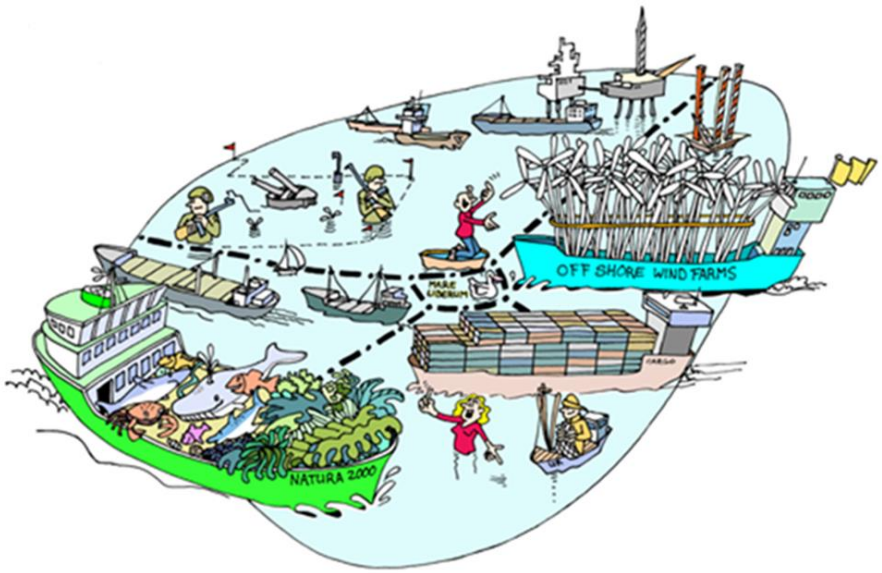
Rijkswaterstaat
Ministerie van Infrastructuur en Milieu



Framework Ecology and Cumulation (KEC)

Framework for assessing environmental and cumulative effects in relation to offshore wind

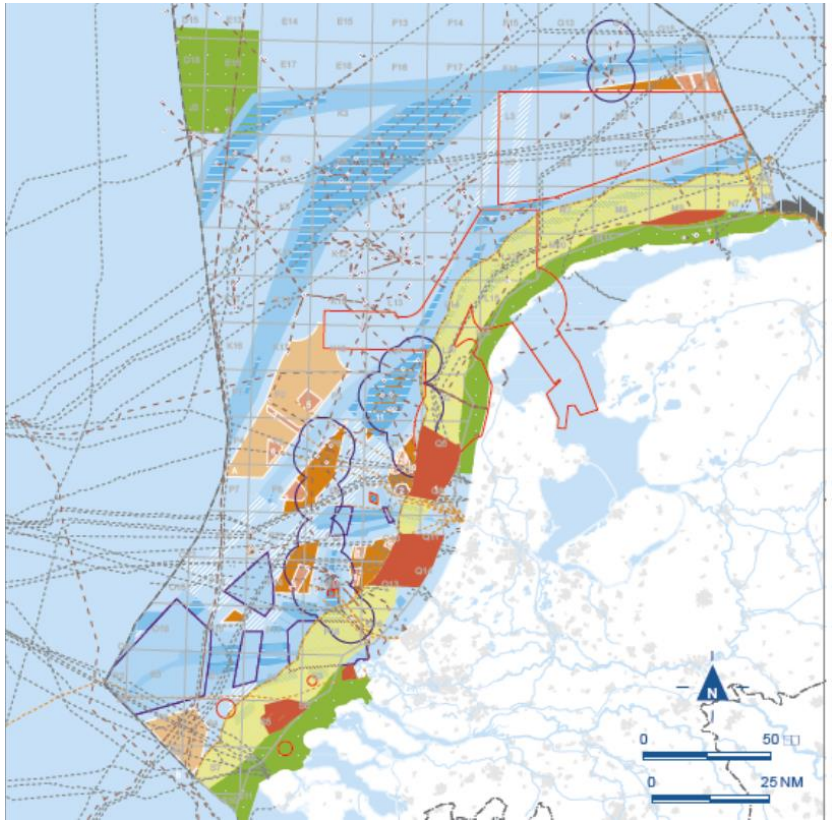
15 Oct. 2014

Rob Gerits, Suzanne Lubbe, Martine Graafland

The reason for developing the KEC

Energy agreement for sustainable Growth (SER akkoord): 4.450 MW at sea in 2023;
Another 10 large windfarms!

Recommendations Netherlands Commission for Environmental Assessment “herziening RSV-WoZ”: Further research is necessary of (cumulative) effects of wind farms on birds and marine life for rollout of WoZ at project level.



Goals KEC

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

Specific for Energy Agreement

- understanding of cumulative effects - Strategic advice

Specific for the Framework Wind op Zee:

- how to assess cumulative environmental effects (focus on priority species-effect combinations)
- how to define maximum level of effects (cumulatively)
- what are the possibilities for mitigation

Ambitions KEC (Generic Framework)

Ambitions 2015-….

- Coordination with neighboring countries (North Sea wide?)
- Take into account MSFD indicators (when sufficiently developed)
- Extending with more activities (sand-extraction, ...?) including assessing effects

Relation with the decisions on parcels (kavelbesluiten)

- Understanding cumulative effects of implementation of energy agreement - Strategic advice
- Evaluation of expected effectiveness mitigation measures
  - For example: noise mitigation measures
- Advice regarding measures for kavelbesluiten (on ecology)

  For example:
  - Noise mitigation
  - Configuration (tip height, corridors)
  - Bat mitigation
- Overview of knowledge gaps - basis for monitoring kavelbesluiten

WORKSHOP: topics

3 subjects with questions after each workshop topic:

1. Development framework of the approach for assessing cumulative effects of offshore wind farm development.
    - Consultations with research institutes and consultancies: problems & recommendations

2. Effects of underwater noise on marine mammals during the construction phase

3. Effects of operational wind farms on birds and bats.

WORKSHOP – Introduction

3 subjects with questions after each workshop topic:

1. Development framework of the approach for assessing cumulative effects of offshore wind farm development.
    - Consultations with research institutes and consultancies: problems & recommendations

2. Effects of underwater noise on marine mammals during construction phase

3. Effects of operational wind farms on birds and bats

NB: Expert Sessions in October / November for the last two topics with specialists of the windfarm companies

WORKSHOP - Sneak Preview - Consultations

- 6 parties interviewed (Oct 2014)

- Bottlenecks
  - Time & money
  - 'No sanctions'
  - Information
    - No clear scope:
      - ecological/legal,
      - geografical,
      - in time
      - activities,
      - species
    - Lack of overview of effects of other initiatives
    - Knowledge gaps:
      - Doses-effect relations
      - How to define maximum level of effects

WORKSHOP - Sneak Preview - Consultations

- Recommendations:
  - Develop a structured method in which clear scoping criteria are given
  - Cumulation-administration: condition: a good registration of activities

  - Solve knowledge gaps with research/monitoring
    - » Population dynamics & models → Maximum effect levels

  - Designated role for government / competent authority
  - Requirements for process; transparency, living document, actualization

WORKSHOP – Framework Wind op Zee

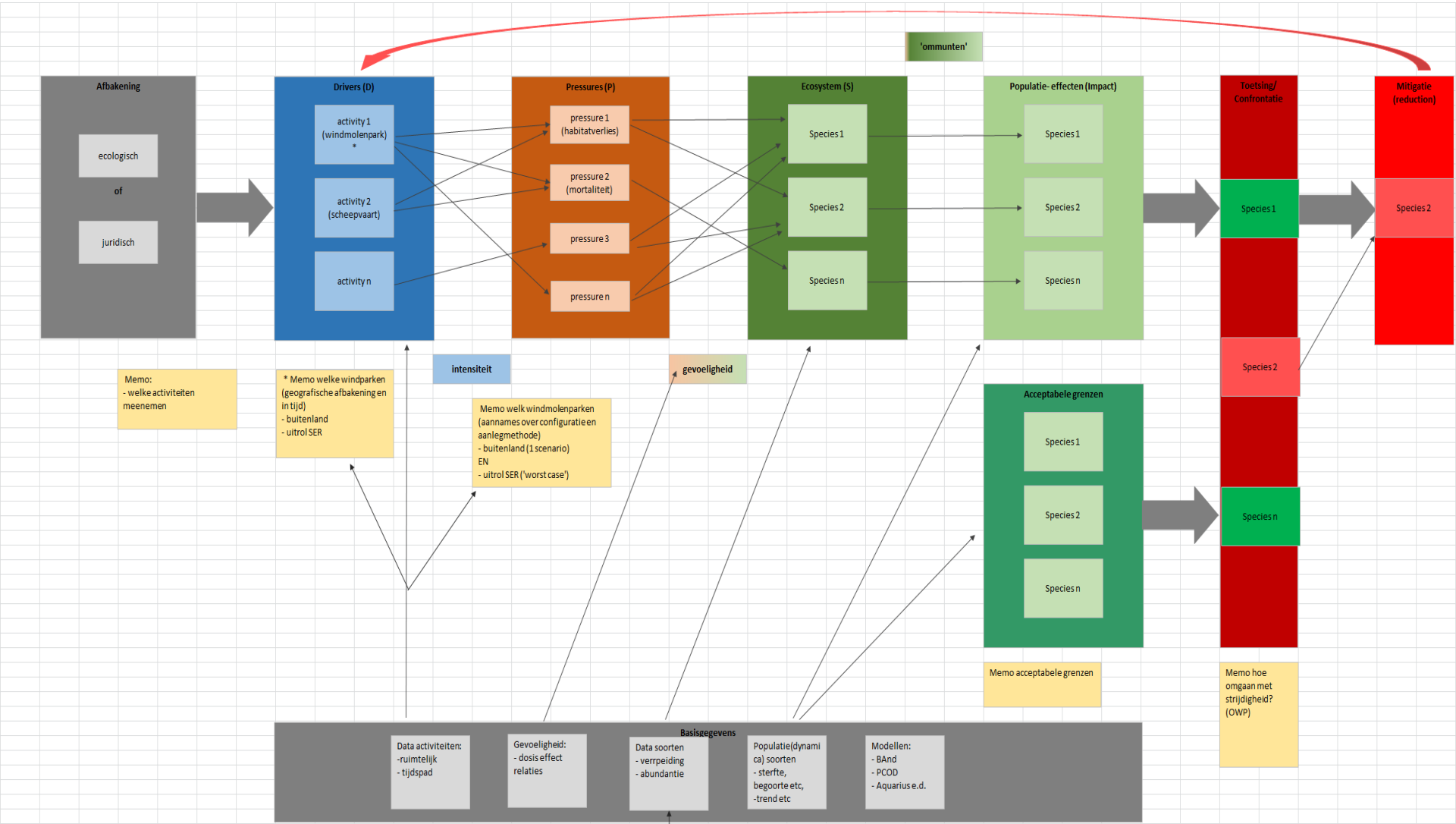
Methodology

- Development of a structured methodology

Scoping and steps to take

- Ecological versus legal
- Which activities are relevant to take into account for assessments
- Which species (within the area of activity) can be impacted
- Effect determination
- Effect assessment
- Options for mitigation

WORKSHOP – Sneak Preview - Framework Wind op Zee



WORKSHOP – Consultations - Discussion

- Are the bottlenecks of the consultation recognizable?
- Other suggestions to shape to the framework

WORKSHOP – Seamammals and Underwaternoise

It’s about the effects of pile driving on harbour porpoises and seals

- Development of a methodology for the propagation of underwater noise and applying that method
- Assessing cumulative effects of all wind farms to be developed according to Energy Agreement – different scenario’s for construction phase. Foreign wind farms are a given
- Effects of other sources of underwater noise (seismic surveys)
- Determination of the population size of harbour porpoises and harbour and grey seals (legal and ecological relevant populations)
- Determination of acceptable maximum effect level (incl PCOD)
- Effect-evaluation

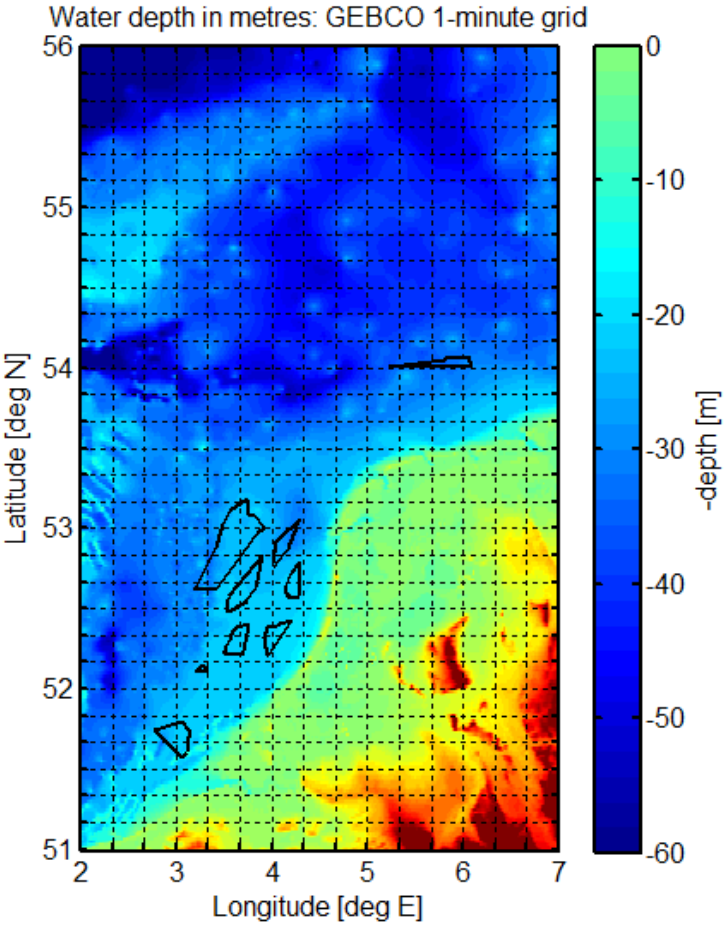
WORKSHOP - Sneak Preview - NL proposed locations

- 4 'wind areas':
  - *Borssele*
  - *IJmuiden Ver*
  - *Hollandse Kust* (6 parts)
  - *Ten Noorden van de Waddeneilanden*

- Water depths 20-30 m

- Power to be installed ~3450 MW
  - i.e. 1150 turbines of 3 MW
  - or 690 turbines of 5 MW
  - or 430 turbines of 8 MW

- Construction years 2016 – 2023
  - i.e. at least 60 to 160 piles / year



WORKSHOP - Sneak Preview - 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 noise limit over prescribed reduction measures*
  - *Practical solutions are available that can comply with German legislation (at 750 m from pile $SEL_{SS} \leq 160$ dB re 1 μPa^2s)*

WORKSHOP - Sneak Preview Propagation calculations (AQUARIUS)

- Calculations for realistic conditions (medium sand, medium wind)
- Uniform water depth 20 and 30 m
  - Distance in (blue) for situation where SEL_{SS}(750 m) = 160 dB
  - 30 m water, no wind, 2 MW hammer:
    - SEL_{SS} = 179 dB at 750 m and 136 dB at 61 km (13 km)
  - 30 m water, no wind, 1 MW hammer:
    - SEL_{SS} = 176 dB at 750 m and 136 dB at 50 km (13 km)
  - 20 m water, no wind, 2 MW hammer:
    - SEL_{SS} = 179 dB at 750 m and 136 dB at 41 km (10 km)
  - 30 m water, 6 m/s wind, 2 MW hammer:
    - SEL_{SS} = 178 dB at 750 m and 136 dB at 49 km (12 km)
  - 30 m water, no wind, 2 MW hammer (at - 6 dB SL_E)
    - SEL_{SS} = 173 dB at 750 m and 136 dB at 33 km (12 km)

WORKSHOP - Sneak Preview – seamammals and underwaternoise

Without noise mitigation:

- Avoidance distances between 33 and 61 km
- Surface inside the avoidancecontour between 3.400 and 11.700 km^2

With noise mitigation:

- Avoidance distances between 10 and 13 km
- Surface inside the avoidancecontour between 310 en 530 km^2

WORKSHOP - Sneak Preview # harbour porpoises

Without noise mitigation

	minimum			maximum		
	July	**Oct/Nov**	**March**	**July**	**Oct/Nov**	**March**
Borssele	1646	1353	3992	5663	4657	13736
IJmuiden ver	idem	idem	idem	idem	idem	idem
Hollandse kust	idem	idem	idem	idem	idem	idem
Noord. Waddeneil.	1142	2322	10139	3931	7991	34889

With noise mitigation

	minimum			maximum		
	July	**Oct/Nov**	**March**	**July**	**Oct/Nov**	**March**
Borssele	150	123	364	257	211	622
IJmuiden ver	idem	idem	idem	idem	idem	idem
Hollandse kust	idem	idem	idem	idem	idem	idem
Noord. Waddeneil.	104	212	924	178	362	1580

WORKSHOP - Sneak Preview – Percentage of the North sea population(%)

	With noise mitigation			With noise mitigation		
	July	**Oct/Nov**	**March**	**July**	**Oct/Nov**	**March**
Borssele	0,6-2,1	0,5-1,7	1,5-5,1	0,06-0,10	0,05-0,08	0,14-0,23
IJmuiden ver	idem	idem	idem	idem	idem	idem
Hollandse kust	idem	idem	idem	idem	idem	idem
Ten noorden van Waddeneilanden	0,4-1,5	0,9-3,0	3,8-13,1	0,04-0,07	0,08-0,14	0,35-0,59

WORKSHOP - Sneak Preview - summary effects on the harbour porpoises (avoidance)

- <u>Without noise mitigation:</u>
  - At least 0,4 – 3,8% of the North Sea population is impacted (2 MW hamer, waterdepth 30 m, no wind, SL_E – 6 dB)
  - Maximal 1,5 – 13% of the North Sea population is impacted (2 MW hamer, waterdepth 30 m, no wind)

- <u>With noise mitigation (SELss (750 m) = 160 dB):</u>
  - At least 0,04 – 0,35% of the North Sea population is impacted
  - Maximal 0,07 – 0,59% of the North Sea population is impacted

WORKSHOP – underwaternoise and sea mammals - Discussion

- Are the assumptions for the scenarios right?
- How do windfarmdevelopers feel about mitigating measures?
- What is your policy with the relationship between flexibility versus worst case determination - requirements? Maximizing flexibility with strict rules or limiting the flexibility and have more flexible rules?

WORKSHOP – Birds and Bats

It is about collisions, barrier effects and habitat loss.

It is about sea birds, migratory birds and bats

- Which species are relevant, what is their distribution and what is their sensitivity for OWF(maps)
- Determination population size per species (legally and ecologically relevant populations)
- What are (worst case) scenario's to assess with respect to wind farm configuration
- Cumulative effects of all wind farms to be developed (Energy agreement). Foreign wind farms are a given.
- Determination of acceptable maximum effect levels
- Effect evaluation

Workshop – birds and bats

- Scenario's: determining ''worst case" bandwidth
  (Depends on type of effect, species and location)

  - Collisions:
    - 3 scenario's
      - 3 MW, D =100 m, 4D
      - 3 MW, D = 121 m, 4D
      - 10 MW, D = 221 m, 4D
    - Band Model (best available practise, used internationally)

Workshop – birds and bats

- Scenario's: determining ''worst case" bandwidth
  (Depends on type of effect, species and location)

  - Habitat loss: 4 MW,7D: maximisation of impacted area
    - Assumption: 10% dies (according to literature)

OPEN ACCESS Freely available online

PLOS ONE

Mapping Seabird Sensitivity to Offshore Wind Farms

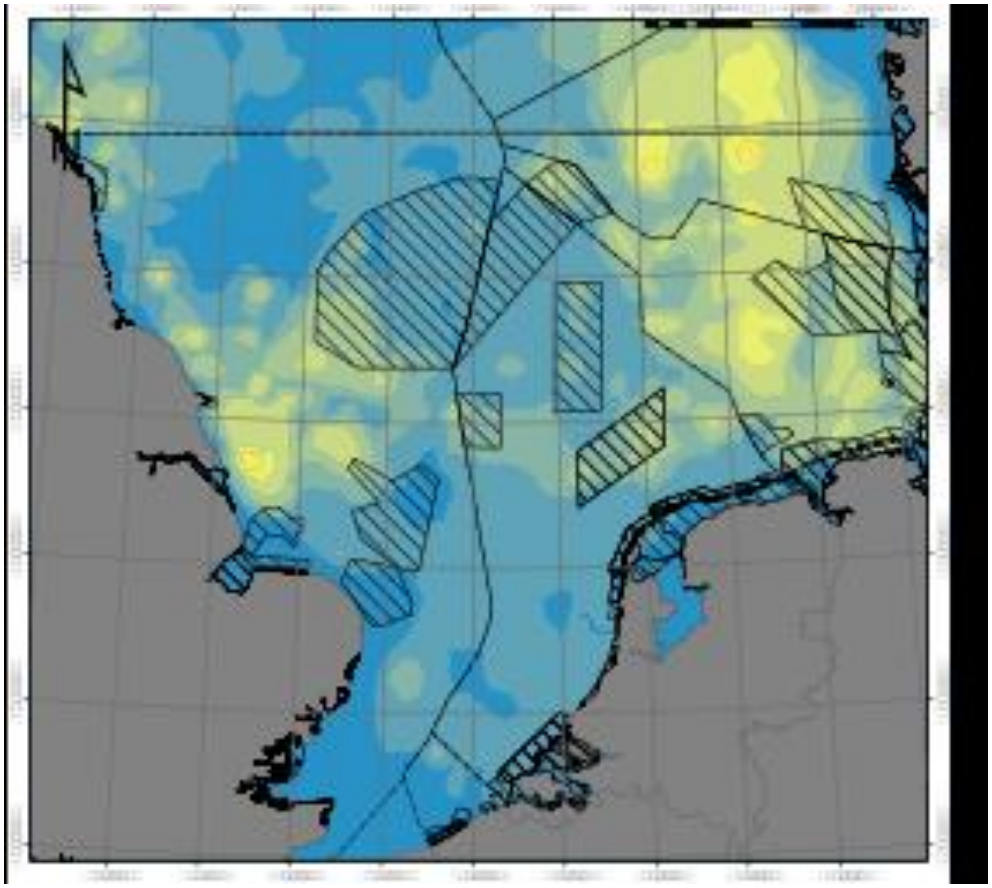
Gareth Bradbury[1]*, Mark Trinder[2], Bob Furness[2], Alex N. Banks[3], Richard W. G. Caldow[3], Duncan Hume[4]

1 Wildfowl & Wetlands Trust (Consulting) Ltd., Slimbridge, United Kingdom, 2 MacArthur Green, Glasgow, United Kingdom, 3 Natural England, Exeter, United Kingdom, 4 Marine Management Organisation, Newcastle, United Kingdom

Abstract

We present a Geographic Information System (GIS) tool, SeaMaST (Seabird Mapping and Sensitivity Tool), to provide evidence on the use of sea areas by seabirds and inshore waterbirds in English territorial waters, mapping their relative sensitivity to offshore wind farms. SeaMaST is a freely available evidence source for use by all connected to the offshore wind industry and will assist statutory agencies in assessing potential risks to seabird populations from planned developments. Data were compiled from offshore boat and aerial observer surveys spanning the period 1979–2012. The data were analysed using distance analysis and Density Surface Modelling to produce predicted bird densities across a grid covering English territorial waters at a resolution of 3 km×3 km. Coefficients of Variation were estimated for each grid cell density, as an indication of confidence in predictions. Offshore wind farm sensitivity scores were compiled for seabird species using English territorial waters. The comparative risks to each species of collision with turbines and displacement from operational turbines were reviewed and scored separately, and the scores were multiplied by the bird density estimates to produce relative sensitivity maps. The sensitivity maps reflected well the amassed distributions of the most sensitive species. SeaMaST is an important new tool for assessing potential impacts on seabird populations from offshore development at a time when multiple large areas of development are proposed which overlap with many seabird species' ranges. It will inform marine spatial planning as well as identifying priority areas of sea usage by marine birds. Example SeaMaST outputs are presented.

WORKSHOP – Sneak Preview - Birds and Bats

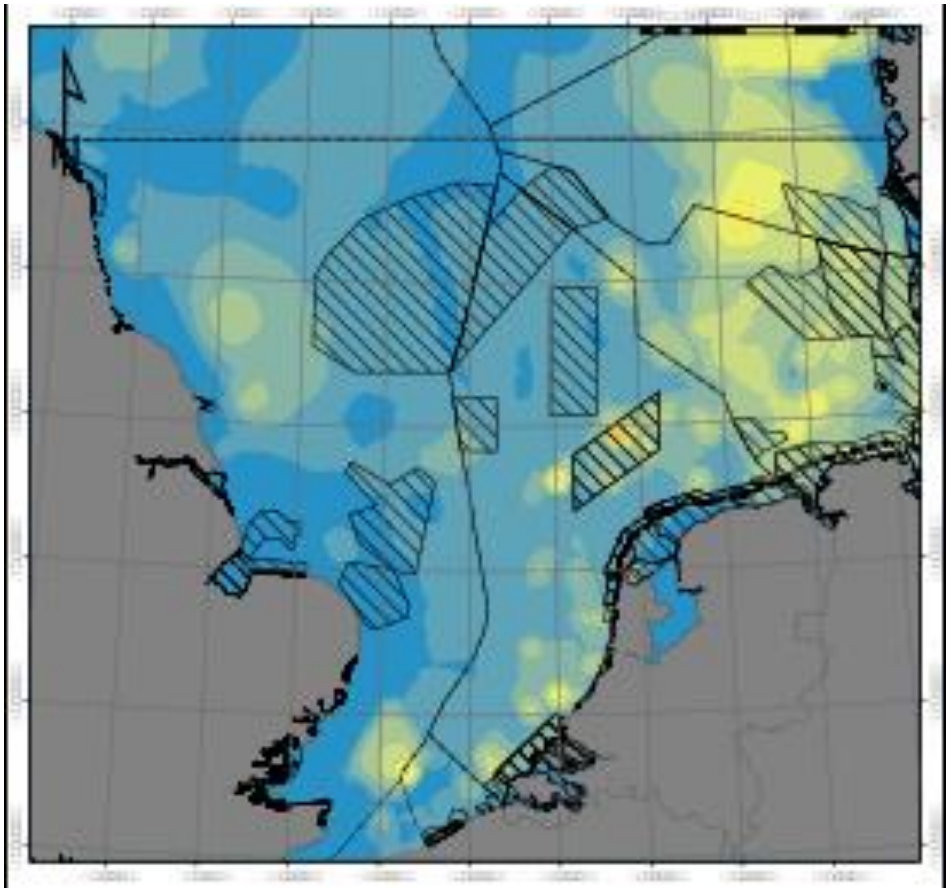


- Density maps (ESAS database)

- 27 species of seabirds
- 6 seasons

- Examples:
- Common guillemot

WORKSHOP – Sneak Preview - Birds and Bats



- Example:
- Lesser black backed gull

Workshop – Birds and bats - discussion

- Are the assumptions for the scenarios right?
- Mitigation opportunities for birds and bats?
- Your view on maximum flexibility versus worst case approach - Maximizing flexibility in EIA and possibly with strict measures in ‘kavelbesluit’ or limiting the flexibility?