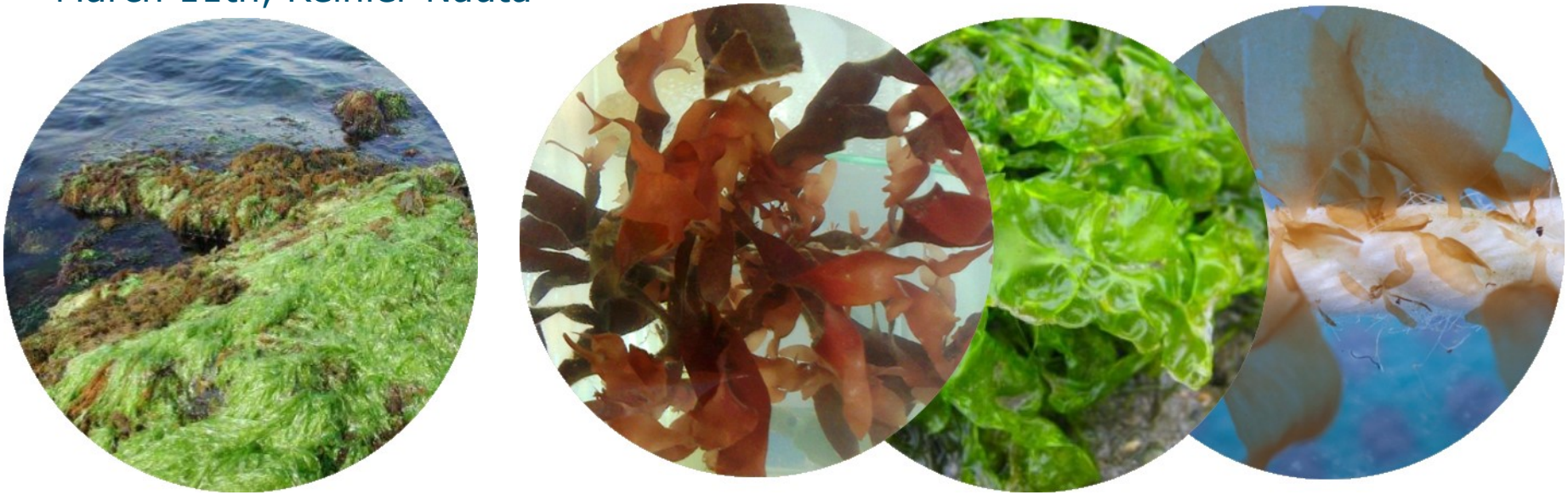
From Knowledge to Knowhow

The transition towards a sustainable seaweed sector

March 11th, Reinier Nauta



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How to make it happen

- Community of Practice
- Come to an integrated approach
- Select a site
- Making the steps

Community of Practice

- Bring a hold to fragmentation and bring together all stakeholders
- But how can we ‘make it happen’? -> find the inhibiting factors

- **Policy**: limited, lacking or inhibiting
- **Risks:** Safety, production and thus business cases

*Both due to the limited and/or lacking knowledge on how seaweed farms act in, and interact with the natural system on **all aspects**.*

How to come to an integrated approach?

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MARIN

Deltares

TNO

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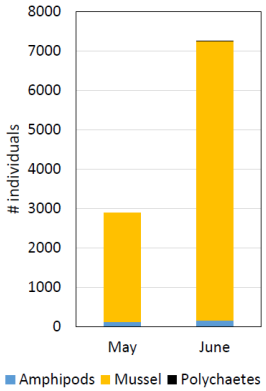
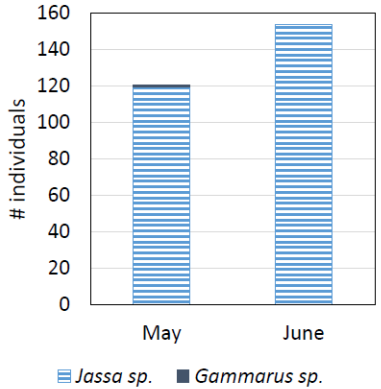
P.E.T.E.R. an integrated approach

- Production
- Ecosystem (*Nature Inclusive*)
- Technology
- Economy
- Risks & Regulations / Boundary conditions

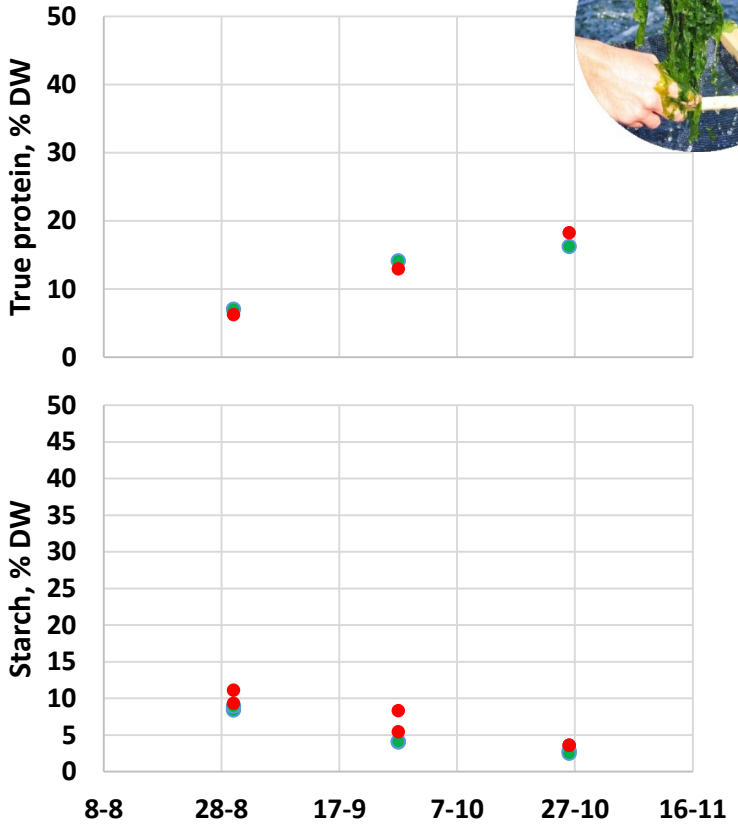
Production: mass, fouling or content?

- Species?
- Cultivars?
- Mass vs fouling
- Mass vs content
- Food safety by design





Jansen (WMR)



I. v/d Meer, A. v/d Werf (WPR)

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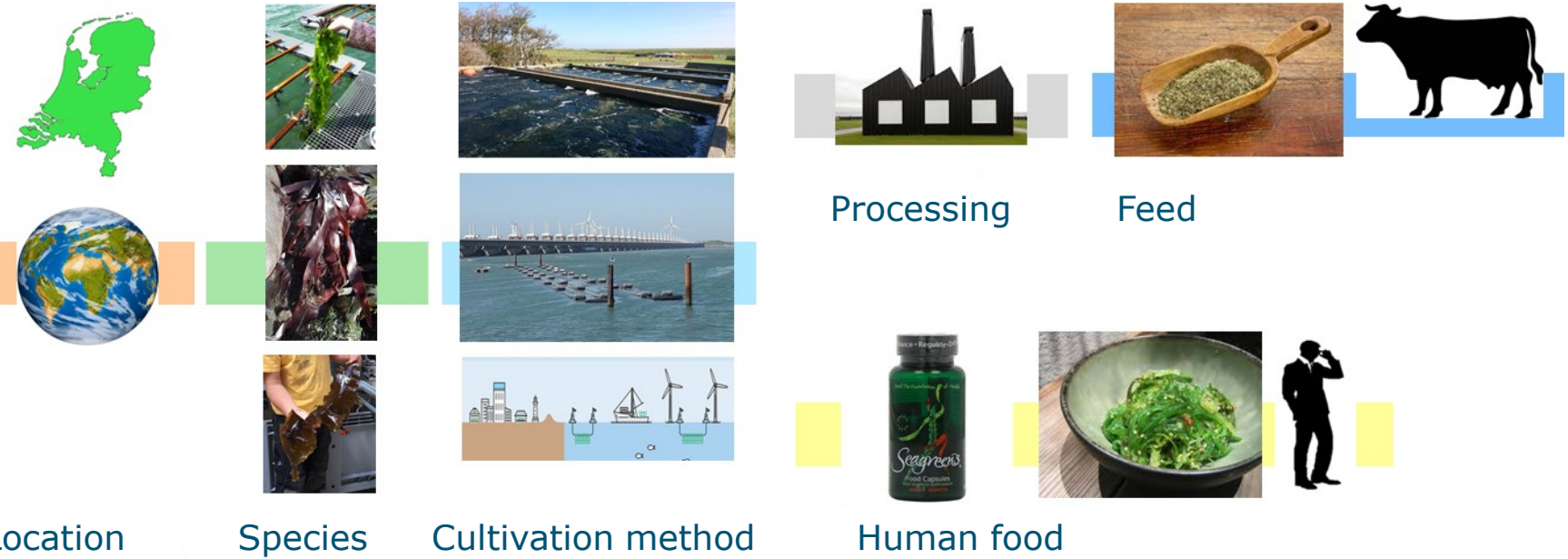
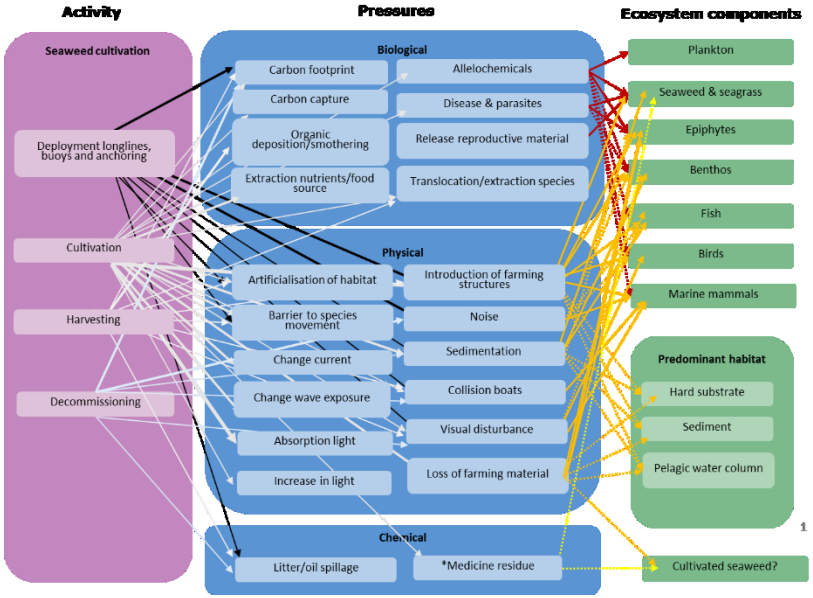
Production: Food safety risks in the chain



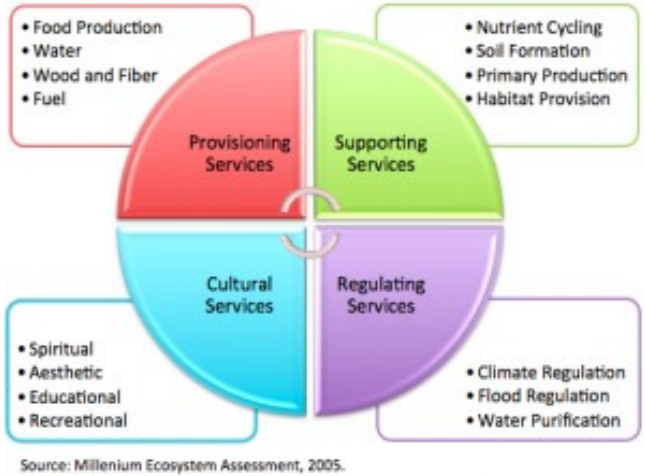
S. van Tuinen (WFSR)

Ecology: interactions with the system

Ecosystem impact



Ecosystem services



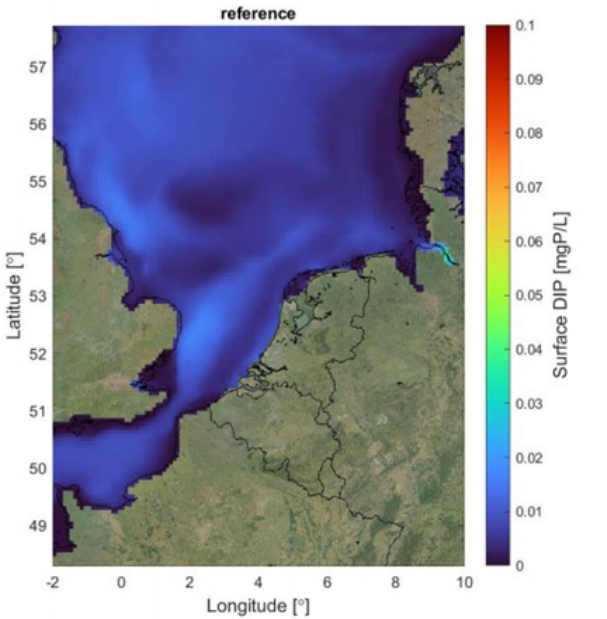
Source: Millenium Ecosystem Assessment, 2005.

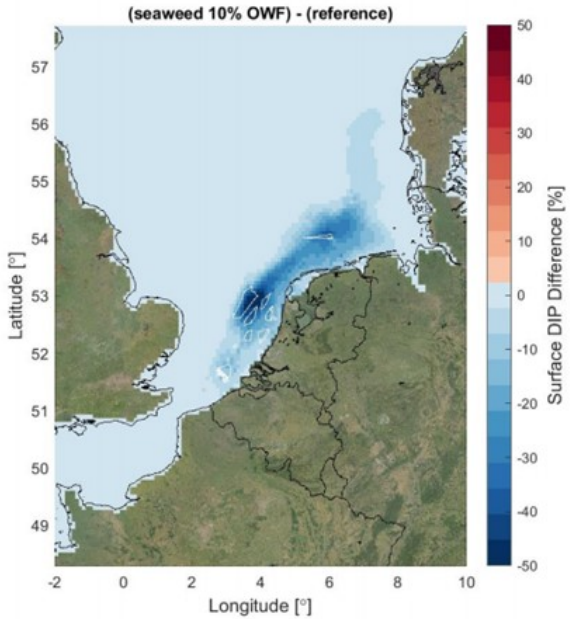
Ecology: Carrying capacity

What can be produced maximally, but with ‘acceptable’ impact?

Impact does not limit to the farm itself

Environmental Footprint in Spring for DIP





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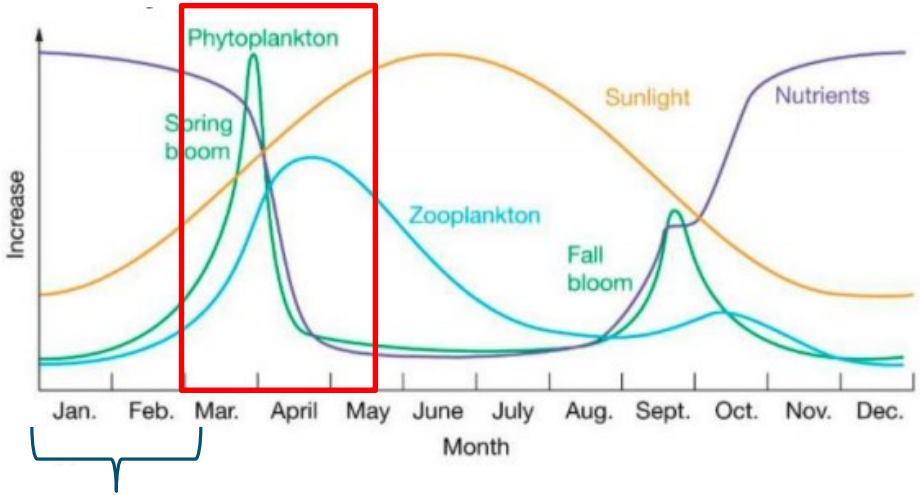
ProSeaweed – Vilmin & Van Duren (Deltares) / Nauta (WMR)

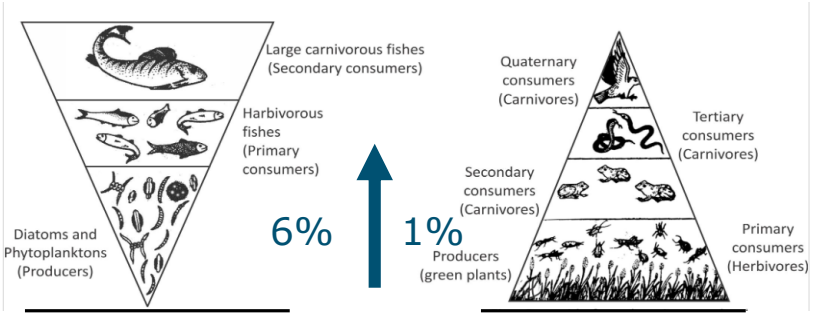
Ecology: Carrying capacity

Interaction between phytoplankton and seaweed due to nutrient uptake

Understanding this complexity: models, indicators and indices are developed



Nutrient storage by seaweed



V.d. Meer (WMR/WU) 2020.

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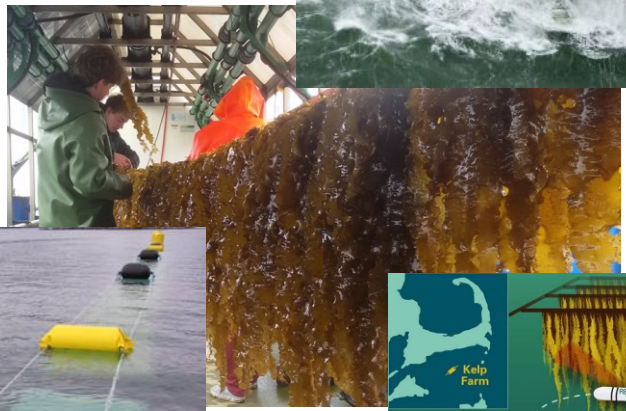
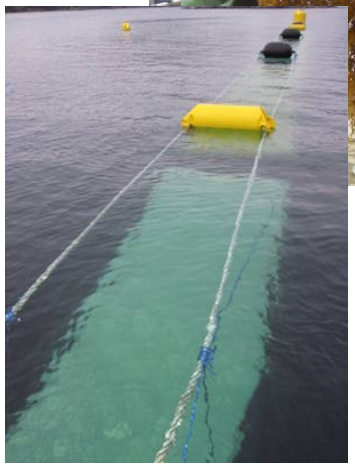
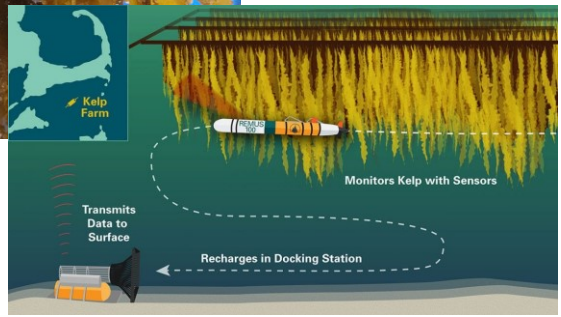
Technology

- Harsh conditions
- Cultivation methods

- Harvesting
- Processing
- Monitoring







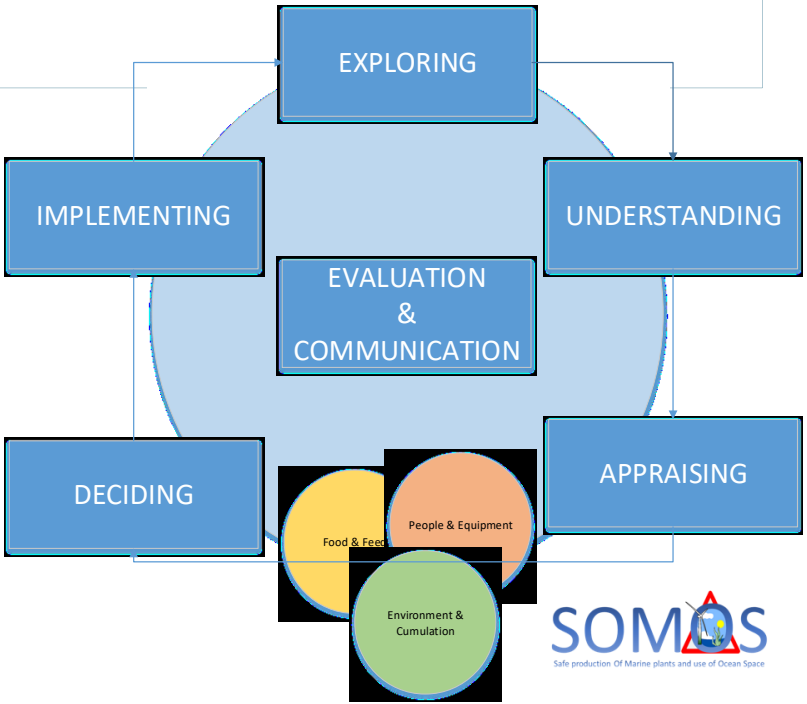
Economy

- Profitability
- Markets: food, feed, biorefinery?
- When to harvest
- Increase efficiency
- Valuing ecosystem services
- De-risking

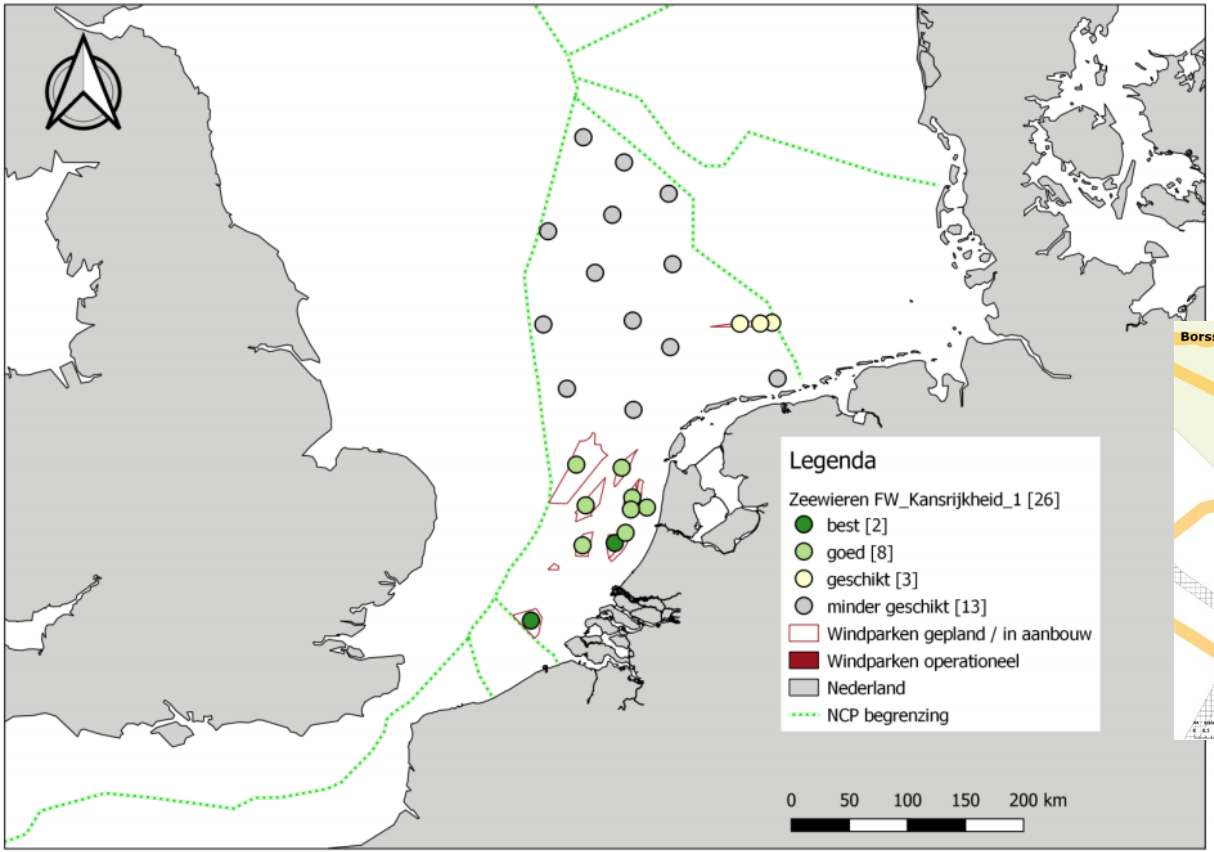
Come to a Business cases, but with a balance between Ecology and Economy

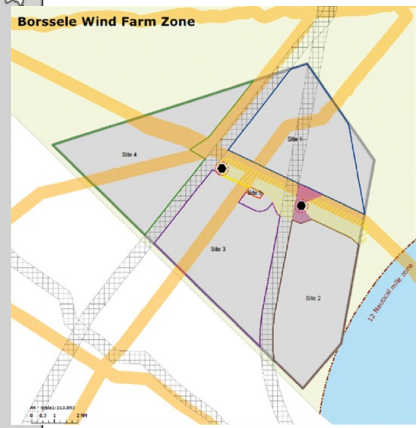
Regulations

- Which species are allowed?
- How to work save?
- Rules and standards (NEN / CEN)
- Legislation on environmental impacts
- **How to select a site?**



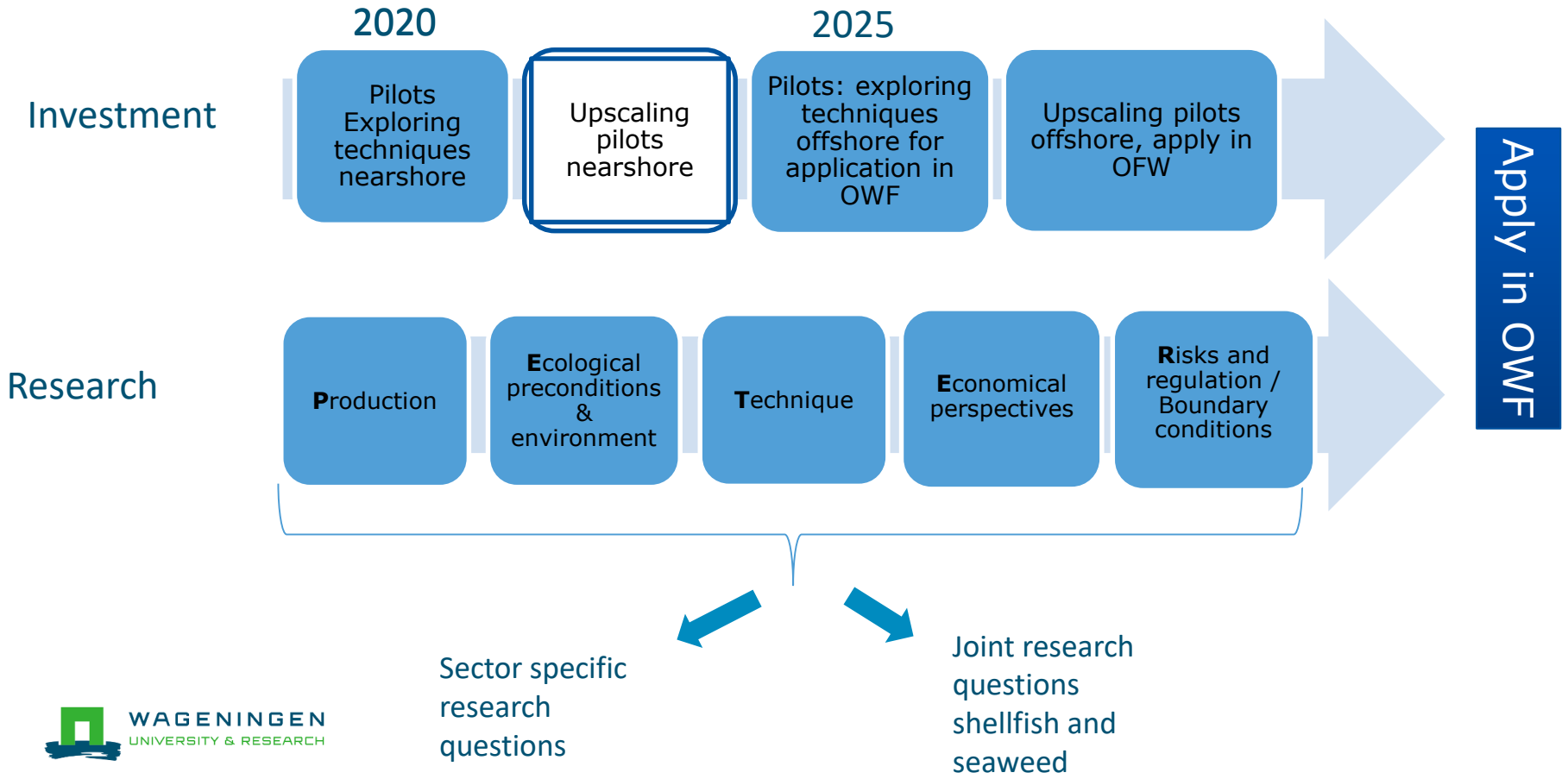
Select a site





Bogaart et al. 2019

1 km^2 (?) offshore pilot in 2025



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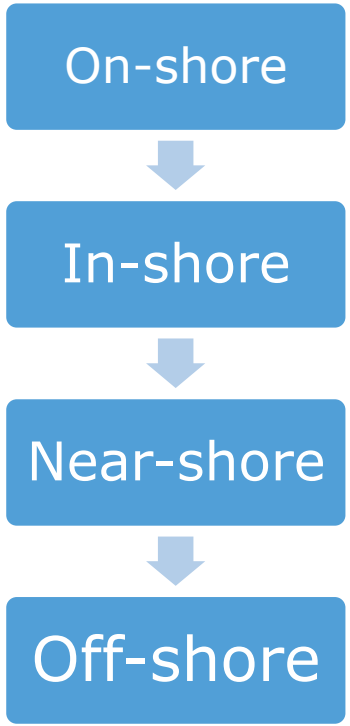
Making it happen: step by step

- Integrated approach: P.E.T.E.R.
- Step by step exploration
- Gather information on impact and effect
- Model -> Measure -> Validate -> Reflect -> Develop



Finding Answers together

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Thank you!

'One Zee-WUR'

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Wag. Economic Research	Econ. Feasibility	Sander v.d. Burg
Wag. Livestock Research	Feed application	Wouter Muizelaar
Wag. Food Safety Research	Safety and contaminants	Siebren v. Tuinen
Wag. Food & Biobased Res.	Extraction and processing	Maarten Kootstra
Wag. Environmental Res.	Ecosystem functioning	Jeroen Veraart

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