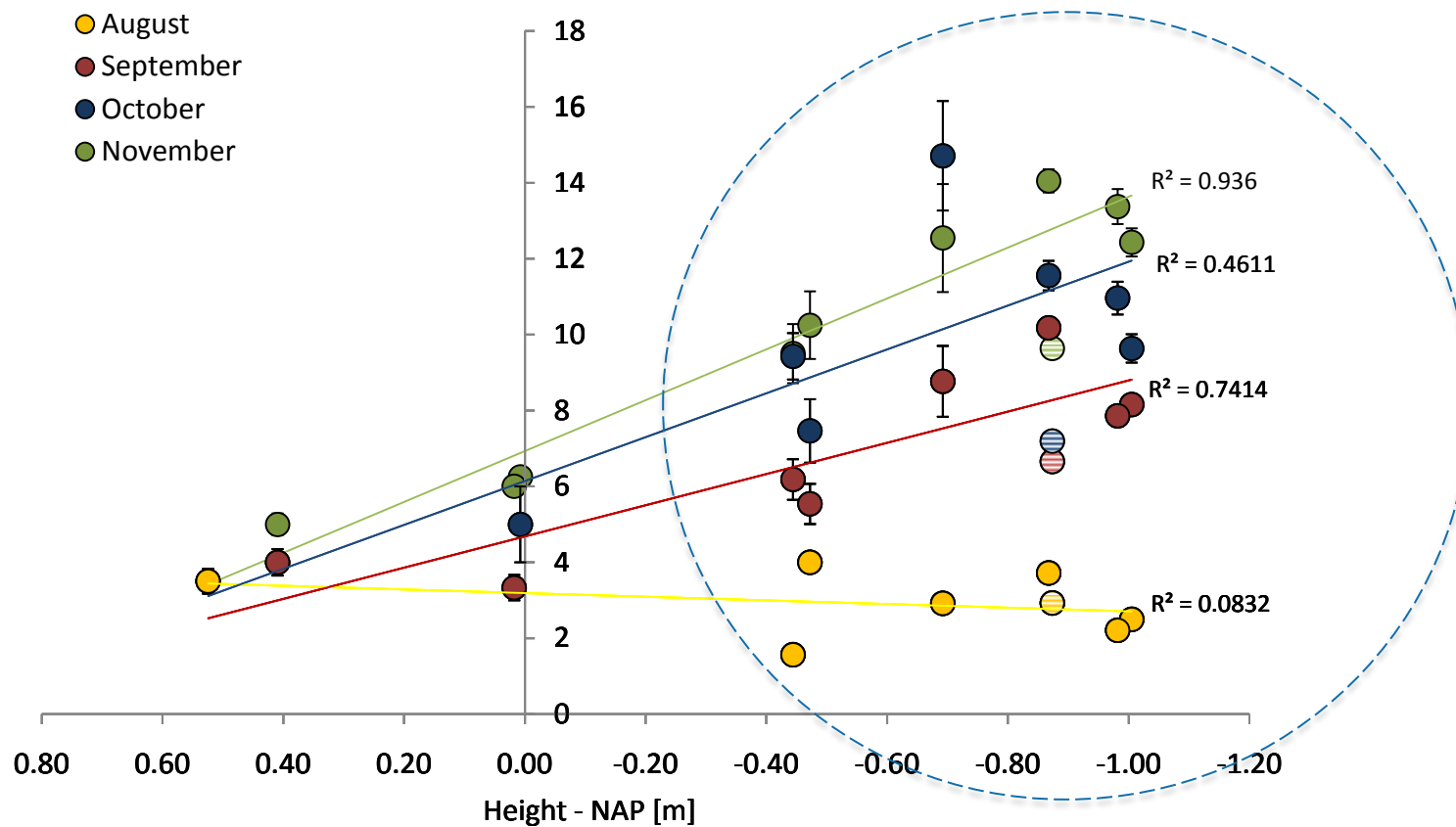
Settlement of Oyster spat



Spat \approx settled oyster larvae ($> 1\text{mm}$)
observed with the naked eye



Growth oyster spat



Improvement oyster growth measurements



Can Artificial reefs become self-sustainable structures which stabilize tidal flats?

- We do not know yet
- But: it looks promising!
 - Settlement can occur, as the reefs are constructed between 0.0 and -1.3
 - Settled oysters grow fast at these locations
 - Sedimentation occurs behind the reefs





*Building
with
Nature*



**Thanks for you
attention**

**Building with Nature is
Building our Future**

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