Environmental analyses for the purpose of the Environmental Impact Assessment procedure for Offshore Wind Farms

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Materials

BEF (Baltic Environmental Forum)

BERR (Department for Business, Enterprise and Regulatory Reform, obecnie BIS Department for Business, Innovation & Skills; UK)

BSH (Bundesamt für Seeschifffahrt und Hydrographie; Niemcy)

CEFAS (Centre for Environment, Fisheries & Aquaculture Science, UK)
COWRIE

Danish Energy Agency

HELCOM

Swedish Environmental Protection Agency

! ! !

The final scope of research and recommended methods

should be **individually selected for each project**,

on the basis of preliminary analyses of conditions in given location and

analyses of the project conducted by experts in particular fields,

and should be **indicated by appropriate authorities in proper permits and decisions** (PSZW and/or decisions on the scope of the EIA Report).

Research

biotic components,
benthos, (infauna, epifauna, macrophytobenthos),
fish,
marine mammals,
birds,

abiotic elements,
bathymetry and geomorphology,
characteristics of the seabed sediments,
characteristics of the geological structure,
ground/soil properties,
wind measurements,
hydrographic conditions (currents, waves),
ice cap formation conditions,
current methods of exploitation of the maritime area

+ visualisation of the OWF impacts on the landscape (for projects located within 30 km from the shore);
+ analysis of the risk assessment regarding the collisions with vessels involved in the execution of the project with other ships/vessels.

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Basic assumptions

✓minimum **one year cycle**

✓**area planned for all the elements** of the investment, *i.e.* wind power plants, transformer stations, seabed cables + **the buffer zone** + the **reference area**

✓the results are **valid for 4 years** from the moment of completing the research - if the DSU is not obtained in the fifth year, the research should be supplemented with an additional one annual cycle

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Seabed research as the starting point

- ✓conducted **once**
- ✓**investment area + 1 NM (buffer zone)**

sediment environment, compactness, transport and structure of the sediments,	sonar,
bathymetry (depth measurements),	echo depth finder,
bed structure research (geological layers),	sub-bottom profiler, drillings + CPT (cone penetration test),
sediment parameters (*e.g.* graining, geochemistry),	sampling (benthos),
hydrodynamics (*e.g.* waves, currents),	surface or bottom (demersal) buoys, ACDP (acoustic Doppler current profiler),
SSC (suspended sediment concentration),	

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Seabed research as the starting point

Assessment of potential impacts:

✓**wash-out processes** around the turbines (necessity to apply materials reducing this process?),

✓**wash-out processes** near seabed cables, possible increase of SCC,

✓impact of the wind farm infrastructure on the **change of water current directions, tides and sedimentation processes** (near the investment) and **directions and energy of the waves** (farther from the investment),

✓non-linear mutual impacts of waves and water currents and the assessment of their impact on the displacement of seabed sediments,

✓mobility of the sediments and diversification of their depth within the area of the planned investment,

✓the impact of cable laying methods on the **SSC.**

Oceanographic research

- ✓salinity,
- ✓oxygen content in the water,
- ✓water currents,
- ✓ice cap.

Direct research	indirect analyses
measurements (at the water surface and at the seabed) conducted during the research on benthos and fish	results from measurements conducted by other stations,
	hydrodynamic model,
	parameters regarding the ice cap and the analysis of the ice cap on satellite images

Results of the oceanographic research are necessary for the understanding of the vertical distribution of marine organisms and the spatial distribution of birds and marine mammals.

Biotic environment research

- ✓identification of species,
- ✓population,
- ✓habitats and their meaning,
- ✓migration routes.

Benthos

✓research is conducted **once, in late summer** (or twice in spring and autumn)
✓**investment area + 1 NM (buffer zone)**
✓rules of conducting the analyses are specified on the basis of the seabed research results and underwater video analyses

infauna,	epifauna and macrophytes.
for each measurement point **2 samples** should be collected with the use of Van Veen grabs,	for each measurement point **4-8 samples** should be collected with the use of Kautsky type frames and the frame trawls,
clam size determination, in the analysed samples (indicator of the seasonal anoxia - oxygen deficit, the source of information on the food resources in the feeding grounds of marine ducks at the depth below 20 m,	sediments coarse-grained/stony: **video analyses and underwater images:** photo sampler, drifter, sledges, ROV,
	analyses of the structure of habitats and their dynamics: **sonar,**
amount of biomass (wet mass g/m2)	amount of biomass (dry mass g/m2)

Benthos

Assessment of potential impacts:

construction works:
✓direct disturbance of the sediments,
✓indirect disturbance of the sediments - release of pollution from the sediments to the aquatic environment.

OWF exploitation:
✓wash-out processes near particular elements of the OWF - potential increase of biodiversity,

Potential analyses of water turbidity at the construction stage, when there is a threat that the water turbidity will increase due to performed works:
✓analysis of the concentration of particles in the column of water,
✓analysis of satellite images.

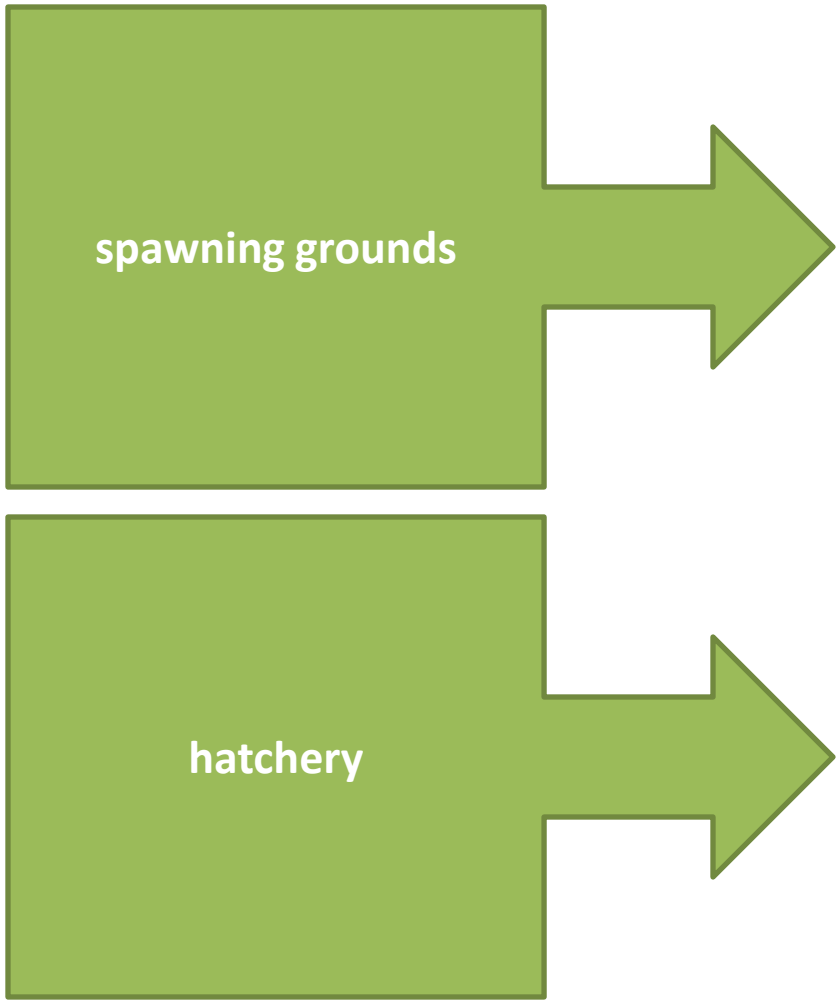
Fish

✓first of all - **analysis of available data**
✓when the available data are insufficient or there is a high risk of impact on fish - **field research,**
✓at least 1 research campaign in spring, summer and autumn (recommended at leat **5 research campaigns**)
✓**investment area + 1 NM (buffer zone)**

identification of
✓species important due to commercial reasons (fishery),
✓species under protection,
✓species of large populations in the given area.

identification of
✓spawning grounds
✓hatchery
✓feeding grounds
✓migration routes

Fish



✓spawning seasons

✓impact of the OWF construction on habitats

✓impact on fish behaviour during the spawning season

✓impact on the conditions in the spawning area

✓meaning of the habitat in terms of the region

✓scale of access limitation to the habitats during construction works

Fish - demersal species

✓research with the use of gill nets/otter trawls conducted at various depths,

✓ sets of nets with various mesh sizes (at least 8 different types) in specified measurement stations,

✓during each research expedition for each depth the samples to be collected from 3 measurement stations,

✓at least 8 measurement stations for each research expedition.

Marine mammals

✓research conducted within **one annual cycle (ringed seal - biennial),**

✓research area for **air observatiosn:**

area of at least 2 000 km^2

rectangular shape

more or less in the middle of the research area

distance from the border of the OWF to the border of the entire research area should be at least 20 km

✓research are for **observations from ships:** about 15 - 200 km^2

✓seal observation area of about 1 000 km^2

+ **2 NM buffer zone** around the specified research area.

Marine mammals

porpoise	grey seal	ringed seal
POD - porpoise detectors	**GPS/GSM transmitters**	**air observations**
devices registering underwater sounds	placed on the heads or necks of the seals (at least on 10 specimen)	conducted along the specified transects in March/April for 2 consecutive years
analysis of sounds recorded by a special computer software	observation of seal movements - analysis of their activity in the investment area	
possibility to determine the presence of porpoises and analysis of their behaviour (frequency of appearance and remaining in the investment area)		

Marine mammals

Assessment of potential impacts:

✓noise,

✓vibration,

✓new environmental components (obstacles on the flow route)

Marine birds - observations from ships

✓**area of 150 - 200 km^2 + 2 nm (buffer zone)**

✓**10 research expedition** per year (or repeated in the following year)

✓**linear transects** from the shore into the sea, each 3-4 km

✓80 - 100 NM long routes per each research expedition

✓**counting of birds flying and swimming** within the strip (300 m wide) at each side of the indicated transect

✓flying birds counted using the "**snapshot**" technique

✓research in **proper conditions** (visibility at least 2 km, sea state max. 4, ship speed 7-16 knots)

Marine birds - observations from ships

✓identification of **species**,

✓identification of the **sex** of those species,

✓number of specimen,

✓**distribution:**

specimen/km2 within the area of the research,
specimen/km2 within the area of the investment,
specimen/km2 within the buffer zone.

Marine birds - observations from ships

✓**area of about 1 000 km^2**

✓research area together with the reference area should be of at least 2 000 km^2

✓ **+ 2 NM (buffer zone)**

✓**alternative for the observations from the ship** during the periods of thick ice cap or in shallow waters,

✓**linear transects** from the shore into the sea, each 3-6 km,

✓observations within the strip (397 m wide) at each side of the plane,

✓observations conducted in proper conditions (flight height - 250 feet, speed 180 km/h, sea state max. 3, visibility min. 5 km)

Marine birds - observations from ships

✓identification of **species**,

✓number of specimen,

✓**distribution:**

specimen/km2 within the area of the research,
specimen/km2 within the area of the investment,
specimen/km2 within the buffer zone.

Migrating birds

✓research in the area, where **migration routes** were observed during a standard bird monitoring,

✓research during **1 annual cycle: from March until May** and **from the second half of July until the end of November;** in case of determining the migration routes, the research may be optionally repeated in the following year;

✓**min. 7 days of analyses per month** in block cycles (at least 53 days, 936 hours),

✓research with the use of **radars** (vertical, horizontal, multibeam - depending on the species) supplemented with the **observations from ships** during the day and **the acoustic registration** at night.

Post-execution monitoring

✓conducted **within the area of the OWF** and **within the reference area,**

✓conducted for **3 or 5 years** (then in 1st, 3rd and 5th year after the OWF start-up),

✓it should serve **the clarification of particular doubts** associated with the potential OWF environmental impact, doubts indicated by appropriate authorities in issued decisions and permits,

✓if a certain **doubt is clarified** before the given date of post-execution monitoring completion, **on the basis of the research conducted for this or other investment**, the monitoring regarding the given subject **should be finished**

Underwater sounds and vibrations

✓noise and vibration level research **in direct neighbourhood of the wind power plants** under and above the water surface,

✓measurements **in terms of one turbine** and **all turbines working at one time** (accumulated impact),

✓changes in the noise and vibration levels under and above the water surface, depending on the **distance from the turbines** and various **weather conditions,**

✓measurements conducted **in specified points** or **along transects.**

Thank you for your attention!

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