Rijkswaterstaat
Ministerie van Infrastructuur en Milieu

Framework Ecology and Cumulation

Rijkswaterstaat, Ministry of Infrastructure and Environment,

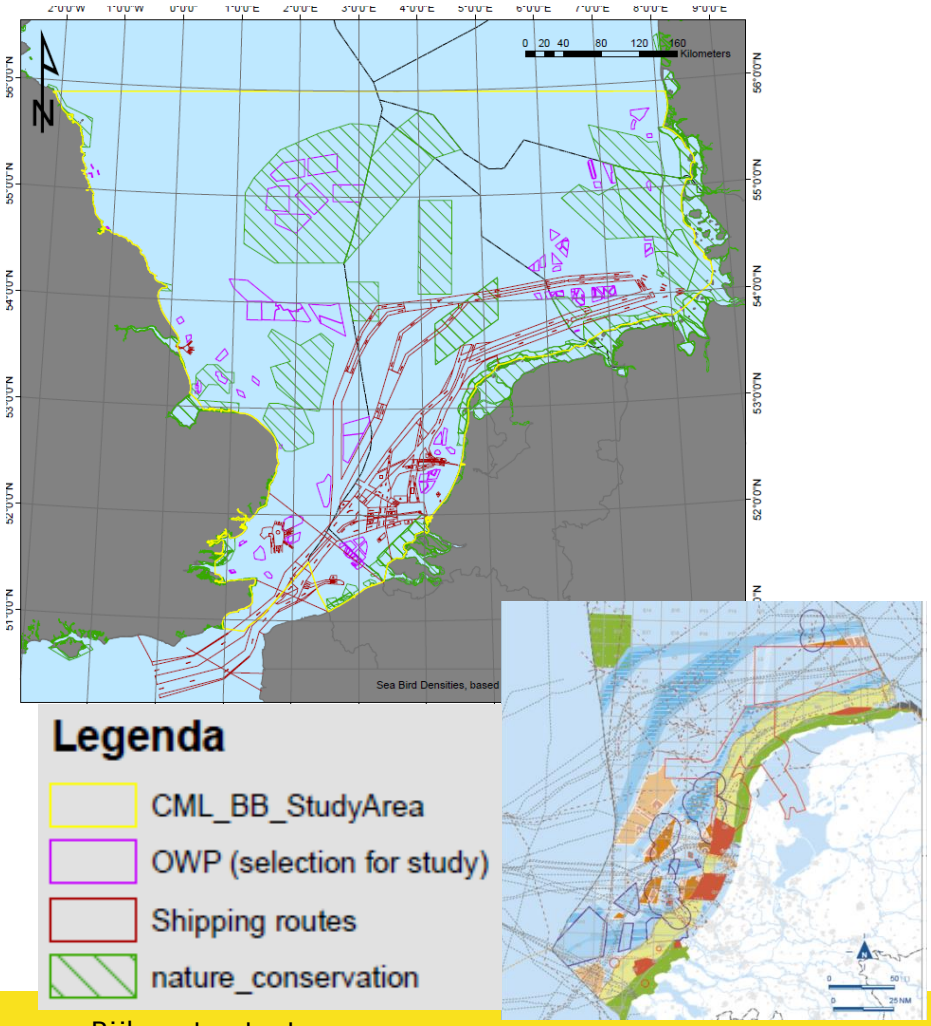
Commissioned by: Ministry of Economic Affairs

Why assessing cumulative effects of offshore wind farm development?

Plans for OWF until 2023 in the entire Southern North Sea area

- total 4450 MW (Netherlands)
- OWF in neighboring countries, up to 8000 turbines

- Need of clear framework for cumulation stressed by cMER (the advisory commission on EIA)
- Not cumulation on a license by license base, all wind parks together -> no unpleasant surprises



Goals and status of the Framework Ecology and Cumulation

1. Energy agreement – understanding and evaluating cumulative effects for implementation of the Energy Agreement
2. Framework Offshore Wind Farms – methodology for determining cumulative effects of offshore wind
3. Generic framework - methodology for determining cumulative effects

National Water policy plan obtains the obligation to adapt The Framework

The Framework will provide and is based on:

Provides:

- Understanding of the cumulative effects of implementation of wind energy at sea as stated in the Energy agreement - strategic advice
- Advice regarding regulations for plot decrees (on ecology)
- Overview of knowledge gaps - foundation for monitoring on Wind Farm Side Decision

Based on:

- Transparency
- Precautionary principle, but realistic worst case
- The use of expert judgement for filling knowledge gaps
- Only published information / models used.

Scope

Framework:

- 10 windfarms, and international
- Only cumulation, not location specific
- Priority for biggest impacts: (Sea mammals & underwater noise, Birds, Bats)
- Only generic advice for mitigation measures
- Not <12 NM

Steps

- Same steps underwater noise and birds
  - Pressures
  - Cumulation with other windfarms (national and international)
  - Cumulation with other pressures (shipping)
  - Calculated effects next to PBR
  - Mitigation

How to evaluate the calculated cumulative effects

Birds and Bats:

- Choice for Potential Biological Removal (PBR) as maximum acceptable impact, allows for scanty population data. PBR has a stronger scientifically base than ORNIS 1% additional mortality (Birds) and is therefor legally accepted under Dutch law.

Harbour Porpoise:

- ASCOBANS, 95% chance on a impact at which population is maintained at at least 80% carrying capacity





Birds

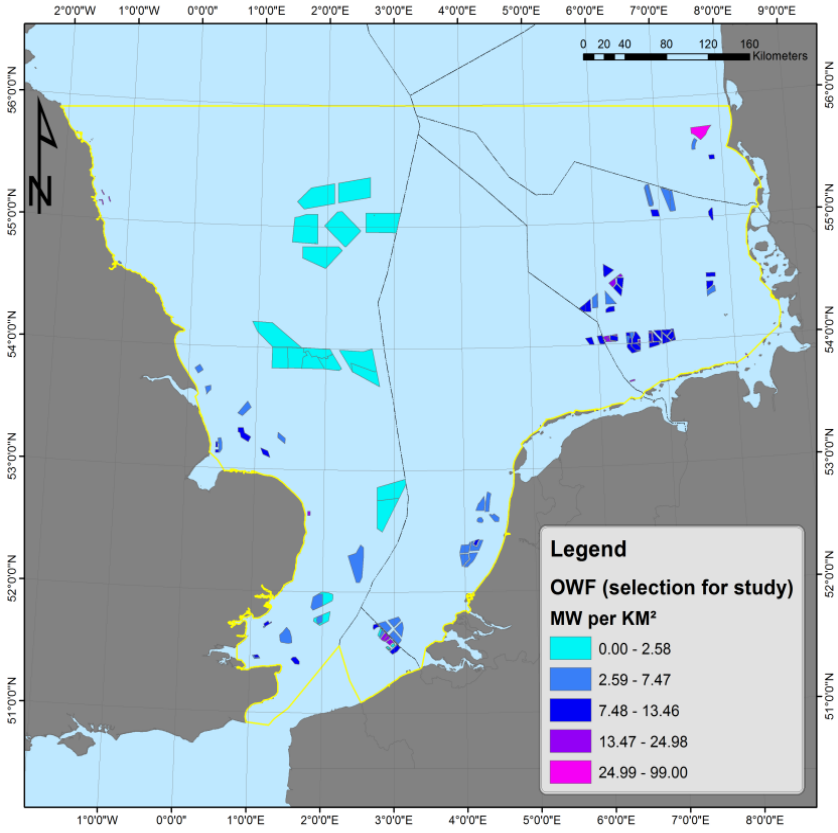
Pressures

- OWF: presence of OWF
  - habitat loss for certain seabirds
  - barrier effects for coastal birds moving out to sea and back
- OWF: rotation of rotor blades:
  - collision risks for seabirds and migrating 'land' birds
- Shipping
  - habitat loss for certain seabirds
- Pressures can (in a ideal world) be summed

Cumulative impact scenario

- Southern North Sea
- All planned OWF until 2023
  - Ca 8.000 turbines
  - Ca 37 GW

- Configuration/lay-out: ‘worst case´
  - 4 MW turbines for habitat loss (SER wind farms)
  - 3 MW turbines for collision risk modelling



Birds: Habitat Loss (and barrier-effects)

- Overlap density maps & cumulative scenario
- Assumption: 10% mortality of ‘displaced’ seabirds (Bradbury et al., 2014)
- Maximum impacts on common guillemot:
  3.464 individuals ~ 0,13 * PBR
- All other seabirds < 0,1*PBR

Birds: Collision Risk Modelling - Band Model

- Most species < 0,10*PBR
- Some 0,10-0,6*PBR (northern gannet, kittiwake, tundra swan, curlew, black tern)
- 3 species of gulls impacts near or over PBR
  - Lesser black backed gull (>PBR)
  - Great black backed gull, (>PBR)
  - Herring gull (±PBR)

Conclusions:

- Seabirds:
  - PBR exceeded for 3 gull species
  - Impact of Collision Risk > Habitat Loss (at least until 2023)
- Migrating ‘land’ birds:
  - Max 0,4-0,6 * PBR in scarce species
- **Significant impact possible** (collision of seabirds)

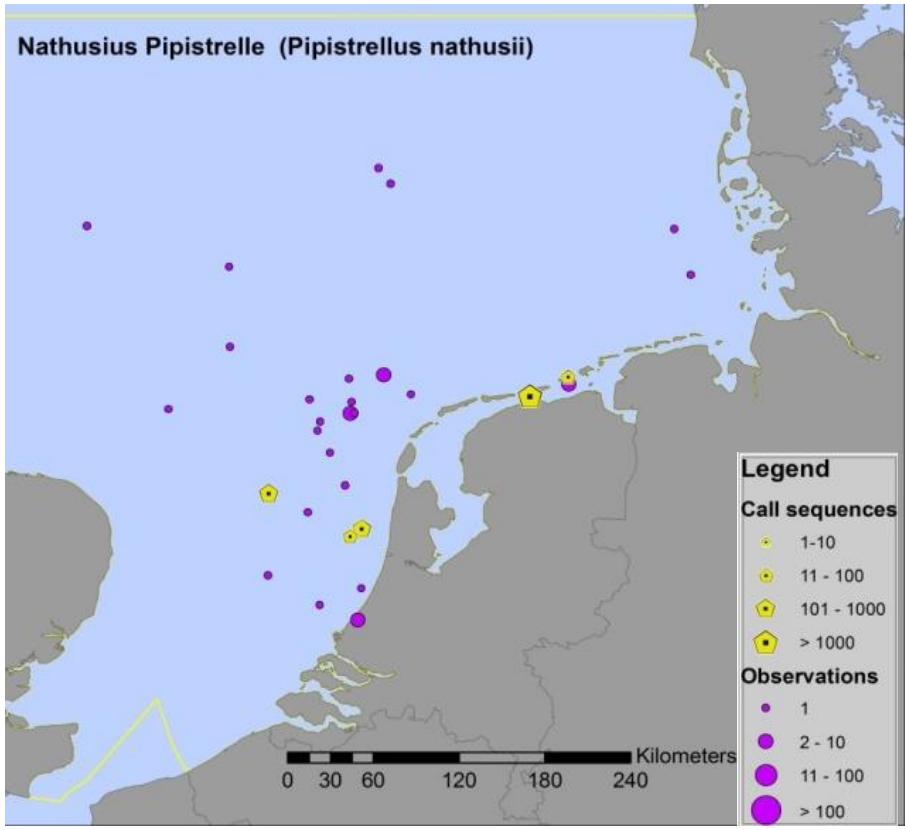
Possible Mitigation Measures

- Birds:
  - Insight in different turbine types: 3 – 10 MW
    - Gulls: 10 MW 20% impact compared to 3 MW
    - Limits to turbine types
  - Start/Stop procedure during massive migration and specific weather (Flora- and Fauna-act)

Bats

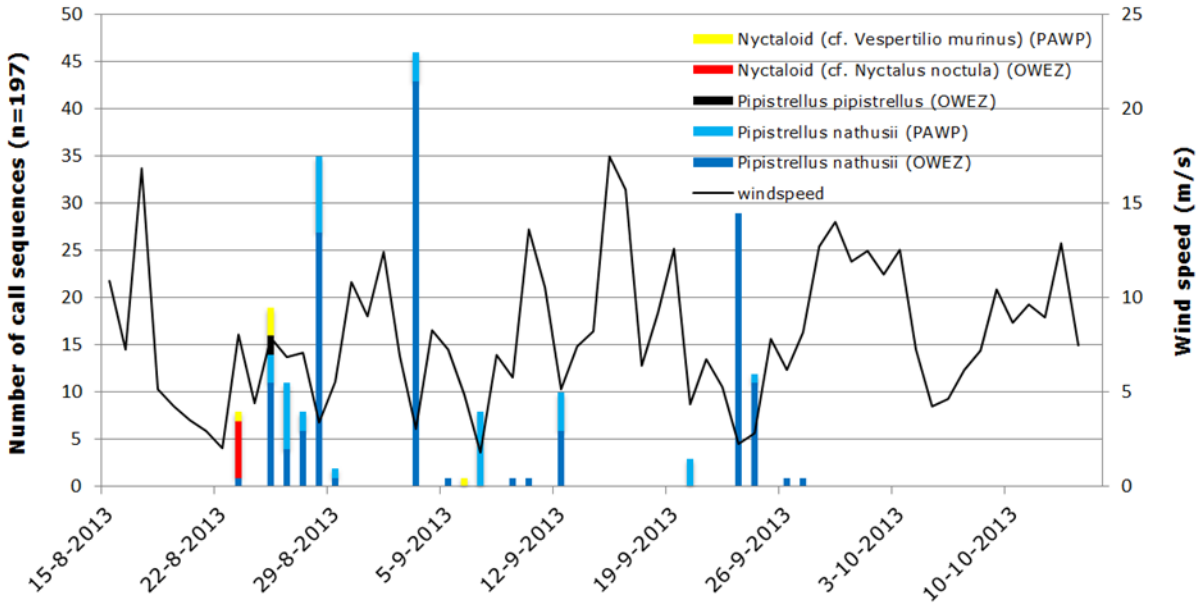
Possible effects on Bats

- ‘massive’ gap in knowledge
- Research from OWEZ OWF:
  - Max 3 species, min 1 species (*Nathusius' pipistrelle*)
  - Only spring and fall
  - Mostly < 4 Bft
- Collision and disbalance, both lethal



Possible effects on bats

- Assumption 1 bat a year per turbine
- Assumed potential effect > PBR
- Research needed



Conclusions:

- Migrating bats:
  - Assumed maximum impact near/over PBR
  - Knowledge gaps: occurrence, trends, numbers, behaviour at sea and wind farms

- **Significant impact possible** (collision of bats)

Possible Mitigation Measures

- Bats:
  - Cut in speed (> 5 m/s), fall (Aug-Sept), night
  - Monitoring

Underwater noise

Scope

- Most vulnerable: Harbour Porpoise
- Assumption: if you protect Harbour Porpoise you protect Seals and fish

Assessment underwater noise

- Calculate the propagation of underwater noise
- Use the thresholds for disturbance (136, 140, 144)
- Determination of the population size of harbour porpoises and harbour and grey seals (legal and ecological relevant populations)
- Determine the sea mammal disturbance days
- Determination of population consequences (incl. PCOD)
- Determination of acceptable maximum effect level
- Effect-evaluation

Scenario's

Dutch scenario's

A. Construction of 2 windfarms in spring, no noise limit (worst case)
B. Construction of 2 windfarms in spring with noise limit of 160 dB at 750 m (German limit)
C. Construction of 1 windfarm in spring and 1 in autumn, no noise limit
D. Construction of 2 windfarms in autumn, no noise limit

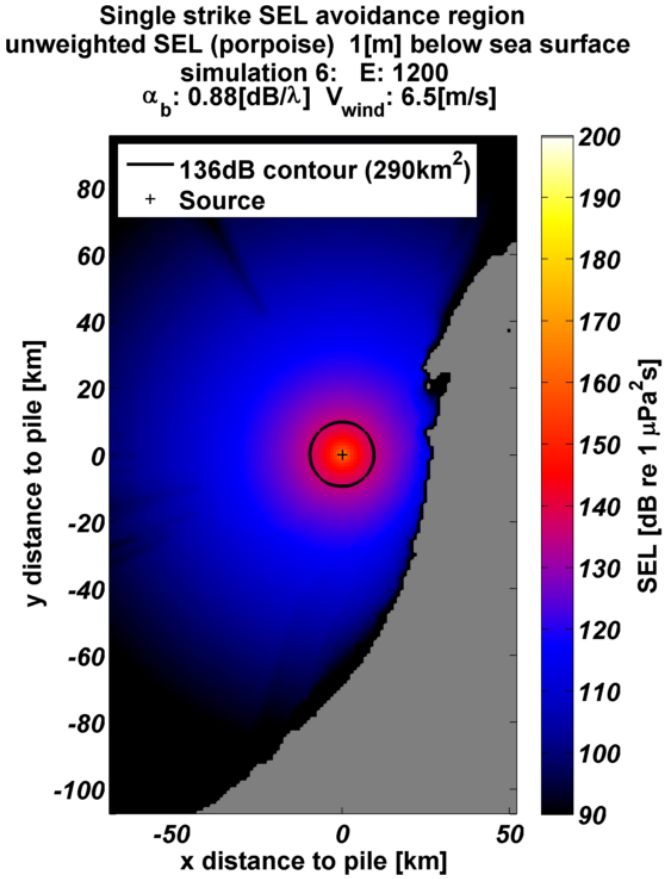
6 MW

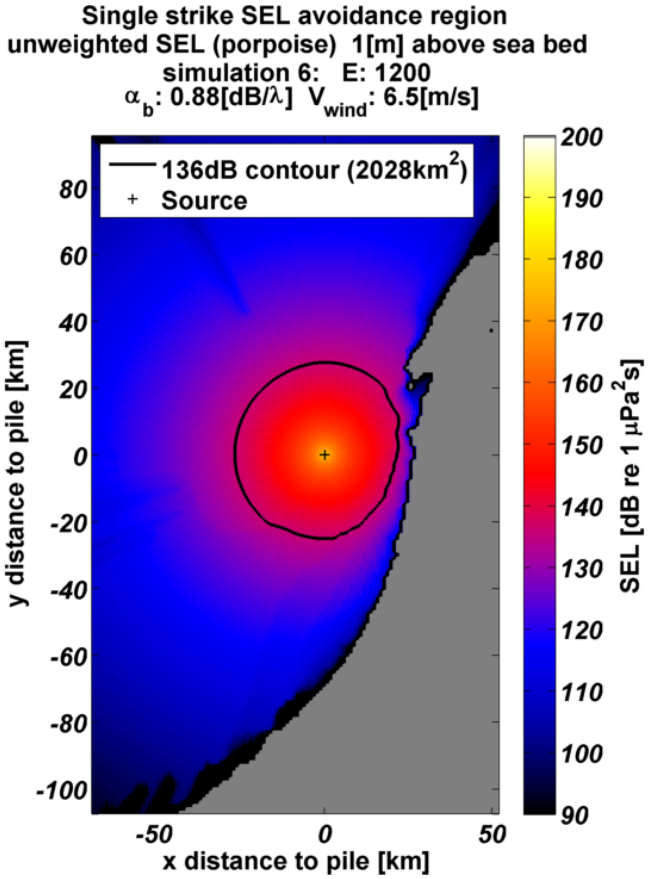
International scenario's*

- No noise limit
- Noise limit of 160 dB at 750 m (German limit)

* single planning, based on publicly available information and the assumption that at any given time only 6 piling vessels are available, 2 of which are assumed to be working in the Dutch wind farms

Acoustic propagation





Disturbance days

Disturbance days are determined by

- the area of disturbance
- the density of the harbour porpoise in the area
- the number of piling days

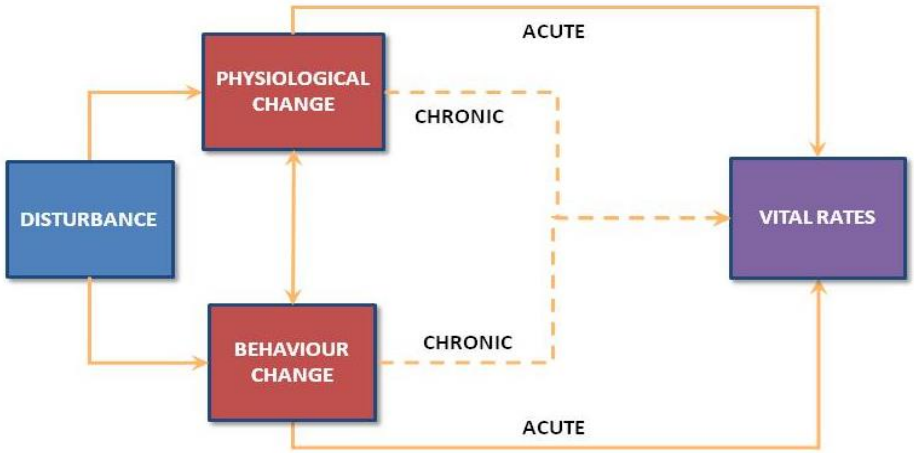
Interim results

scenario	piling days	porpoise disturbance days
1	580	2.326.049
2	580	203.668
3	580	1.572.572
4	580	802.261
5	580	2.326.049
6	580	2.326.049
7	580	4.652.098
8	580	775.350
9	580	3.145.144
10	580	905.803
11	3.709	17.103.778
12	3.129	14.777.729
13	3.709	6.272.563
14	3.709	1.791.273

1	NL, 2 spring
2	NL, 2 spring, 160 dB norm
3	NL, 1 spring, 1 fall
4	NL 2, fall
5	Sc 1, NCP pop
6	Sc 1, only effected pop
7	Sc 1, 2 disturbance days
8	Sc 1, 8 hour disturbance
9	Sc 3, 2 disturbance days
10	Sc 1, threshold 144
11	International + Sc 1
12	International – NL
13	Int + sc.1 plus threshold 144
14	Int + sc. 1 plus threshold 144 plus 160 dB norm

Interim Pcod model

Input = harbour porpoise disturbance days



- **Significant impact possible** (population consequences)

Potential mitigation measures

Spatial planning

- Possible wind farm locations are already selected

Temporal planning

- Seasonal restrictions for piling activities
- Simultaneous piling at multiple locations

Noise reduction

- The industry has expressed a preference for a clear noise limit
- Practical solutions are available (noise mitigation)
- Flexible measures (seasonal and limit) x dB re 1 μPa^2s at 750 m from pile

Also

- International coordination
- Others: Seismic, shipping, etc.

Questions?

More information,
see www.noordzeeloket.nl
from April on