Marine Spatial Planning and Offshore Wind Energy

United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM)
Second expert meeting of the Working Group on Marine Geospatial Information
Rostock-Warnemünde, Germany (24 to 28 February 2020)

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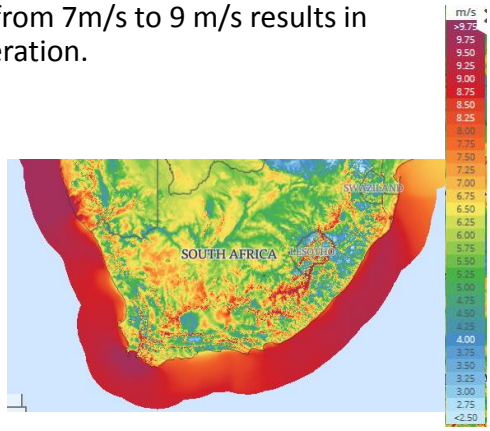
Wind Energy – why going offshore?

- Better resource, stronger and more stable winds
- Cubed relationship between wind speed and wind power: $P_w = \frac{1}{2}\rho A v^3$
- 28% increase of wind speed from 7m/s to 9 m/s results in 112% increase in power generation.
- Larger project scale:

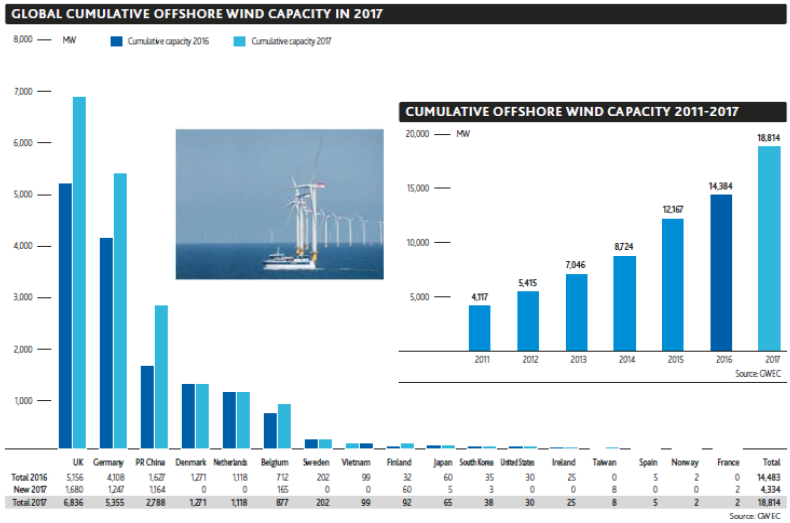
onshore wind farms 20-50 MW

offshore 200 MW to > 1GW

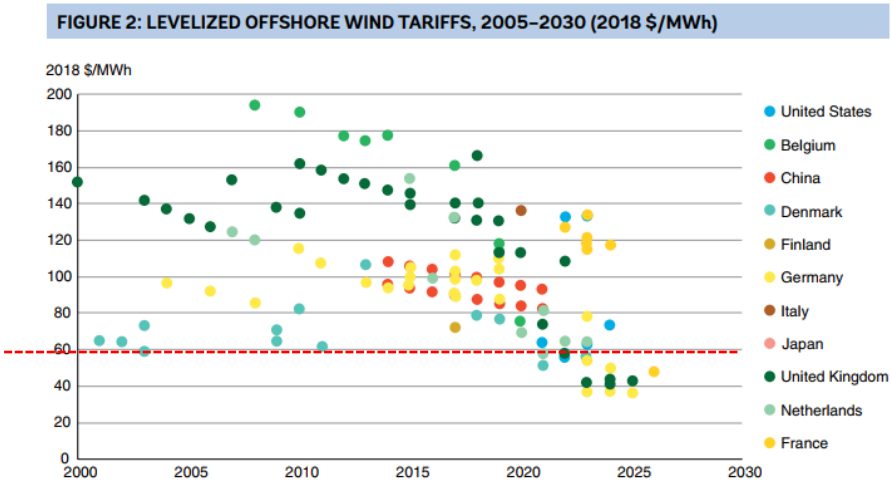
- Less planning restrictions
- More space (?)



Offshore wind energy coming of age

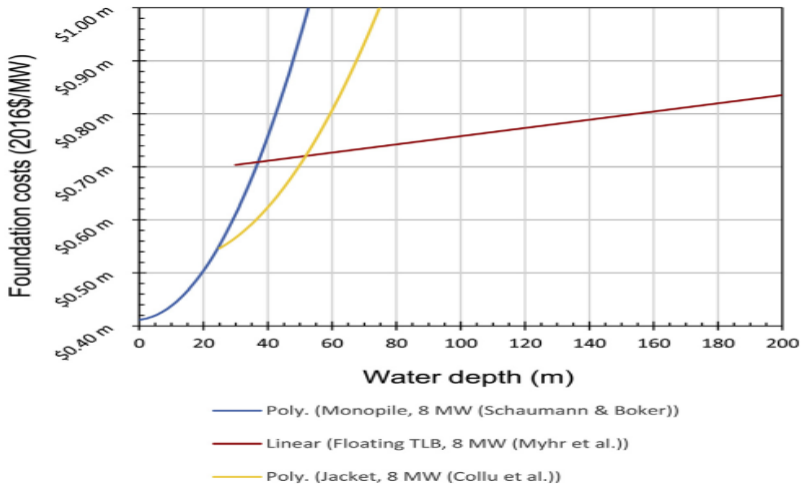


Cost reduction in offshore wind: also due to better spatial planning



ESMAP, 2019

Economic significance of accurate bathymetry data



Bosch et al. , 2019

Seabed 2030

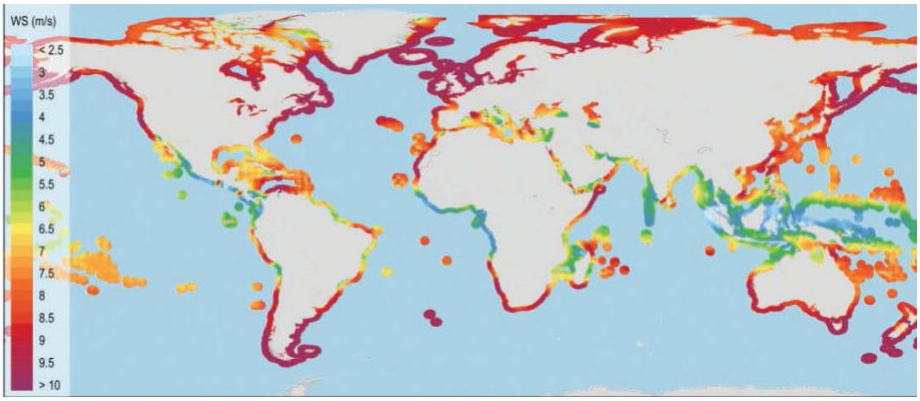
- New data highly relevant in context of offshore wind modelling.
- Priority for promising markets?

TABLE 1: SUMMARY TECHNICAL POTENTIAL FOR OFFSHORE WIND IN SELECT EMERGING MARKETS WITHIN 200 KM OF COAST

Country	Fixed (GW)	Floating (GW)	Total (GW)
Brazil	480	748	1,228
India	112	83	195
Morocco	22	178	200
Philippines	18	160	178
South Africa	57	589	646
Sri Lanka	55	37	92
Turkey	12	57	70
Vietnam	261	214	475
Total	**1,016**	**2,066**	**3,082**

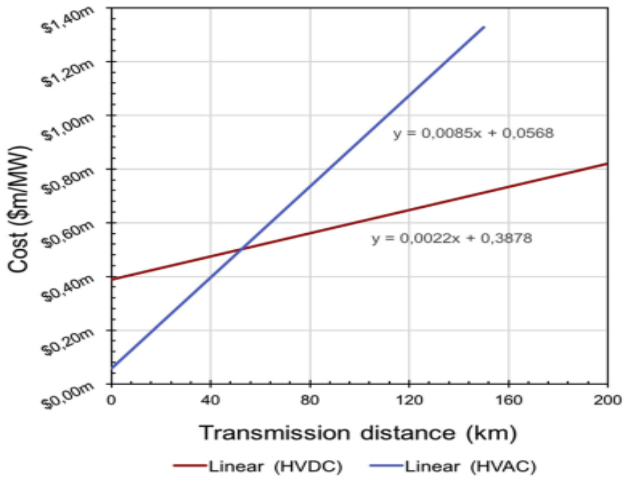
ESMAP, 2019

Varying priority regarding SB 2030 surveys…



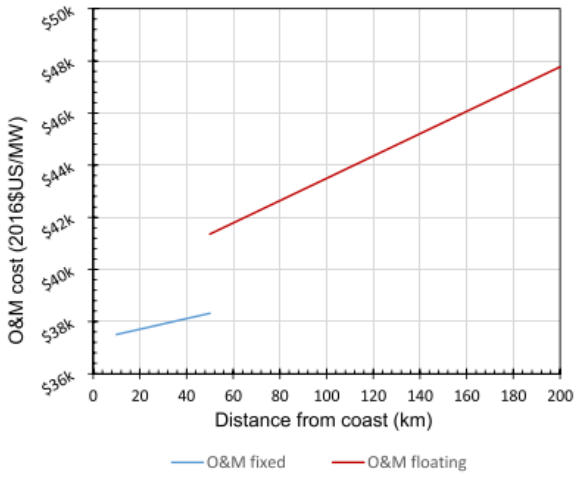
ESMAP, 2019

Land-sea interface 1: Distance to grid connection points and hydropower reservoirs for energy storage



Bosch et al. , 2019

Land-sea interface 2: distance from ports



Bosch et al. , 2019

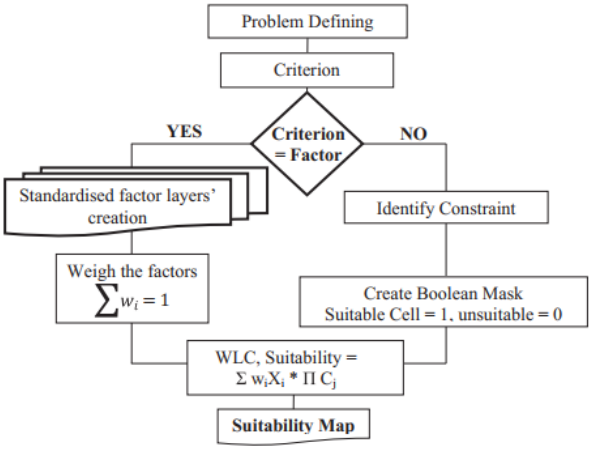
Spatial Data needs…

Parameter	Relevant for which potential type?	Unit?	Minimum / Maximum value	If unsuitable: trade-off possible?	Data availability? (global/regional /national)	Data owner	Data open access or proprietary	Relative importance/ weight ?
Wind resource	?	?	?	?	?	?	?	?
Water depth bottom fixed	?	?	?	?	?	?	?	?
Water depth floating	?	?	?	?	?	?	?	?
Marine protected area	?	?	?	?	?	?	?	?
Distance from grid	?	?	?	?	?	?	?	?
Distance from demand ctr.	?	?	?	?	?	?	?	?
Distance to port	?	?	?	?	?	?	?	?
Military zones	?	?	?	?	?	?	?	?
Radar interference/aviation	?	?	?	?	?	?	?	?
Seabed conditions	?	?	?	?	?	?	?	?
Metocean data	?	?	?	?	?	?	?	?
Marine cables and pipelines	?	?	?	?	?	?	?	?
Shipping density	?	?	?	?	?	?	?	?
Bird habitat/migratory pathways	?	?	?	?	?	?	?	?
Legal status (territorial waters/EEZ)	?	?	?	?	?	?	?	?
Fishing activity	?	?	?	?	?	?	?	?

Most data themes addressed

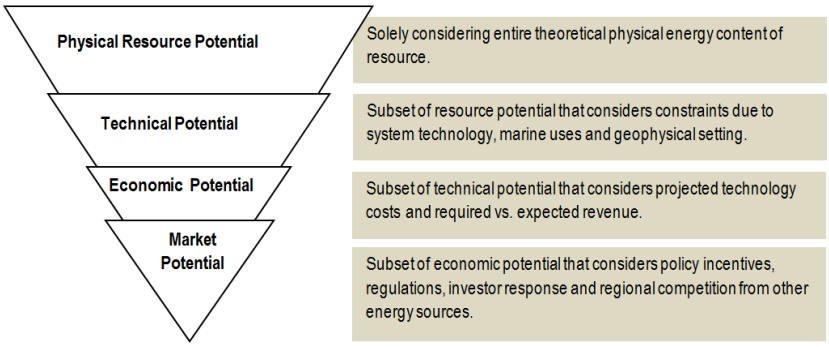
Figure 2. The global fundamental geospatial data themes.

Offshore wind farm planning as spatial optimisation exercise

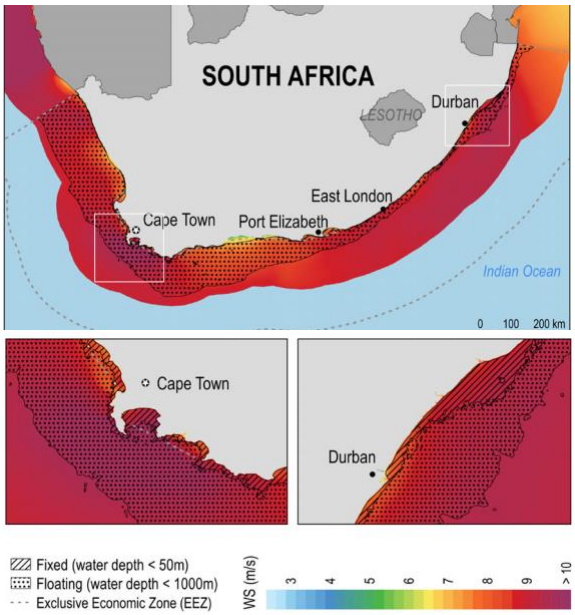


Mahdy, 2018

Offshore wind potentials – location, location, location…

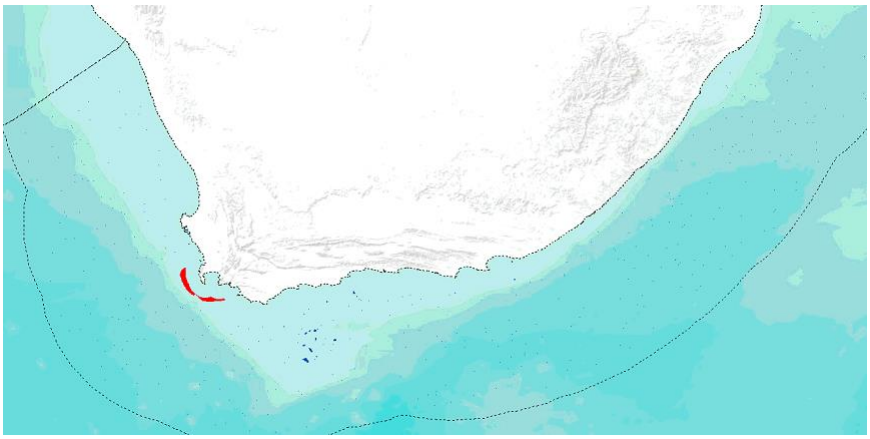


Example South Africa Offshore Wind Potential



ESMAP, 2019

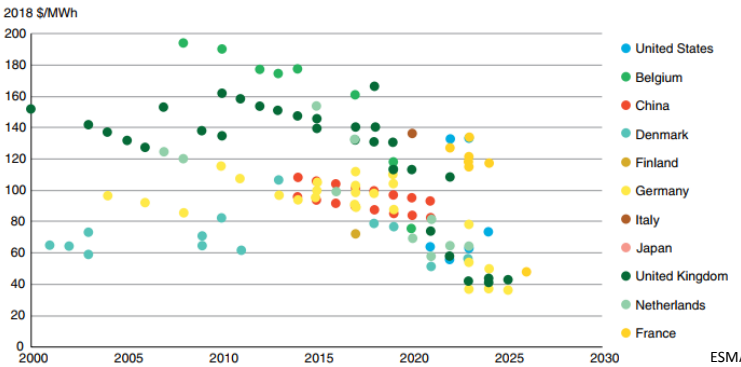
Optimising spatial model to identify the 'best' location for 5 GW capacity



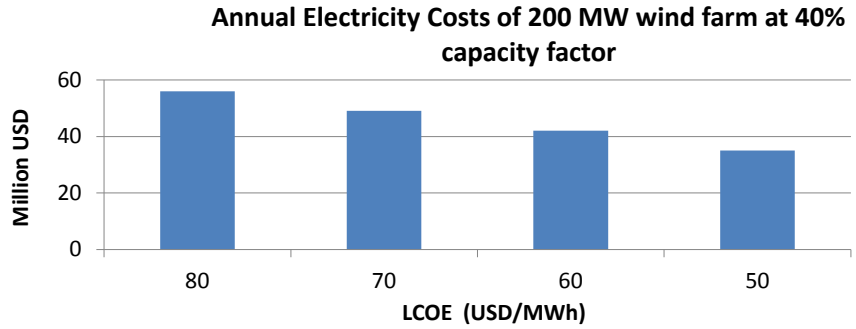
The cost of spatial Illiteracy in offshore wind planning

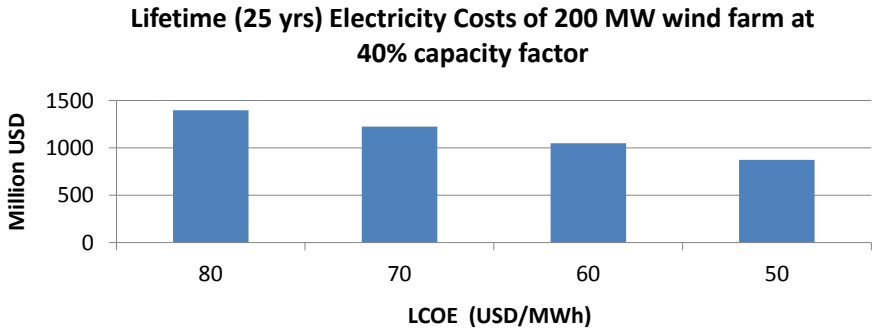
- Power output of 200 MW offshore wind farm: 700 GWh/year
- Annual cost saving per 1$/MWh LCOE reduction: 700 000 US $
- Cost saving over 25 year live time: 17, 5 Million US $

FIGURE 2: LEVELIZED OFFSHORE WIND TARIFFS, 2005–2030 (2018 $/MWh)



ESMAP, 2019





Carbon savings of 200 MW wind farm (700 GWh), every year delay is a year of missed carbon savings

210 000 t CO_2 annually
5,25 million t CO_2 over 25 years

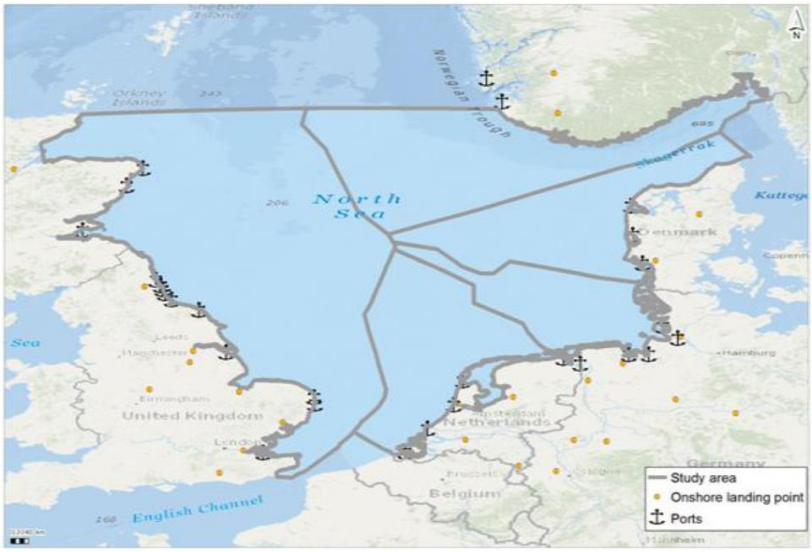
South Africa Offshore Workshop Draft Programme
2-3 April 2020 I Venue TBD, Pretoria

- Opportunity to collaborate with other groups to con open marine geospatial data
- GWEC interested to develop a generic marine spatial planning template for new offshore wind markets

Use case questions directly transferable to offshore wind

1) How does your country organize and manage marine geospatial information (e.g., spatial
data infrastructure)?
2) How are data added to or integrated with existing geospatial data, including landbased data?
3) How can or do you share and integrate your data with other national agencies?
4) Do you have any international, cross-agency, or non-governmental partnerships that
facilitate the collection, sharing, and maintenance of data?
5) What legal and logistical barriers do you know of or foresee in using a multilateral
approach to managing and sharing data (i.e., marine spatial data infrastructure)?

Southern North Sea basin



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Shipping Density

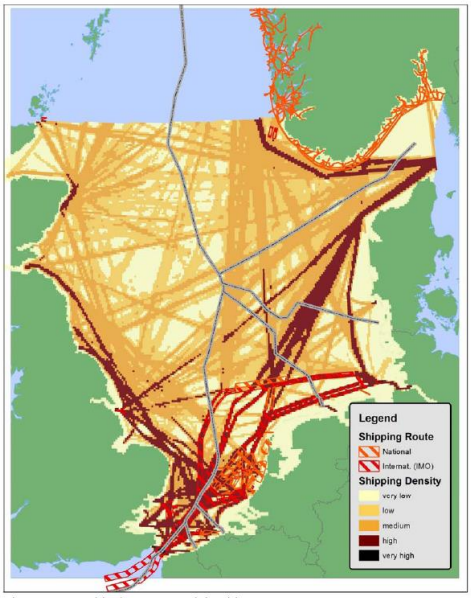

Figure 1 Shipping routes and densities

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Offshore Oil Installations

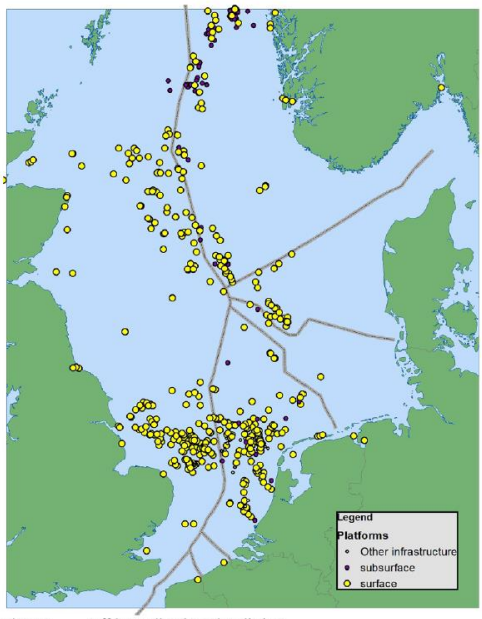

Figure 2 Offshore Oil and Gas installations

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Fishing

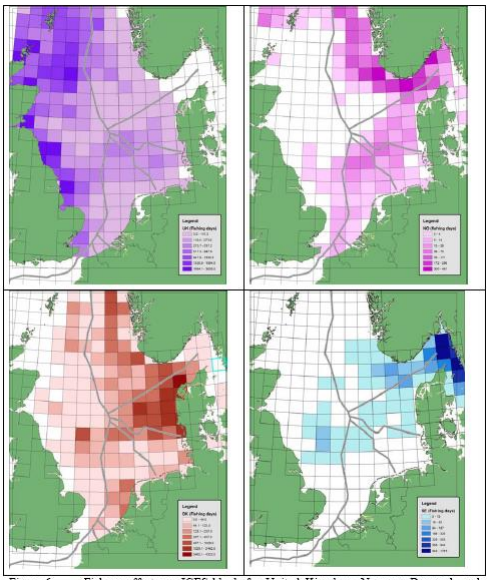

Figure 6 Fishery effort per ICES-block for United Kingdom, Norway, Denmark and Sweden

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Submarine Cables

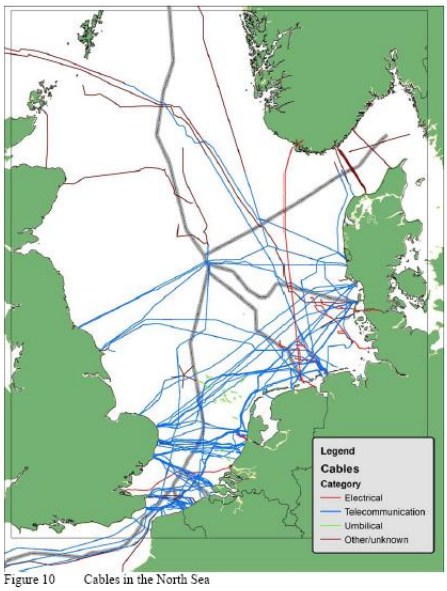

Figure 10 Cables in the North Sea

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Military Use

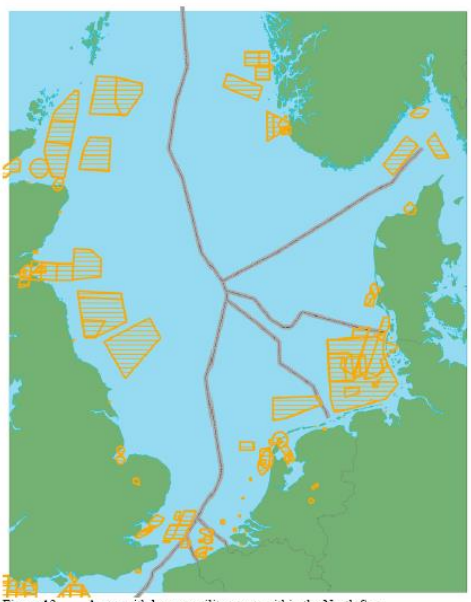

Figure 12 Areas with known military use within the North Sea

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Sand Extraction

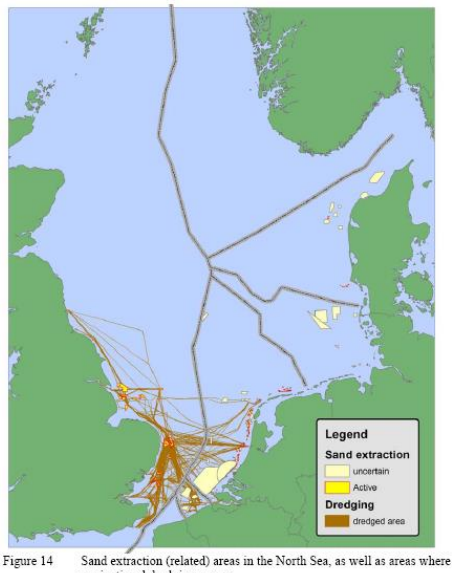

Figure 14 Sand extraction (related) areas in the North Sea, as well as areas where navigational dredging occurs.

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Radar Interference

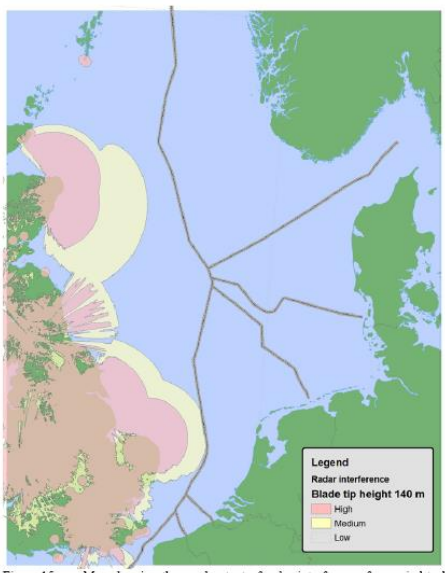

Figure 15 Map showing the areal extent of radar interference from wind turbines with a blade tip height of 140 m. for the United Kingdom.

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Nature Conservation

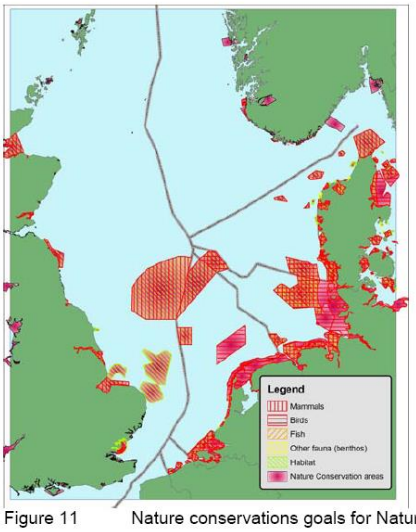

Figure 11 Nature conservations goals for Natura 2000 areas (including draft areas) within the WindSpeed study area.

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Thank you