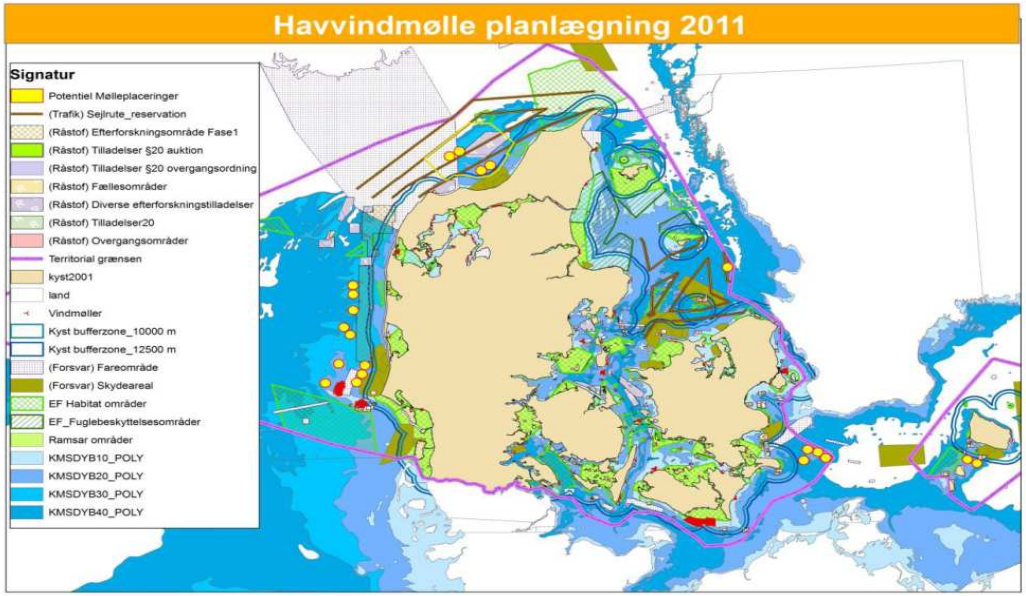
Pia Bro Christensen, Green Center, nov. 2013

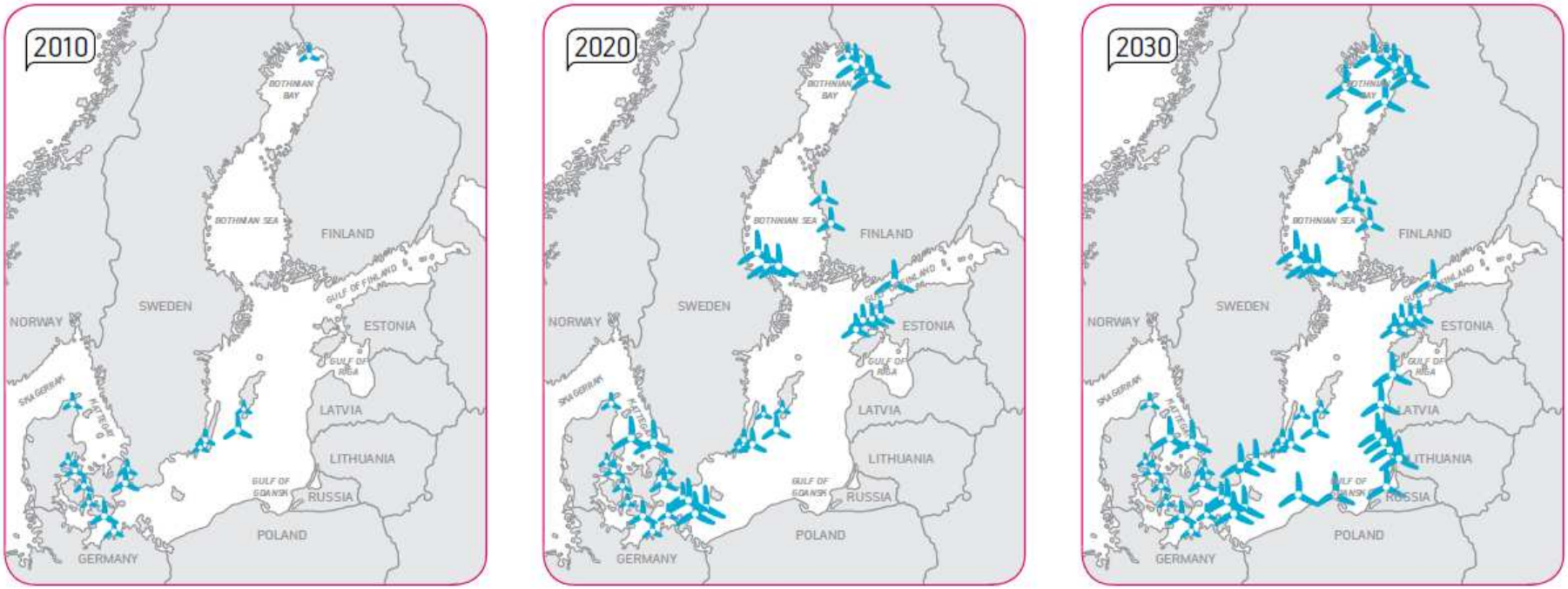
The colocalization of offshore wind parks and other uses – pilot Rødsand 2

- Background
- The potentials *(development of wind potentials, space/spatial efficiency, planning, economy, biomass, nutrient sequestration, clustering, new jobs/rural economy)*
- The visions
- The pilot in Rødsand 2
- Results

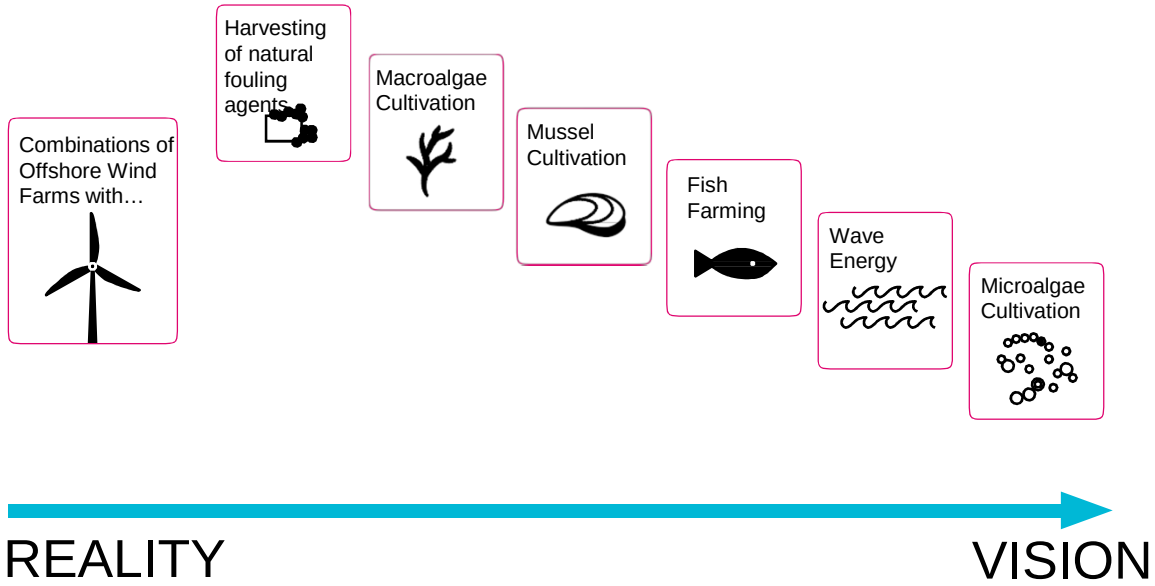


Windfarms - planned and projected

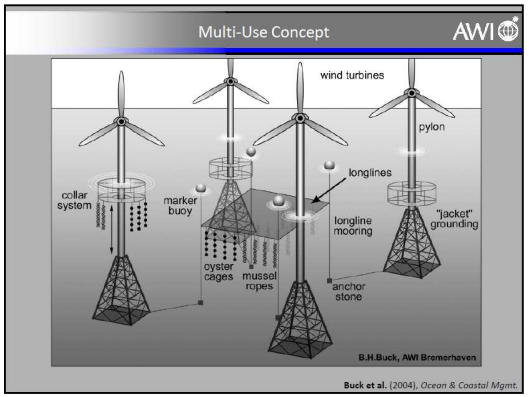
Figure 2: Outline of the present, planned and projected wind mill farms in the Baltic Sea area. (Data from WWF).

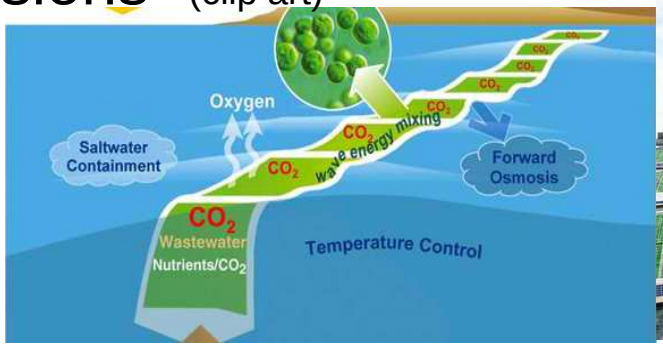


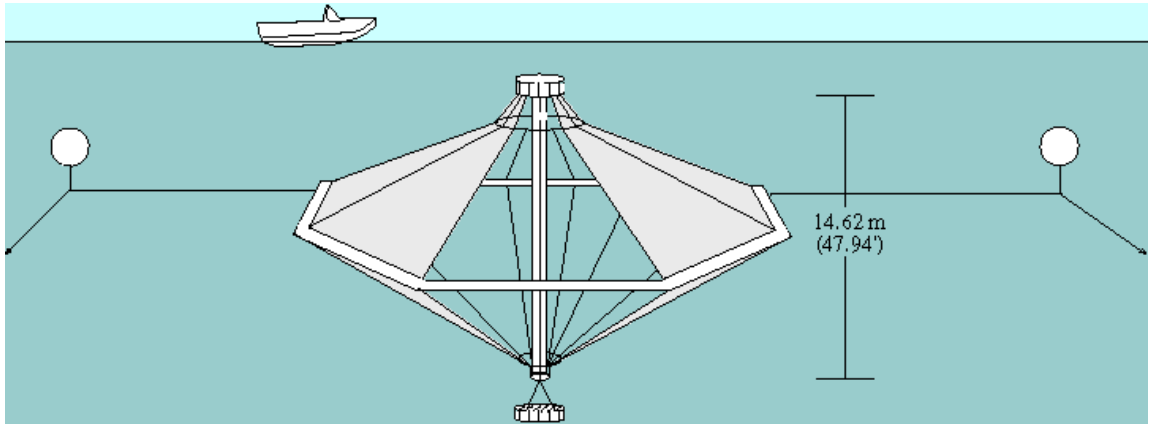
POSSIBLE COMBINATIONS WITH OFFSHORE WIND PARKS

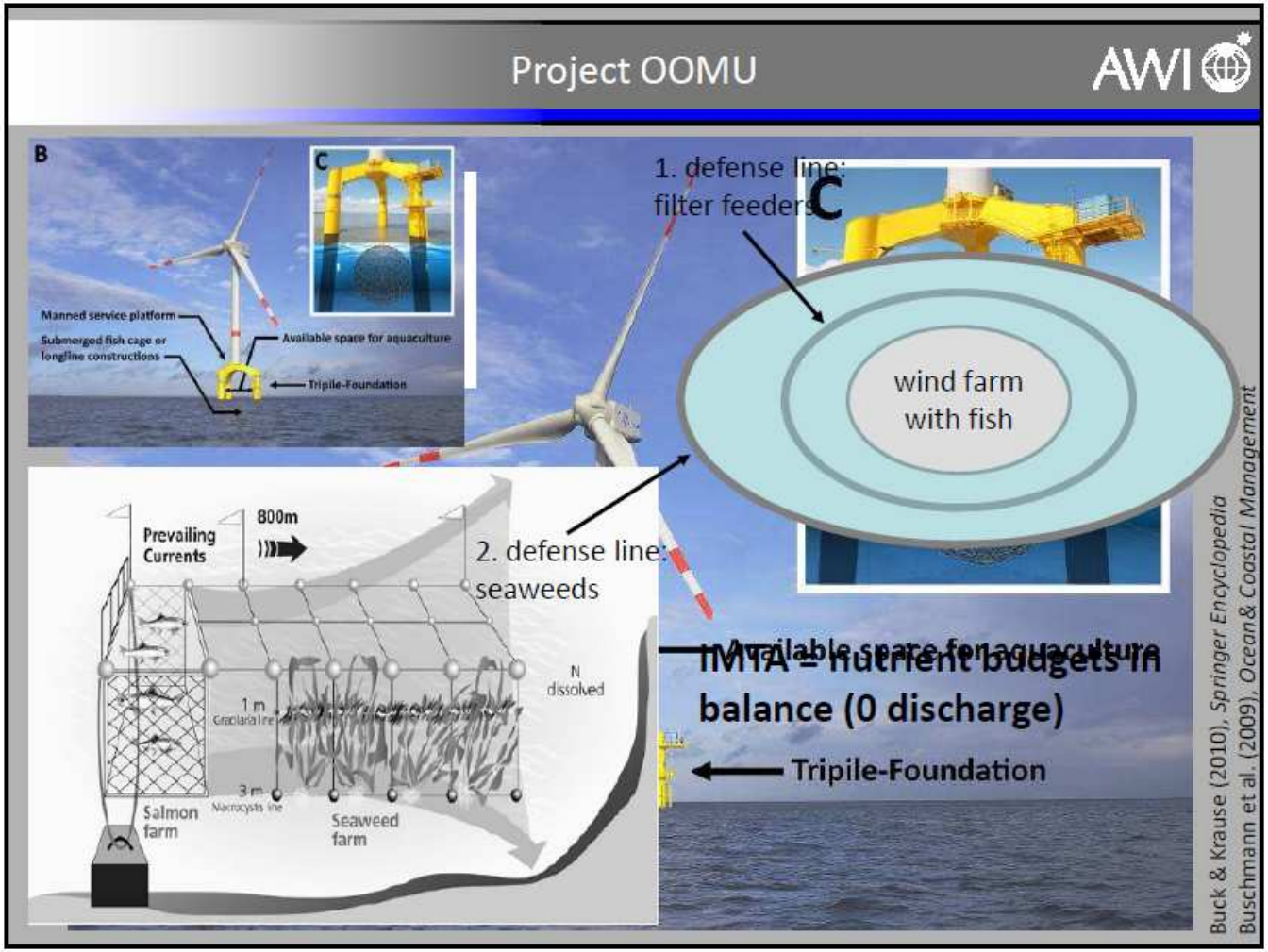


Background – ”the visions” (clip art)

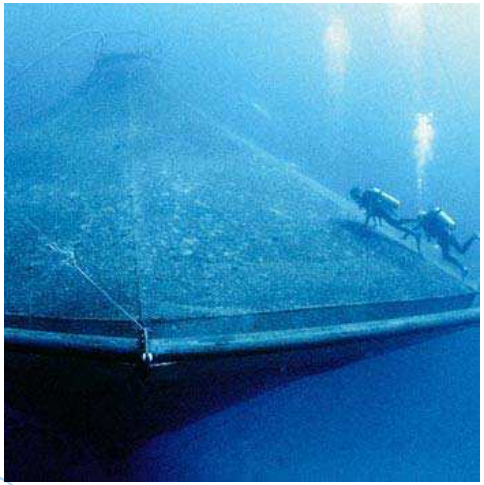







Project OOMU
AWI
B
C
Manned service platform
Submerged fish cage or longline constructions
Available space for aquaculture
Tripile-Foundation
1. defense line: filter feeders
C
wind farm with fish
Prevailing Currents
800m
2. defense line: seaweeds
N dissolved
1 m
3 m
Salmon farm
Seaweed farm
Available space for aquaculture
IMTA = nutrient budgets in balance (0 discharge)
Tripile-Foundation
Buck & Krause (2010), Springer Encyclopedia
Buschmann et al. (2009), Ocean& Coastal Management

The visions



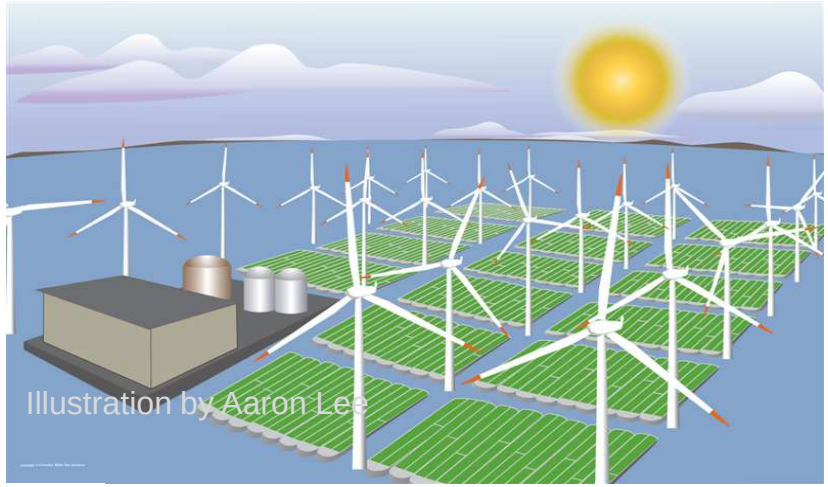
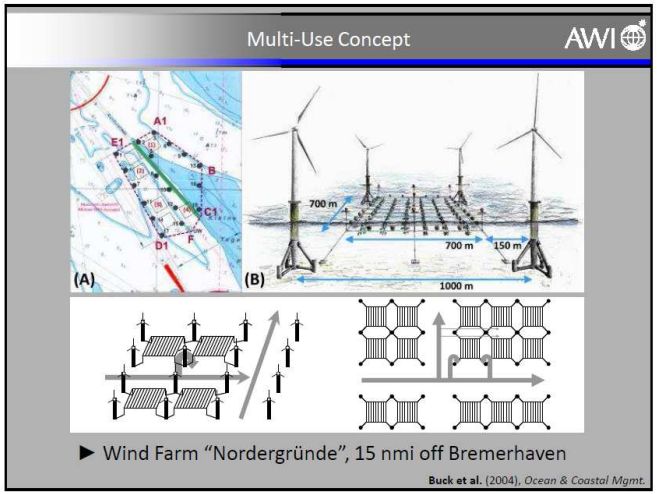
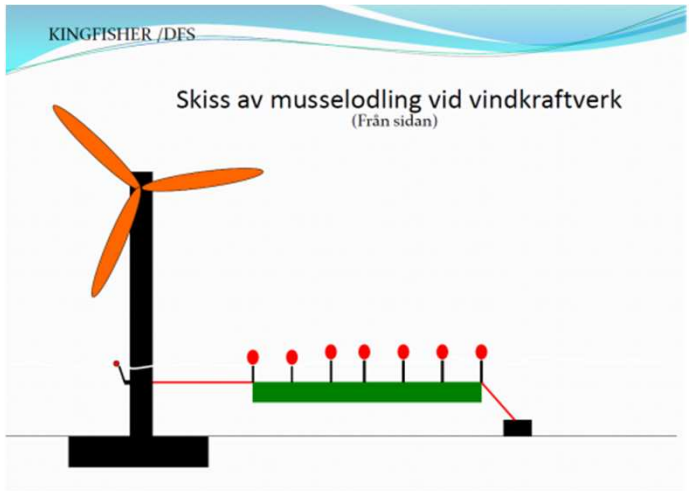


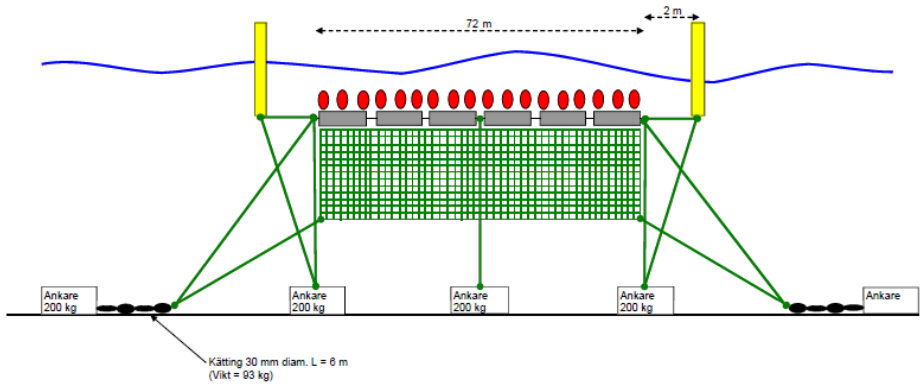
Illustration by Aaron Lee

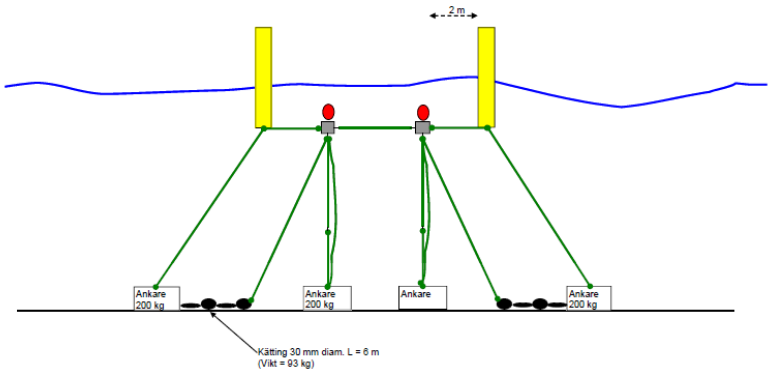

Multi-Use Concept
AWI
(A)
(B)
700 m
700 m
150 m
1000 m
► Wind Farm "Nordergründe", 15 nmi off Bremerhaven
Buck et al. (2004), Ocean & Coastal Mgmt.


KINGFISHER /DFS
Skiss av musselodling vid vindkraftverk
(Från sidan)

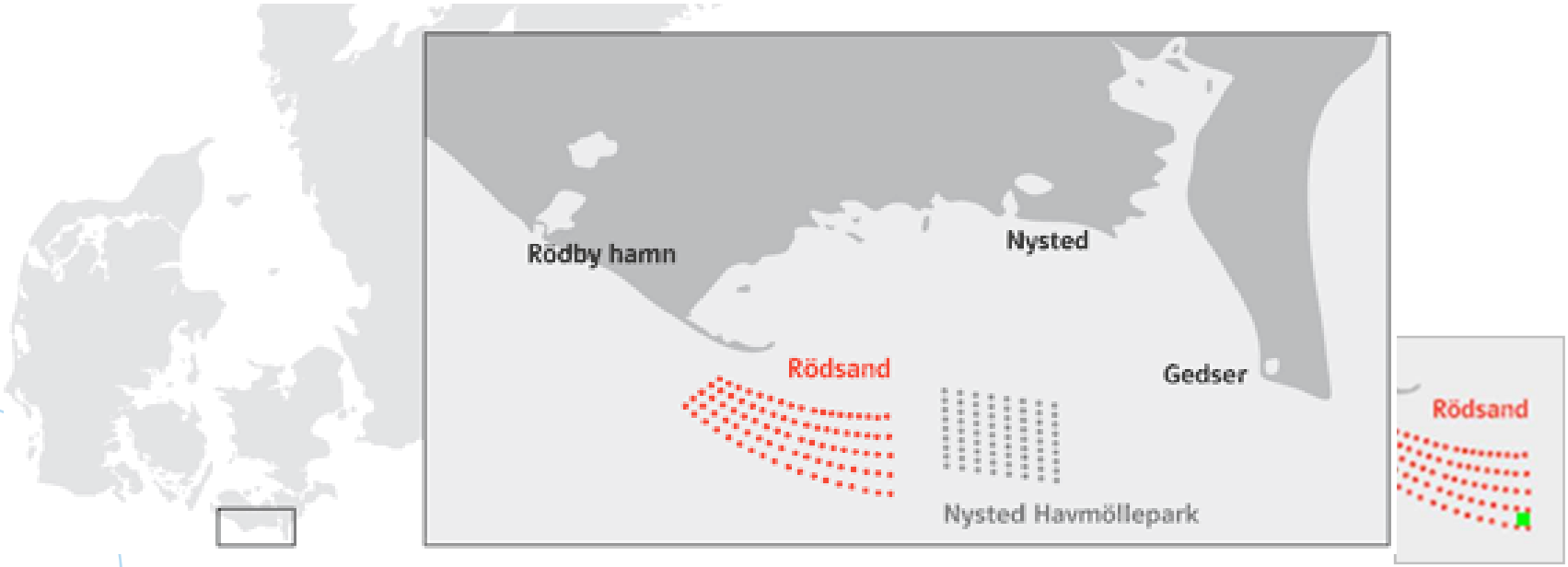
Rødsand 2 – the pilot site

The pilot site





Rødsand 2 – the pilot site

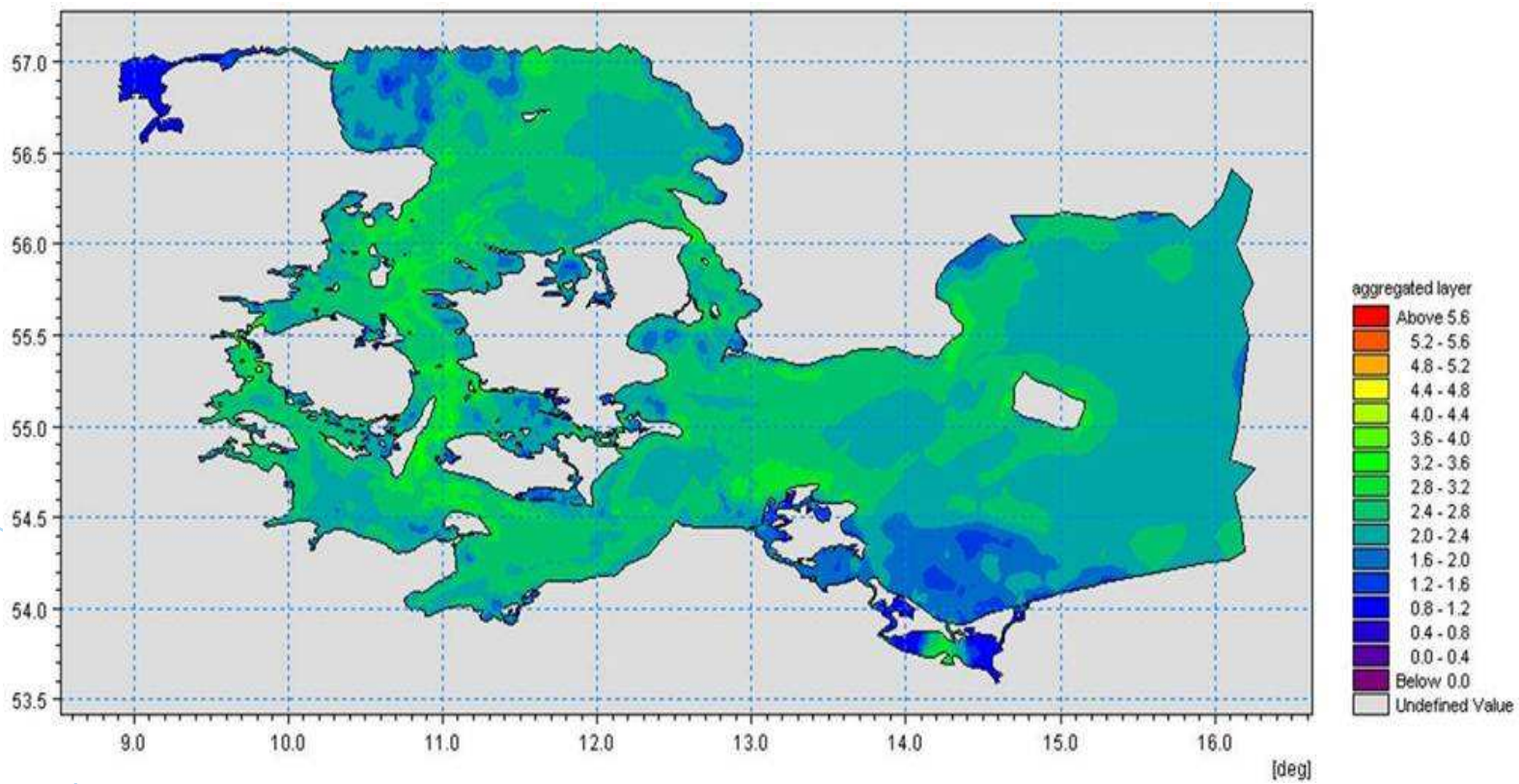


5x18 (2,3 MW) mills, 207 MW, 34 Km^2
producing 800 mill. kWh per year
Supplying 200.000 households

Rødsand 2 – the pilot site

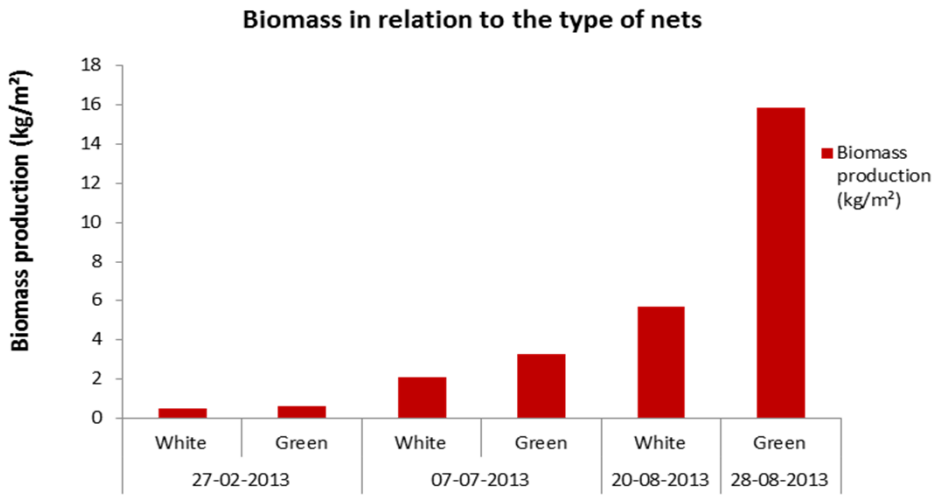
- An estimate of the biomass potential
- Low tech, low costs
- Removal of nitrogen (and carbon)
- Cooperation with the local site management / The wind firms
- Practical experiences
- New cooperations
- obstacles

Upwelling areas



Figuren viser den akkumulerede opadrettede transport af bundvand over skillefladen(termoklin/haloklin) fra april – sept(skala er log(m) enheder. I et område på 3-500 km2 (Djursland, Storebælt, Langelandsbælt) er den opadrettede transport >= 2000 m/april-sept, svarende til en tilførsel på 50-100 g DIN/m2 til overfladelaget (Diss. Inorg. Nitrogen)! Når der ses bort fra ekstremer (kystopvældet ved Peru og Namibia o.l.) er raterne i de indre danske farvande meget høje. Der er tale om næringsrigt bundvand fra Skagerrak som "rives" op af overfladestrømmen fra Østersøen, og krydret med kystopvæld (Langelandsbælt, Fyns Hoved, Samsø, Djursland).
Salinitet har naturligvis en selvstændig betydning for produktionen-----.

Results: biomass production and sequestration



Yearly production > 10 kg m^2 dry matter (This corresponds to 2.6 ton N/ha or 260t/Km^2)
Small-scale trials and experience from Swedish West coast suggest a nutrient harvest of 1.5 ton N/ha
More than 2000 ton N per year can be sequestrated using 25 % of Rødsand 2 (area 34 km^2)
This corresponds to 13% of the nitrogen reduction of 17,210 tons of Denmark has committed itself to by 2021 according to HELCOM Baltic Sea Action Plan

Results: Challenges

Cooperation
- lack of tradition (wind sector and aquaculture, local community)
- conflicting interests

Technology
- Application of equipment on the mills
- Anticorrosive equipment, cables---
- Use of local operation and maintenance equipment
- Insurance
- Sampling and weather conditions (wind, icing, waves)

Legal challenges
- Lack of incentives for colocalization (planning, payment schemes)
- Environmental permits

Biomass production and nutrient sequestration
- Promising potential for nutrient sequestration and production of aquatic biomass

Environment
- Interference with natural ecosystems (noise, shadowing,

Perspectives

- Biomass production (food, feed, energy,)
- Nutrient sequestration – recycled nutrients
- Ecosystem service tools/instruments - 1 kg of nitrogen – 4-70 Euro per kilo or more (implementation of water framework directive in DK)
- Need for more and larger pilots in the BSR (diff. Typesand diff.localizations)

Onsevig Climate Park

Onsevig Climate Park – Integrated Coastal management

Kramnitze pumping station