

13th MEETING OF THE TECHNICAL COMMITTEE
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**IDENTIFYING EVIDENCE NEEDS TO INFORM ASSESSMENT OF CUMULATIVE
IMPACTS FROM OFFSHORE RENEWABLE ENERGY DEVELOPMENTS ON
MIGRATORY WATERBIRD POPULATIONS**

Discussion paper

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Summary

1. The ability to undertake cumulative impact assessment of offshore wind farms on seabird populations is highly constrained by a lack of understanding of how these populations are affected by wind farms.
2. Whilst monitoring is undertaken at many offshore wind farms, large uncertainty remains around the consequences of erecting thousands of turbines in the marine environment for migratory seabird populations.
3. There are opportunities, however, to improve the situation through identifying key knowledge gaps that collaborative, transboundary, strategic research projects could address.
4. The development by AEWA of a clear statement of priorities for relevant data collection could be highly influential given AEWA's neutral, inter-governmental status.
5. Identification of key evidence needs for these seabird populations can be seen as an essential first step to deliver the Technical Committee's task related to cumulative impact assessment.
6. Some suggestions are made as to how this might be taken forward.

Introduction

[Resolution 5.14](#) {2012} "*Requests the Technical Committee to work with Ramsar's STRP and other interested parties to develop guidance for assessing the significance of cumulative impacts of multiple wetland losses along species' flyways, and the implications for EIA, SEA and other assessment processes.*"

A similar mandate exists for Ramsar's Scientific and Technical Review Panel in its [Resolution X.26](#) {2008}.

The issue is a high priority task in the TC's current workplan (Management of human activities):

Extractive industries – cumulative impact assessment

Work with the Ramsar STRP and other interested parties to develop guidance for assessing the significance of cumulative impacts of multiple wetland losses along species' flyways, and the implications for EIA, SEA and other assessment processes. (Resolution 5.14) (carried over from Work Plan 2012-2015).

Whilst the original motivation of this task was the assessment of the consequences of multiple wetland losses along flyways from the impact of extractive industries, the AEWA task is deliberately framed in a wider context in recognition that the multiple habitat loss is a major issue for waterbird conservation. In this respect, displacement from otherwise preferred habitats is taken as virtual habitat loss in line with AEWA's definition of disturbance.

The issue of cumulative impacts from renewable energy deployments is becoming of increasing importance, as are the data and information needs with which to assess this.

We outline the key issues below with respect to wind energy developments. The initial issue is the lack of relevant data with which to even consider undertaking Cumulative Impact Assessment (CIA).

1. What is the issue?

- 1.1. Deployment of offshore wind at a large scale is already underway in European waters and much more is planned (<http://www.ewea.org/policy-issues/offshore/>), with potentially even more in the future following the UNFCCC Paris Agreement.
- 1.2. Migratory waterbirds (e.g. divers, gannets, large and small gulls, terns, auks, seaduck, etc.) will potentially encounter multiple offshore wind farm (OWF) developments on many occasions during their annual movements through European waters. These developments may impact migratory waterbird populations through three main mechanisms:
 - 1.2.1. a direct increase in mortality through individuals dying through collision with turbines;
 - 1.2.2. indirect increases to mortality by individuals being displaced from preferred foraging grounds due to the present of an OWF;
 - 1.2.3. indirect increases to mortality through increased energetic costs of having to fly further to travel around an OWF, frequently termed barrier effects (Drewitt & Langston 2006).
- 1.3. However, direct evidence for increased mortality through these mechanisms, especially at the population-level (rather than the individual-level) are lacking. Whilst there is evidence for some species of diver and seaduck being displaced by OWF, e.g. Red-throated Divers *Gavia stellata* in the North Sea (Percival 2014); divers and Common Scoter *Melanitta fusca* in Danish waters (Petersen *et al.* 2006) the consequences of this displacement on population status and viability are unknown.

Similarly, direct observations of birds colliding with wind turbines in the marine environment are lacking although birds, such as large gulls, are frequently observed flying in the vicinity of turbines and are therefore presumed to occasionally collide with turbines.

Quantifying the additional energetic cost of having to fly further to travel around an OWF is very challenging, although this is more likely to be an issue for breeding birds repeatedly flying between a nest site and foraging area, rather than birds on migration.

2. What is currently being done?

- 2.1. In the UK, monitoring of bird densities is undertaken prior to applying for consent to construct an OWF, to inform Environmental Impact Assessments (EIA). Additionally, undertaking some further monitoring is usually a condition of the regulator granting consent (see MMO 2014 for a review). Other European countries also undertake monitoring at OWF developments. Post-consent monitoring is usually focussed around ascertaining whether those species identified as potentially being affected by the development in the EIA are, in fact, impacted locally.

In the UK, bird populations of primary concern are those that are interest features of SPAs (Special Protection Areas under the EU Birds Directive) (see MMO 2014 for more information).

- 2.2. Whilst it is important to ensure that these individual breeding and wintering SPA populations are not adversely affected by a development, it may be that the cumulative impacts to migratory birds that encounter multiple OWF during their annual movements are of greater conservation concern.
- 2.3. Cumulative impact assessments (CIA) have been undertaken for birds in the North Sea (e.g. Brabant *et al.* 2015; Leopold *et al.* 2014). However, these CIAs rely on very large assumptions about the likely impacts of OWF on birds.
 - 2.3.1. Indirect increases to mortality by individuals being displaced from preferred habitats in the UK and mortality from collisions with turbines are usually estimated using collision risk models, such as the Band model (Band 2012). However, these models are highly sensitive to certain parameters, such as the likelihood of an individual bird seeing a turbine and changing its flight path to avoid it, yet evidence for the rate at which birds avoid turbines is sparse and inconsistent (Cook *et al.* 2014). The uncertainty around collision estimates has recently been explicitly recognised and acknowledged (Masden 2015).
 - 2.3.2. Increases in mortality attributable to displacement from important habitats are based on even less evidence and have even greater uncertainty (JNCC 2015). These uncertainties around mortality attributable to OWFs become propagated and magnified during the cumulative impact assessment, resulting in very large uncertainty around true impacts.
- 2.4. Whilst CIA should be the ultimate aim, the current lack of good quality evidence on the impacts of OWF on birds renders current CIA efforts of limited use. **There is an urgent need for large-scale collaborative strategic research that fills key evidence needs for CIA.**

3. What evidence is needed?

- 3.1. Recently, some strategic research projects have been initiated to try and reduce uncertainty around predicted impacts, e.g. the ORJIP (Offshore Renewables Joint Industry Programme) Bird Collision Avoidance study which tracks changes in flights paths of birds in the vicinity of a wind farm, using radar, cameras and human observers (<http://www.nirasconsulting.co.uk/current-events/news/2014/niras-and-dhi-win-orjip-bird-collision-avoidance-study.aspx>). However, more large-scale strategic projects like this are required.

Whilst current monitoring undertaken at individual OWF by individual developers may provide some useful information on the impacts of OWF on birds, much of the work is unlikely to be of a suitable spatial and temporal scale to inform cumulative impact assessments. The need for international cooperation and coordination with monitoring has long been recognised, e.g. Desholm (2006), yet is still largely lacking.

- 3.2. There is agreement among some European regulators that cumulative impacts are a key concern. The InterGovernmental Forum comprises regulators from Denmark, Sweden, Germany, France, Belgium, Netherlands and the UK. Through working with this group, JNCC has collated a short-list of seabirds, divers and grebes that are of concern to these countries with respect to OWF development (see **Appendix 1** for both a list of species and more information on the InterGovernmental Forum). Additionally, this Forum also produced a list of key issues and evidence needs for these species (**Appendix 1**).
- 3.3. The next step is to undertake a prioritisation exercise, identifying those species that are likely to be most vulnerable to large-scale deployment of offshore wind energy development and to select discrete research projects that would be most effective at reducing uncertainty in cumulative impact assessments.

Some initial work by the ICES/OSPAR/HELCOM Joint Working Group on Seabirds identified some potential projects for a four species (Red-throated Diver *Gavia stellata*, Gannet *Morus bassanus*, Great Black-backed Gull *Larus marinus*, Little Gull *Larus minutus*) [report imminently to be published at - <http://ices.dk/community/groups/Pages/JWGBIRD.aspx>]. For example, a high priority project might be to better understand Red-throated Diver movements during the non-breeding season. This species is known to be displaced by OWFs and is also known to use areas currently being developed

throughout the North Sea and Baltic Sea for wintering and staging during migration. Do the cumulative effects of these developments in several European countries' waters pose a threat to Red-throated Diver population viability through reduced habitat availability, especially during vulnerable periods such as post-breeding moult?

- 3.4. The InterGovernmental Forum provides an opportunity for a list of high priority research projects to be reviewed and potentially endorsed by regulators.

4. What could AEWA do?

- 4.1. There is an opportunity to make progress through the provision of a platform that enables multiple countries to:
 - 4.1.1. Recognise and acknowledge that further investigation is warranted into the potential impacts of offshore wind farms on the conservation and viability of migratory waterbird populations due to the scale of existing, planned and proposed offshore wind development in European marine waters;
 - 4.1.2. Facilitate the formation of a technical working group¹, by inviting specialists from countries with an interest in developing offshore wind energy to join the group on a voluntary basis;
 - 4.1.3. The technical working group would identify and prioritise those species of highest vulnerability to offshore wind farm impacts;
 - 4.1.4. The group would also identify and prioritise key strategic research questions that will meet key evidence needs on the impacts of offshore wind farms on migratory bird populations;
 - 4.1.5. Seek funding for and support strategic research projects;
 - 4.1.6. Encourage implementation of new evidence as it becomes available through multiple avenues (e.g. data sharing sites, freeware models for CIA); and
 - 4.1.7. Provide advice on minimising future impacts, e.g. marine spatial planning, wind farm design/layout, *etc.*
- 4.2. Obtaining better evidence on the potential impacts of offshore wind farms on seabird populations will not only improve the ability to conserve these populations but also has the potential to facilitate production of cheaper electricity from renewable sources and assist governments with meeting their renewables targets through reducing environmental uncertainty around consents.

Possible next steps

Whilst this immediate issue relates to cumulative impacts of offshore wind energy development, there is a wider context, in that – as recognised by MOP5 – the impact of cumulative losses is an issue relevant to multiple other contexts, affecting many species and caused by all forms of anthropogenic impacts on waterbirds and/or their habitats.

We note the issue is relevant not just to the issue identified in Resolution 5.14, but also to actions highlighted as desirable in [Resolution 6.11](#) on addressing the impacts of renewable energy deployment. In particular, it:

1. *Urges* Parties and *encourages* non-Party Range States, notwithstanding the call of Resolution 5.16, to implement the provisions of document *Renewable Energy Technologies and Migratory Species: Guidelines for Sustainable Deployment* (document AEWA/MOP 6.37) adopted by Resolution 6.5, as applicable, depending on the particular circumstances of each Party, including to:

¹ This might initially comprise a working group of the Technical Committee with additional invited membership.

1.1 apply Strategic Environment Assessment (SEA) and EIA procedures or similar procedures involving assessment of impacts on protected areas and other sensitive areas of importance to migratory waterbirds, as appropriate, when planning the use of renewable energy technologies;

1.2 undertake appropriate survey and monitoring both before and after deployment of renewable energy technologies to identify impacts on migratory waterbird species and their habitats in the short- and long-term, as well as to evaluate mitigation measures; and

1.3 apply appropriate cumulative impact studies to describe and understand impacts at a larger scale, such as at population level or along entire flyway;

The provision of guidance as indicated in section 4 above would directly assist Parties in delivering these needs.

We would appreciate the views of the Technical Committee on this issue.

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Appendix I

Paper to the ICES/OSPAR/HELCOM Joint Working Group on Seabirds, November 2015.

IDENTIFYING COLLABORATIVE TRANSBOUNDARY STRATEGIC RESEARCH PROJECTS TO REDUCE UNCERTAINTY AROUND THE IMPACTS OF OFFSHORE WIND FARMS ON BIRDS

Joint Nature Conservation Committee (Sue O'Brien and John Goold)
7th October 2015

Summary

- Offshore wind farms can affect seabirds, divers and seaduck but the extent of effects and the population-level impacts of effects are not well understood. Uncertainty in environmental impact assessments increases the cost of developing offshore wind farms and hinders meeting ambitious EU targets on renewable energy.
- Through the Intergovernmental Offshore Wind Forum (IGF), several countries identified species which present a consent risk to future offshore wind farm development, as a consequence of an insufficient understanding of the potential impacts of wind farms on these species. Additionally, IGF identified a list of specific questions and evidence needs relating to both population characterisation and population-level impacts of wind farms.
- Of particular interest to IGF is transboundary effects on populations, e.g. cumulative impact on biological populations that span multiple country boundaries, such as migratory species.
- JWGBird Members are invited to:
 - Consider the list of species and evidence needs identified in this paper;
 - Advise on existing research, including work as yet unpublished, that would contribute to filling evidence needs;
 - Recommend research projects for addressing the evidence needs at a transboundary scale.

Background to the Intergovernmental Offshore Wind Forum

The Intergovernmental Offshore Wind Forum (IGF) was initiated by the Danish Energy Agency (DEA), as part of the European Wind Energy Association (EWEA <http://www.ewea.org/>) meeting in March 2015, in Copenhagen. Recognising that public bodies across Europe encounter the same challenges with respect to offshore wind development, use the same waters and supply chain and operate under the same EU legislation, the DEA anticipated the forum would be used to exchange ideas, develop common agreement on cross-border issues and to develop a network of contacts. At the first meeting, the group held two parallel sessions on economic and environmental issues respectively (<http://www.ens.dk/en/ewea-offshore-2015>).

Following the success of this workshop, The Crown Estate hosted a second IGF workshop in London on 9th September 2015. The Joint Nature Conservation Committee (JNCC) developed the focus for the environment session, through collating information from individual countries on environmental issues. Countries were asked to supply a list of species of concern, with respect to environmental impact assessment for offshore wind development, along with their specific questions, evidence needs and issues of concern. See below for more information. During the workshop, attended by regulators and/or their representatives from the UK, Denmark, Netherlands, Germany, Sweden and Isle of Man, delegates agreed that there was a need to develop approaches to assessing transboundary impacts of offshore wind farms on wide ranging species, identifying marine mammals and seabirds, seaduck and divers as the species of primary concern.

A third IGF workshop will take place in Paris in November, as part of the AWEA 2015 Annual Event (<http://www.ewea.org/annual2015/networking/intergovernmental-offshore-initiative-3rd-work-session/>). JNCC are currently developing ideas for discussion in the environment session, potentially with the focus

around developing a cumulative assessment framework. Whilst there are currently no further IGF workshops planned, the success of the IGF means this forum will hopefully continue into 2016 and beyond.

Developing transboundary collaborative research projects to fill key evidence gaps

Uncertainty about the impacts that offshore wind farms have on protected seabird, seaduck and diver populations has resulted in some offshore wind developments not going ahead, e.g. London Array Phase 2 was not developed due to uncertainties over the impacts of offshore wind farms on wintering red-throated divers, a feature of a Special Protection Area in that area (<http://www.londonarray.com/project/london-array-to-stay-at-630mw/>). With challenging renewable energy targets to be met and intentions of developing offshore wind at scale, the uncertainties around environmental impacts of offshore wind developments and the economic consequences of this, need to be addressed.

Many marine bird and mammal populations of concern in terms of offshore wind development have biogeographic ranges that span more than one country and many migrate across the maritime zones of multiple countries. During both the first and second IGF workshops, delegates identified a lack of knowledge of transboundary issues, particularly cumulative impacts and the size of relevant reference populations against which to undertake assessments, as important evidence gaps. Adopting a collaborative approach among countries that share these populations to address key knowledge gaps that are driving uncertainties in impact assessments would seem to be essential.

Through the IGF, JNCC has proposed a process for identifying trans-boundary knowledge gaps and identifying opportunities for collaborative strategic efforts, with the intention of moving towards better alignment of national programmes and, ultimately, developing collaborative research projects.

As a first step, and something of general value, JNCC collated information to construct an overview across Europe of the marine bird and mammal species of concern in terms of offshore wind development, from the perspective of both pre-consent assessment and post-consent monitoring. Prior to the workshop, IGF delegates were invited to complete a template spreadsheet, listing marine bird and mammal species of concern and what the associated issues of concern are, in relation to current and planned wind farm developments. Contributions were received from UK, Netherlands, Belgium, Germany, Denmark and Sweden. The attached spreadsheet collates all this information but summaries are presented in Table 1 and Table 2 below.

Species of Concern

Table 1. A summary of the seabird, seaduck and diver species identified as being of concern, with respect to offshore wind development, to more than one country. Six countries contributed to this list.

English common name	Latin Name	No. countries listing this species
Sandwich tern	<i>Thalasseus sandvicensis</i>	4
Red-throated diver*	<i>Gavia stellata</i>	4
Lesser black-backed gull*	<i>Larus fuscus</i>	4
Herring gull	<i>Larus argentatus</i>	4
Great black-backed gull*	<i>Larus marinus</i>	4
Common guillemot*	<i>Uria aalge</i>	4
Razorbill*	<i>Alca torda</i>	3
Northern gannet*	<i>Morus bassanus</i>	3
Common tern	<i>Sterna hirundo</i>	3
Common scoter	<i>Melanitta nigra</i>	3
Velvet scoter	<i>Melanitta fusca</i>	2
Little gull	<i>Larus minutus</i>	2
Common eider	<i>Somateria mollissima</i>	2
Black-throated diver	<i>Gavia arctica</i>	2
Black-legged kittiwake*	<i>Rissa tridactyla</i>	2
Arctic tern	<i>Sterna paradisaea</i>	2

* species reviewed by the MacArthur Green draft report, *Qualifying impact assessments for selected seabird populations: A review of recent literature and understanding*, also being discussed under ToR (e)

It is important to note that IGF delegates were not given a detail definition of what determined whether a species was of concern or not with the result that some countries contributed a long list of species whereas others only a very short list. This list also does not indicate the extent to which a particular species is of concern, i.e. a species could be of medium priority to many countries which would mean it ranks highly on this list, whereas a species such as puffin, which is of high priority in Scotland, is not of concern to any other countries. Consequently, this list is useful for identifying those species that are of concern across multiple countries but not those that are of highest priority in any one country. However, the aim of this work was to identify transboundary collaborative projects that would meet evidence needs and so this list is helpful in identifying those bird species that warrant further consideration in this particular context.

Issues of Concern and Associated Evidence Needs

Table 2. High-level evidence needs and questions relating to marine birds (seabirds, divers and seaduck) and offshore wind farms, collated from and agreed by delegates at the 2nd IGF workshop. Evidence needs identified for other taxa are not listed here.

Question related to offshore wind energy development	To answer this we would need a better understanding of...	Evidence need: More information is required on...
What are transboundary cumulative impacts from offshore wind farms (OWF)?	Numbers of birds using different sea areas at different times of year and consistency in distributions across years – defining populations at a regional scale as basis for assessment of cumulative transboundary effects	More up to date information on bird distributions and numbers covering large sea areas – monitoring at scale of individual wind farm developments is too small to quantify cumulative trans-boundary impacts. Better quantification of impacts of offshore wind farms on birds (see below).
	Large-scale seasonal movements of birds and drivers of those movements (e.g. prey availability, weather conditions).	Movements of birds, e.g. tagging studies, stable isotope analysis, etc. but with studies carried out in a coordinated strategic manner across multiple locations.
	Meta-population dynamics, e.g. natal dispersal, inter-annual movements between colonies of breeding birds.	Concurrent information on potential covariates, e.g. sea surface temperature, prey, etc. Large scale tagging and ringing studies at multiple locations concurrently, e.g. colour-ringing.
	(Meta) population sizes of relevant bird species, as well as estimates of (meta) population parameters such as reproductive success, mortality, life expectancy, etc.	As complete as possible data on demographic parameters of the relevant species for the populations frequenting the North Sea
What are cross-sector cumulative impacts?	Population-level consequences of cumulative impacts across all industries which may directly or indirectly limit marine bird populations.	Information on direct mortality (e.g. net entanglement) or indirect mortality (e.g. displacement from shipping, changes to discards, etc) and ability to quantify the magnitude of these impacts, relative to offshore wind energy industry impacts.
What are the impacts of OWF relative to other causes of population change, e.g. climate change?	Population-level consequences of climate change and an understanding of mechanism, e.g. change in prey availability reduces productivity.	Baseline information on population size, demographic rates and information on how these change with variables such as SST and prey.

<p>How many birds die from collisions with OWF?</p>	<p>Rate of collisions or an estimate from collision risk models.</p>	<p>Year-round species-specific empirical data across multiple sites and species for parameters that are used in collision risk modelling, especially those parameters that models are most sensitive to.</p> <p>Improved and tested technology to directly measure species-specific collisions as a proportion of birds using the area and to validate collision risk model estimates.</p> <p>The ability to assign collision mortalities to the appropriate relevant population exposed to collision risk.</p>
<p>Do displacement and barrier effects occur (not known for all species) and, where it is known to occur, what are the population level consequences of displacement? Does habituation occur and if yes, does it bring incidental benefits, e.g. increased prey availability within OWF resulting in increased survival rates?</p>	<p>Displacement rates, models to quantify energetics of displacement and impacts at population level.</p>	<p>Better quality year-round information across multiple sites and species on displacement rates plus long-term studies to quantify habituation. Studies dedicated especially to establishing possible changes in seabird abundances/densities inside and outside wind farm areas for species still considered to avoid wind farms</p> <p>Energetic costs of displacement/barrier effects (e.g. reduced prey intake, longer foraging trips) and consequences on productivity and survival rates.</p> <p>Empirical data to reduce uncertainty in models to estimate displacement impacts (e.g. Chris Toppings' agent-based model).</p> <p>Interaction effects across industries, e.g. gulls attracted to fishing vessels that are not permitted to enter OWF resulting in apparent displacement from OWF but no change in species' energetic budget.</p>

Request for input from JWGBird Members

JWGBird Members are invited to discuss the evidence needs listed in Table 2, in relation to the species listed in Table 1, with a view to identifying collaborative transboundary strategic research projects, specifically:

- Consider the list of species and evidence needs identified in this paper;
- Advise on existing research, including work as yet unpublished, that would contribute to filling evidence needs;
- Suggest research projects for addressing the evidence needs at a transboundary scale.

Next steps

The key transboundary evidence needs and potential research projects to inform them, identified during the JWGBird meeting for individual species/groups of species, will be presented to the IGF at the 3rd workshop in Paris on 18th November 2015.

There is an intention to establish a technical working group with members nominated by IGF delegates, tasked with taking forward a list of priority research questions and opportunities across the involved countries. The information gathered from JWGBird Members will be a very valuable starting point and steer for this work. It is expected that the knowledge gap and evidence need review for selected seabird species, being taken forward by Bob Furness for a group of Southern North Sea wind developers, will feed into this as well. This review is also for discussion under ToR (e), with a draft report by MacArthur Green, entitled, *Qualifying impact assessments for selected seabird populations: A review of recent literature and understanding*.

Together, the technical working group and IGF delegates will review the list and prioritise potential collaborative strategic research projects against a list of criteria, including considerations such as the ability of a project to reduce the economic cost of environmental uncertainty on deploying wind energy developments at scale.