Strategies for the Environmentally Sound Development of Offshore Wind Energy
Suggestions for Good Practice in Planning, Mitigation, Environmental Assessment, and Compensation

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- Working stations e.g. Federal Agency of Nature Conservation (BfN), Federal Ministry of Environment (BMU), Federal Railway Agency
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1. Introduction

2. Good Practice for an Environmentally Sound Development of Offshore Wind Farms (OWF)

3. Evaluation of Good Practice for an Environmentally Sound Development of OWF

4. Summary
1. Introduction: Offshore wind in Germany

- Offshore Wind (2016): up to 4000 MW
- Offshore Wind (2020): at least 6.500 MW
- Offshore Wind (2030): at least 15.000 MW
- Goal for wind energy: 50% of Germany’s electricity demand by 2050
1. Introduction: Offshore Wind Energy and its Environmental Impacts

• Knowledge on environmental impacts of OWF was limited

• Offshore test plant (Alpha Ventus/German North Sea)

• Major financial support for ecological accompanying research and technical innovation

• Knowledge has increased considerably

• Research in Germany and international research came to nearly similar results according to the environmental impacts of OWFs
1. Offshore Wind Energy and its Environmental Impacts: Benthos

• Impacts of OWFs on benthos can be assessed as positive

• But: species composition changed because of the new habitats.
1. Offshore Wind Energy and its Environmental Impacts: Fish

• After construction, the abundance of fish species in OWF was higher

• But: also harmful effects on fish while construction

• Turbines serve as artificial reefs and effect of the ban on fishing positive for the biodiversity
1. Offshore Wind Energy and its Environmental Impacts: Seabirds

- Seabirds are affected by collisions with turbines, barrier effects, habitat loss but also by attraction.
- Seabird distribution of resting birds changes substantially.
- Some bird species avoid OWFs, whereas others ignore them or are attracted to them.
1. Offshore Wind Energy and its Environmental Impacts: Migrating Birds

- Displacement effects and anticipatory evasion behaviour from OWF;
- Birds avoid the zone of the rotor blades (especially in daytime)
- Significant effects on migratory birds could not yet be proven
- Higher collision risk in night time and in bad weather
- But: fatality studies were difficult

- Harbour porpoises impacted during the ramming period
- Permanent destruction of their hearing is possible in the direct vicinity of the ramming
- But: displacement effect is only temporary; no long-term impacts
- In operating OWFs, no increase in abundance of harbor porpoises
2. Good Practice for an Environmentally Sound Development of OWF: Marine Mitigation Hierarchy

--- Exception
- Prohibition
--------- Thresholds ---------
  o Other forms of offshore / onshore compensation
  o Real marine compensation
+ Mitigation (e.g. bubble curtains)
++ Avoidance (e.g. marine spatial planning)
2. Good Practice: Avoidance by Reform of Spatial Planning

• Future OWFs away from important seabird habitats

• High-density harbor porpoise habitats should be kept free of future OWFs

• More efficient SEA of marine spatial and grid planning: consideration of alternatives and cumulative assessment of impacts
2. Good Practice: Mitigation against Underwater Noise
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2. Good Practice: Reform of Application and EIA

Reforms of EIA

• SEA on level of the marine spatial planning / offshore grid planning with consideration of alternatives and cumulative assessment

• Focus on the decision relevant effects of OWF: birds and harbor porpoises

• Establish standards for Prognosis Models the Environmental Impacts Studies (StUK plus)

• Establish cumulative assessment of effects (international)

• Establish thresholds for the relevant effects
2. Good Practice: Application of compensation measures

- Federal Nature Conservation Act and several international agreements require compensation measures.

- Marine compensation measures for certain marine biotopes and onshore already exist and should be required in the approval procedure (Lüdeke et al 2014).

- Alternative: Compensation measures onshore

- Ultima Ratio: Innovative forms of compensation
3. Method for the Evaluation of Good Practice

• Evaluation by about 50 expert interviews using a questionnaire
• experts of the different branches of the offshore wind energy sector (universities, administration/government, offshore wind companies, environmental NGOs).
• First investigation: experts compared different subjects of protection (2011)
• Second investigation (2015) on evaluation of the reform initiatives for offshore wind planning
3. Results on Reforms of EIA

- Mankind (Tourism, cultural goods)
- Birds (Resting and Migrating Birds)
- Mammals (Harbor Porpoise)
- Cumulative Effects
- Climate Change
- Socio Economic Effects
- Shipping

Legend:
- more important
- just important
- less important
3. Results of the Evaluation of Good Practise

- Spatial Planning: Exclusion of OWF in hot spot areas (e.g. of mammals, loons)
- Spatial Planning: Exclusion of OWF outside of priority areas
- Technical mitigation: Obligatory application of technical noise mitigation measures
- Technical mitigation: lightening of OWF only when necessary (reduction of collision risk)
- EIA: Strict thresholds (underwater noise, reduction of habitat)
- EIA: Standardization of Prognosis
- EIA: Special Focus on relevant impacts (birds, mammals)
- Compensation: Application of other compensation measure (onshore, reduction of other impacts)
- Compensation: Application of real marine offshore compensation measures

- very important
- important
- less important
- not desirable
4. Summary

• Reforms of Spatial Planning necessary

• Technical mitigation measures against underwater noise are obligatory

• Reforms of EIA are desireable

• Marine compensation measure are urgently required
4. Summary and Discussion

• Knowledge on the impacts of OWFs on the marine environment has advanced considerably

• Impacts for benthic organisms and fish could be assessed as positive, impacts on birds and on harbour porpoises as relevant negative

• An environmentally sound offshore wind development can be possible, especially with the use of avoidance, mitigation and compensation measures

• But an international large-scale assessment of impacts over a longer period is still necessary
Results of the investigation will be published in the upcoming PhD thesis on “Strategies for an environmentally sound development of offshore wind energy”

The investigation was recently submitted to Journal of Environmental Policy and Management

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