

Assessing the extent and significance of uncertainty in offshore wind assessments (AssESs): Project Executive Summary

These reports present the ORJIP 'Assessing the extent and significance of uncertainty in offshore wind assessments' (AssESs) project. The key motivations for the project are an **urgent need to quantify current levels of uncertainty** across the **ornithological assessment** process, **sensitivities of estimated impacts** to different sources of uncertainty, and a need to **improve** the way in which **information** on **uncertainty** is **translated** into decision-making within the context of a precautionary approach.

This project was delivered through **four linked work packages** (and a fifth work package which provided an independent review of the process and resulting recommendations).

Work Package 1 involved a **review of approaches to the treatment of uncertainty within assessments and the evidence base that informs these approaches**. Current Statutory Nature Conservation Body (SNCB) guidance was reviewed in order to determine the quantitative approaches and tools that are commonly used in ornithological assessments within the UK context. A detailed review was then undertaken of the available evidence on parameter values, and associated uncertainties, for each of the biological parameters involved in collision and displacement risks models used within assessments. This has included, where relevant, reviewing the different underlying source of information that could be used to inform the values of each of these parameters. We highlighted challenges in relation to using empirical information to inform the parameters used within the models (e.g. in relation to the interpretation of the avoidance rate parameter used in collision risk models).

WP1 also included an **update of the strategic review of the sources of uncertainty in the ornithological assessment process in Searle et al. (2023)** which provided a roadmap towards both improving uncertainty quantification and reducing uncertainty across the assessment process and highlighted specific priorities of work required to deliver reductions in uncertainty and improvements to the quantification of uncertainty. The review and roadmap have been updated to reflect the rapid development of research and evidence since Searle et al. (2023), identifying additional emerging knowledge gaps (e.g. around HPAI) and outlining current research activity to address gaps identified in Searle et al. (2023).

Work Package 2 provided a **quantitative evaluation of how sensitive key impact metrics are to uncertainty in parameter values and model assumptions**. We evaluated the extent to which key impact assessment outputs, such as metrics associated with Population Viability Analysis (PVA), are sensitive to uncertainties in inputs, to assumptions around model structure, and to correlation between parameters.

We assessed **sensitivity to inputs** using information derived through stakeholder engagement and based on the outcomes of the review in WP1. Outputs demonstrated particular sensitivity of key output metrics to parameters that have a linear relationship with mortality (for displacement) and flux (for collision), with lower sensitivity to parameters describing bird morphology and baseline demography. Uncertainty in outputs is strongly influenced by parameters, particularly avoidance and displacement rate, for which the output metrics are sensitive to the parameter values and the parameter values contain substantial uncertainty, and is also heavily driven by treatment of variation in density data.

Systems-based sensitivity analysis investigated whether a holistic modelling of the uncertainties in the assessment process could lead to a robust representation of the sensitivities in the system. It examined whether the inclusion of biological processes which are currently not considered within assessments, such as the inclusion of an explicit relationship between population size and foraging range, lead to significant divergence of risk estimates, and contract or inflate uncertainty in predictions of population viability. This exploratory, forward-looking investigation of uncertainty helps inform which biological features currently omitted from assessments need to be introduced, and which of the existing features may be simplified without loss in accuracy or precision.

Work Package 3 used **stakeholder engagement**, via an online workshop and a series of nine in-depth semi-structured interviews with representatives working in consultancies, SNCBs/public sector, and industry organisations, to understand how information on uncertainty is used in assessments within the context of the precautionary principle. Key themes that emerged from the stakeholder engagement activities included the importance of uncertainty (which is inherent in all aspects of marine assessment), the propagation of uncertainty through tools within Habitat Regulation Assessments (HRAs) and Environmental Impact Assessments (EIAs), and the application of precaution within assessments in terms of (a) where in the process precaution is applied, (b) the magnitude of precaution applied and (c) concerns around potential for over-precaution.

Work Package 4 integrated evidences from WPs 1-3 into **two sets of recommendations**.

Recommendations around priority future research needs to reduce uncertainty are derived primarily from the update to the route map for reducing and quantifying uncertainty in assessments (Searle et al., 2021, 2023), which expanded the original set of 16 priorities to include an additional three emerging priorities, evaluated which priorities are most likely to lead to a reduction in uncertainty, and linked recent and current research activities that address these priorities.

Recommendations around improvements to the evaluation of uncertainty in ornithological offshore wind impact assessments were developed following the stakeholder engagement in WP3 and focused on:

1. Developing clearer guidance around propagation of uncertainty in assessment tools;
2. Improving the representation of consultants in commissioning, developing & implementing tools
3. Developing a more strategic approach to development & maintenance of assessment tools
4. Co-developing ways to address situations in which over-precaution is perceived to occur
5. Implementing more systematic & rapid dissemination/evaluation of new evidence around uncertainty
6. Facilitating more rapid integration of new evidence into SNCB advice
7. Ensuring an appropriate level of cross-border consistency in approaches to uncertainty
8. Promoting a shared understanding and accessible communication of information around uncertainty
9. Moving to a plan-based approach, and how this could enable the improved treatment of uncertainty

Each of these high-level recommendations contained a set of specific recommendations, for which we described the motivation, roles, responsibilities, constraints, dependencies and timescales required to implement them. There was a particular focus on highlighting recommendations with potential to rapidly (e.g. within the next 12 months) deliver benefit. A Error! Reference source not found.has provided a summary of these recommendations and is intended to be used as a visual tool to promote their uptake and dissemination.

Reference: Searle et al. (2023). Searle KR, S H O'Brien, E L Jones, A S C P Cook, M N Trinder, R M McGregor, C Donovan, A McCluskie, F Daunt & A Butler. 2023. A framework for improving treatment

of uncertainty in offshore wind assessments for protected marine birds. ICES Journal of Marine Science, fsad025, <https://doi.org/10.1093/icesjms/fsad02>