23/01/2024

Dear Sir/Madam,

Invitation to Tender for the Modelling of kittiwake metapopulation dynamics project for the Carbon Trust's Offshore Renewables Joint Industry Programme for Offshore Wind (ORJIP Offshore Wind)

You are invited to submit a Tender for the Modelling of kittiwake metapopulation dynamics project (the "MetaKitti project" or "Project") which is part of the ORJIP Offshore Wind. The key objective of the Project is to quantitatively evaluate kittiwake colony connectivity for UK and North Sea regions relevant to the offshore wind industry and to assess the demographic implications of inter-colony movements for determining the vulnerability of kittiwake populations breeding in Special Protection Areas to mortality attributed to offshore wind farms.

The Invitation to Tender (ITT) consists of the following documents:

- Description of Tender (this document);
- ORJIP Offshore Wind Stage II Contractors' Conditions;
- Tender Certificate (Word template);
- Bid Price Calculation Sheet (Excel template); and
- Clarification Document (if applicable[1]).

Unless informed to the contrary, tenders and communications shall be sent by e-mail to the following e-mail addresses: ivan.savitsky@carbontrust.com and zilvinas.valantiejus@carbontrust.com.

Tenders must be submitted before 08/03/2024, 12:00 GMT. Any tenders received after this date and time will be deemed non-compliant.

Your Tender must consist of the following, the contents of which are described further below:

- Main Bid Document (pdf) – template not provided;
- Signed Tender Certificate (pdf) – template provided; and
- Bid Price Calculation Sheet (xls) – template provided.

The timeline of this procurement process is as follows:

Deadline for clarification questions	09/02/2024
Clarification Document published[1]	14/02/2024
Submission of full Tender	08/03/2024, 12:00 GMT
Bidder interviews	March 2024
Successful Contractor announcement	April 2024
Envisaged Contract award date	April 2024

Please e-mail any clarification questions, including questions about the timing of this ITT, to ivan.savitsky@carbontrust.com and zilvinas.valantiejus@carbontrust.com any time before

[1] A Clarification Document will not be published if no clarification questions are received in relation to this ITT.

09/02/2024. The complete set of clarification questions and all answers to clarification questions will be published in the Clarification Document on our website by 14/02/2024 and will hence be visible to all potential Bidders: https://www.carbontrust.com/news-and-events/tenders

For information about ORJIP Offshore Wind, please see the Carbon Trust's web site: https://www.carbontrust.com/our-projects/offshore-renewables-joint-industry-programme-orjip-for-offshore-wind

We look forward to receiving your Tender.

Yours sincerely,

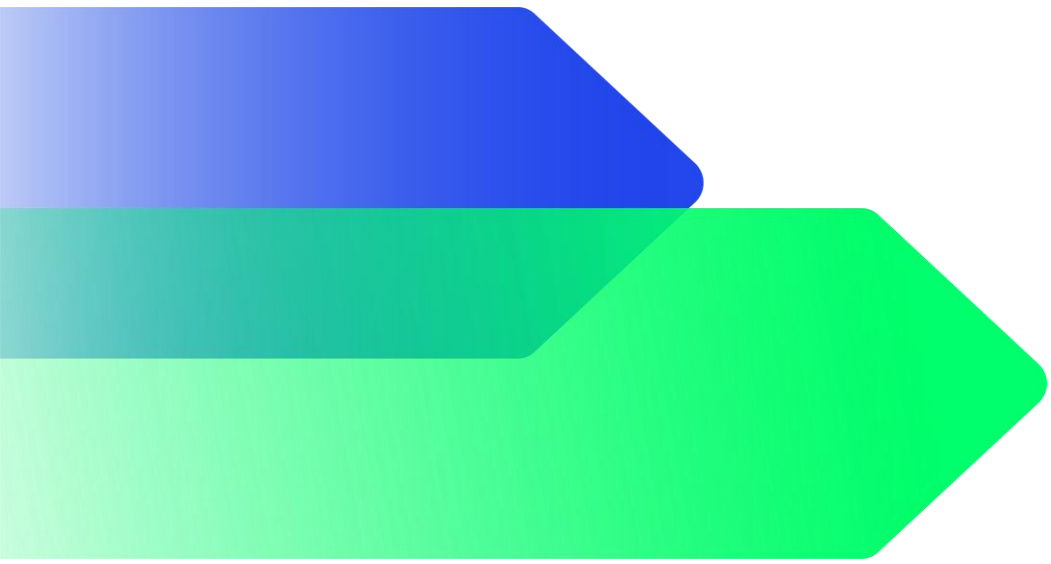
……..
Ivan Savitsky
For and on behalf of **THE CARBON TRUST**

Offshore Renewables Joint Industry Programme for Offshore Wind

Invitation to Tender for the “Modelling of kittiwake metapopulation dynamics” Project

Description of Tender

January 2024



Contents

IMPORTANT INFORMATION FOR BIDDERS

Publishing

Neither this document, nor any part of it nor any other information supplied in connection with it may, except with the prior written consent of the Carbon Trust, be republished, reproduced, copied, distributed or disclosed to any person for any purpose other than consideration by the recipient of whether or not to submit a tender.

Tender evaluation

The received tenders will be evaluated by the Carbon Trust and the ORJIP Offshore Wind Partners and the project-specific Project Expert Panel (PEP) against the criteria provided in section 7. The Bidder authorises the Carbon Trust to share its submitted Tender for this purpose with the ORJIP Offshore Wind Partners and, without any supporting financial information (Financial Proposal incl. the Bid Price Calculation Sheet), the parties appointed to the PEP. A shortlist of Bidders will be created and invited for interview. Carbon Trust will conduct vetting of the shortlisted bidders. Carbon Trust may request shortlisted bidders to fill-in a Due Diligence Questionnaire to supply additional information prior to being invited for an interview.

Contracting

Bidders should note that the Scope of Work contained in section 4 of this document does not constitute an offer to contract with the Carbon Trust. It only represents a definition of specific requirements and an invitation to submit a Tender addressing these requirements.

Issuance of this Invitation to Tender and the subsequent receipt and evaluation of the tenders by the Carbon Trust does not commit the Carbon Trust to enter into a Contract with any Bidder.

Should Your Tender be successful, a Final Scope of Work that builds upon the Scope of Work contained in section 4 of this document and Your Approach to Work will be mutually agreed between You and the Carbon Trust. Once the Final Scope of Work is agreed, Your offer will be formally accepted by the Carbon Trust issuing an Award Letter, the Final Scope of Work, the ORJIP Offshore Wind Stage II Contractors' Conditions, and any clarifications agreed in writing. The Award Letter, the Final Scope of Work, the ORJIP Offshore Wind Stage II Contractors' Conditions, and any clarifications agreed in writing will establish the Contract for the Modelling of kittiwake metapopulation dynamics project (the "**Contract**") between You and the Carbon Trust. With the exception of any minor amendments to the ORJIP Offshore Wind Stage II Contractors' Conditions which may be requested by the Bidder, the submission of a Tender shall constitute unqualified acceptance of the ORJIP Offshore Wind Stage II Contractors' Conditions. In the event that minor amendments to the ORJIP Offshore Wind Stage II Contractors' Conditions are requested, such amendments must be clearly stated and the exact alternative wording must be provided in Annex A of the Tender Certificate. Please note that it is at the sole discretion of the Carbon Trust to accept any of the proposed amendments and that the Carbon Trust reserves the right to require the provision of further information in relation to any such request. No minor changes other than those contained in Annex A of the Tender Certificate at the time of submitting the tender will be considered. No material changes will be considered at any time.

Mechanics of the Tender process

Bidders should note that:

- it is at the discretion of the Carbon Trust whether to accept any non-compliant Tender or whether to reject any non-compliant tenders without progressing such tenders through the evaluation phase;
- the Carbon Trust reserves the right not to accept the lowest priced Tender or any Tender whatsoever;
- the Carbon Trust reserves the right to accept more than one Tender;
- unless a Bidder makes a formal statement to the contrary, the Carbon Trust reserves the right to accept any part of a Bidder's Tender without accepting the remainder;
- formal notification that a tender has been successful will be communicated in writing by the Carbon Trust;
- the costs of tendering are the full responsibility of the Bidder; and
- the pricing set by Bidders shall be valid for a minimum of 90 days.

Bids may be submitted by individuals, companies, organisations or consortia.

Bidders should be aware that dates referred to in this Invitation to Tender may be subject to change where this is necessary in the interests of the Project (such changes will be notified in advance).

The Tender Certificate, Main Bid Document and any correspondence must be written in English. This Invitation to Tender, the Contract, its formation, interpretation and performance is subject to and in accordance with the law of England and Wales.

Conflicts of interest

Bidders should be free of any commercial interests, partnership arrangements or contracts underway or other matters which may present a conflict or potential conflict of interest in respect of the provision of these services. As set out in section 3, if a Bidder thinks that it may have any conflict or potential conflict of interest, the Bidder shall describe the details of this conflict and provide details of whether and how it would propose to manage such a conflict in a satisfactory and robust manner in Annex B of the Tender Certificate. The Carbon Trust reserves the right to require the provision of further information in relation to any conflict or potential conflict of interest.

Disclaimer

The information contained in this Description of Tender document and in any documents or information it refers to or incorporates (the "**Disclosed Information**") has been prepared to assist interested parties in deciding whether to submit a Tender. The Disclosed Information is not a recommendation by the Carbon Trust. It does not purport to be all inclusive or include all the information that a Bidder may require.

Neither the Carbon Trust nor any of its directors, employees, agents or advisers makes any representation or warranty (express or implied) as to the accuracy, reasonableness or completeness of the Disclosed Information. All such persons or entities expressly disclaim any and all liability (other than in respect of fraudulent misrepresentation) based on or relating to the Disclosed Information or any subsequent communication. The Bidder should conduct its own due diligence and seek its own professional, legal, financial and other advice as appropriate. The only information which will have any legal effect and/or upon which any person may rely will be such information (if any) as has been specifically and expressly represented and/or warranted in writing to the successful Bidder in any written contract that may be entered into with the Carbon Trust.

1. Introduction to the Offshore Renewables Joint Industry Programme for Offshore Wind

1.1. The Offshore Renewables Joint Industry Programme for Offshore Wind ("ORJIP Offshore Wind") is a collaborative R&D programme between the Carbon Trust, EDF Energy Renewables Limited, Ocean Winds UK Limited, Equinor ASA, Orsted Power (UK) Limited, RWE Offshore Wind GmbH, Shell Global Solutions International B.V, SSE Renewables Developments UK Limited, TotalEnergies OneTech, Crown Estate Scotland, The Scottish Ministers and The Crown Estate Commissioners (the latter 11 collectively referred to in this document as "**ORJIP Offshore Wind Partners**").

1.2. The objective of ORJIP Offshore Wind is to improve the evidence base in respect of the overall impact that offshore wind projects have on the marine environment and with regard to other uses of marine areas as well as better inform consenting authorities, offshore wind farm developers and other relevant stakeholders on the environmental risk that is associated with planned and existing offshore wind projects.

1.3. To achieve this objective, ORJIP Offshore Wind provides a framework to identify, develop, initiate and conduct impactful, relevant and strategic research and development projects aimed at reducing consenting risk, project maturation time, cost, and the environmental impact of offshore wind projects. Research is undertaken under areas that are chosen as priority focus areas for ORJIP Offshore Wind each year of the programme.

1.4. Contractors receive technical direction and data from ORJIP Offshore Wind Partners through the Carbon Trust management team and in collaboration with the parties in the Project Expert Panel.

1.5. This project will fall under the "Impacts on ornithology" priority focus area.

1.6. Please note, the term "Contractor", where used within this document, refers only to the successful Bidder or, in the event that the Contract is awarded to a consortium, the successful Bidders.

2. Background and objective of the MetaKitti project

2.1. The MetaKitti project aims to provide a quantitative evaluation of the scale and strength of kittiwake colony connectivity for UK and North Sea regions relevant to the offshore wind industry and to evaluate the demographic implications of inter-colony movements

for determining the vulnerability of kittiwake populations breeding in Special Protection Areas (SPA) to mortality attributed to offshore wind farms (OWF).

2.2. The project scope comprises six key objectives:

i) Estimating connectivity between kittiwake colonies;

ii) Predicting population responses to OWF predicted mortality in closed vs. open systems;

iii) Modelling source and sink dynamics;

iv) Identifying key demographic data gaps;

v) Incorporation of new evidence into population viability analysis (PVA) tool and production of guidance for testing compensation scenarios;

vi) Providing recommendations for the use of developed models, including in other regions within the UK and the North Sea, and identification of evidence gaps.

2.3. An additional objective throughout the study will be the identification of other factors that may influence migration rates or the effectiveness of compensatory measures, including avian influenza and coastal infrastructure.

2.4. The project findings are expected to greatly improve the ability to predict how SPA populations will respond to estimated OWF mortality, by bringing greater biological realism to current population viability analysis (PVA) modelling approaches. In addition, novel knowledge on which colonies may operate as "source" or "sink" populations, and the consequences of sustained immigration and emigration fluxes on population growth, will help inform the design and effectiveness of compensatory measures.

3. Tender documents for submission

3.1. In response to this Invitation to Tender, Bidders are required to submit

i. A Main Bid Document (pdf) – no template provided but contractors are requested to split the document between the Technical Proposal and the Financial Proposal;

ii. The signed Tender Certificate (pdf) – template provided; and

iii. The filled-in Bid Price Calculation Sheet (xls) – template provided.

3.2. The Main Bid Document should be no more than 20 pages excluding appendices and no more than 40 pages including appendices. Font should be clearly legible, and be at least font size 11. The Main Bid Document shall as a minimum include the following information:

Technical Proposal:

i. The Bidder's proposed detailed Approach to Work (see section 4 and criterion 1 for more details). Bidders shall provide Work Package descriptions in the format

set out at the end of section 4 in this document. The Approach to Work shall be split into a Technical Proposal and a Financial Proposal:

- include a Gantt chart which describes the timeline for the Project, showing when each Work Package will start and finish;
- outline how the Bidder will deliver the Scope of Work and do so on budget and within the allocated time;
- specify any input data, background IP, hardware or other inputs that the Bidder requires the Carbon Trust and/or the ORJIP Offshore Wind Partners to provide;
- specify any Alternative Work (i.e. substitute activities to take place instead of certain activities outlined in the Scope of Work in section 4), but without any supporting financial information. If Alternative Work forms part of the Approach to Work, the Bidder is expected to highlight, explain and justify the intended deviation from the Scope of Work. Alternative Work will be considered as non-optional when the Tender is evaluated; and
- specify any Additional Work (i.e. activities to take place in addition to the activities outlined in the Scope of Work in section 4), but without any supporting financial information. If Additional Work forms part of the Approach to Work, the Bidder is expected to explain and justify why the Additional Work would be beneficial and to provide a separate quotation for these activities. It is at the discretion of the Carbon Trust to consider Additional Work in the evaluation of the Tender.

ii. an explanation of experience and staff skills, and how these are relevant to the Approach to Work – see criteria 2 and 3 for more details; and

iii. supplementary information to provide experience evidence and skills evidence (e.g. CVs) – see criteria 2 and 3 for more details. This information should be provided as appendices to the Main Bid Document.

Financial Proposal:

i. a pdf copy of the filled-in Bid Price Calculation Sheet;

ii. the offered Bid Price, including any cost assumptions deemed relevant by the Bidder – see section 6 and criterion 4 for more details;

iii. the price for any Additional Work proposed by the Bidder; and

iv. a Work Package specific breakdown of the costs per sub-contractor (if any).

3.3. The Tender Certificate must be signed by an authorised signatory. Bidders must fill in the provided template.

3.4. The filled-in Bid Price Calculation Sheet must be provided in Excel format in addition to the information provided in the Main Bid Document. See section 6 and criterion 4 for more details.

3.5. The failure by a bidder to submit either the Main Bid Document, the signed Tender Certificate or the filled-in Bid Price Calculation Sheet shall mean that such Tender is a non-compliant Tender.

4. Scope of Work

4.1. The Scope of Work is provided at the end of this section 4.

4.2. The Scope of Work comprises 7 Work Packages. The Scope of Work sets out the initial ideas on the key activities that the Contractor is expected to deliver for the Project.

4.3. It is expected that the Contractor will report on Project Deliverables to the ORJIP Offshore Wind Steering Group and the PEP. The Carbon Trust, ORJIP Offshore Wind Steering Group and the PEP shall review and provide feedback on each Project Deliverable. There will be at least one round of review comments to be accommodated by the Contractor for each Project Deliverable.

4.4. The Final Scope of Work will be agreed between the Carbon Trust and the Contractor when entering into the Contract. The Final Scope of Work may reflect any updates, changes or improvements to the Scope of Work as proposed by the Contractor in its Alternative Work or Additional Work and as agreed by the Carbon Trust.

4.5. Due to the breadth of skills and experience required for the Project, bidders may decide to build a consortium to successfully meet the objectives of the Project. If a Tender is submitted by a consortium it is expected that, in the case that the consortium is selected as the preferred Bidder, Carbon Trust will only enter into a Contract with the Project Coordinator, and that the Project Coordinator will subcontract the other members of the consortium.

4.6. The Carbon Trust appreciates that it will take a small team of mixed seniority approximately 12 months to complete the Project.

4.7. Bidders should use the Scope of Work as set out below to create the Approach to Work. Any Alternative Work or Additional Work shall be stated in the Approach to Work at the end of the relevant Work Package description.

4.8. It is expected that simplifying assumptions will be required to complete the work in the given timeframe. These assumptions should, to the extent possible at the time of Tender submission, be clearly stated in the Approach to Work. It is expected that during the

execution of the MetaKitti Project, any assumptions will be discussed with the ORJIP Offshore Wind Steering Group and the PEP prior to the start of each Work Package.

4.9. This scope of work builds upon work completed by JNCC as part of the Offshore Wind Strategic Monitoring and Research Forum (OWSMRF), under JNCC. 2022. OWSMRF Research Opportunity 3.1: Modelling of kittiwake meta-population dynamics. Joint Nature Conservation Committee, Peterborough.

Detailed project objectives

Objective 1: Estimating connectivity between kittiwake colonies

Key questions: Are focal colonies open to immigration and emigration, and if yes at what frequency are these movements occurring and where?

The first objective is to quantitatively estimate the strength of connectivity between kittiwake colonies of high offshore wind consenting risk in the UK and North Sea regions, by modelling their meta-population dynamics. This includes:

- defining focal regions to be modelled;
- building and parameterising a demographic model for kittiwake populations open to immigration and emigration (the model will be informed by empirical data and allow for movement rates to be captured at biologically relevant scales);
- running the model and estimating the strength of connectivity between colonies; and
- validating model outputs.

Objective 2: Predicting population responses to OWF predicted mortality in closed vs. open systems

Key questions: Is there enough immigration going on to supplement a colony that has poor breeding success? Is emigration accelerating the risk of decline from anthropogenic mortality? How is this mortality influenced by the cumulative effects of anthropogenic causes (including climate change) with other issues like extreme weather events or avian influenza?

A second objective is to evaluate the importance of inter-colony movements in driving the vulnerability or resilience of SPA populations to anthropogenic mortality, and then assess the sensitivity of current impact assessment approaches to the assumption of closed populations. This includes:

- performing PVA analyses informed by plausible estimates of connectivity derived from modelling;
- comparing population trajectories and evaluating the risk of population decline in both open and closed population systems under various anthropogenic mortality scenarios; and
- interpreting the results of this analysis in the context of offshore wind impact assessment.

Objective 3: Modelling source and sink dynamics

Key question: Within the focal region, which colonies are operating as “source” and “sink” populations?

A third objective is to explore the wider meta-population processes and mechanisms maintaining the population size of both single colonies and the wider colony network, by modelling source and sink population dynamics. This includes:

- building and parameterising a meta-population dynamic model for kittiwake colonies likely to be connected by dispersal events;

- estimating demographic rates for different colonies within the network and evaluating the relative contribution of these to population growth rate;
- evaluating directional patterns of movements between colonies; and
- identifying which colonies act as “source” and “sink” within the wider population network.

Objective 4: Identifying key demographic data gaps

Key question: Which data gaps create the most uncertainty in model outputs?

A fourth objective is to identify demographic data needs that will improve confidence when predicting the strength of connectivity, population trajectories and population growth rates. This includes:

- performing sensitivity analyses on key components of models developed;
- identifying which new empirical data will help the most with reducing uncertainty in estimates of connectivity, predicted vulnerability to OWF mortality and population growth rates; and
- producing recommendations to inform the collection of new empirical data.

Objective 5: Provide recommendations for the use of developed models, including in other regions within the UK and North Sea, and identification of evidence gaps.

Produce a recommendations document for the use of developed models incorporating objectives 1-4. The recommendations should include consideration of how the modelling can be rolled out to other UK regions of interest to offshore wind development as well as other North Sea regions of interest. The recommendations should also identify further evidence gaps.

Objective 6: Incorporation of new evidence into population viability analysis (PVA) tool and production of guidance for testing compensation scenarios

Produce best practices for results to be incorporated in new guidance. The guidance should include consideration of how to apply the outcomes of the work when running PVAs for impact assessments at different scales.

The guidance should also consider how to apply the modelling to examine potential compensation scenarios (e.g., introduction of new artificial nesting structures, improvement of demographic rates) to aid understanding of potential scales of requirements.

The incorporation best practice should outline any contingencies, e.g., where additional empirical data may be required.

Consideration of the practical implementation of models and guidance produced will be paramount to the success of the study, and bidders should consider this during the proposal stage and demonstrate how this will be included in delivery.

WORK PACKAGES

Work package	Description of work
WP1 **Data collection**	**Goal** Identify and assess available datasets. **Activity** The contractor should identify relevant available datasets and assess their quality for producing a robust understanding of kittiwake meta-population dynamics at a regional scale in UK areas of relevance to the offshore wind industry. The availability of good-quality demographic data will dictate which colonies and regions could be considered in the meta-population model(s). Moreover, identifying additional datasets (e.g. from telemetry and capture-mark-recapture studies) that will help inform the model or validate modelling outputs will be critical. The bidder should consider which regions may be appropriate based on the availability and quality of datasets in other UK regions of interest to the offshore wind industry, and throughout the project should consider how regions with lower data availability can be included. The project should apply to at least the whole of the United Kingdom, and consider any potential possibility for conclusions that can be drawn internationally. There are several questions that the Contractor should consider and include in their proposal: 1) How can artificially created colonies be considered throughout the modelling, including oil & gas assets, buildings, and artificial nest boxes? 2) How can theoretical data (e.g., around artificial nesting platforms) be included in the analysis or future studies? 3) How can impacts of external factors such as climate change, other coastal infrastructure, and avian influenza be considered within the modelling? 4) How can data from outside the UK be incorporated into the analysis? It is understood that data availability will affect the feasibility of the various model approaches and the scope of data inclusion. Based on the results of WP1, the Contractor should make recommendations as to the optimal way to proceed, given data availability. This will need to be agreed with the ORJIP OSW Steering Group & Project Expert Panel.

WP1 Deliverables:

D01: Data collation report

D02: Presentation to ORJIP Steering Group & Project Expert Panel

WP2

Pilot model

Goal

Develop, run and validate a meta-population dynamics model on one or more case study region(s) to estimate connectivity between kittiwake colonies.

Activity

Conduct modelling to achieve Objectives 1 and 2.

Key ecological questions are:

- Are focal colonies open to immigration/emigration?
- How frequently do individuals disperse between colonies?
- Where do individuals disperse?
- Where do they disperse most/least frequently?
- Do dispersing rates vary with distances to the nearest colonies?
- What is the spatial scale of the meta-population?
- Do open and closed populations differ in their projected trajectories?
- Does immigration help maintain population size despite predicted OWF mortality?
- Is there a threshold above which emigration rapidly exacerbates the risk of decline of a colony suffering from predicted OWF mortality?
- What immigration/emigration ratio is needed to maintain population size despite poor breeding success?
- Is there a threshold above which the negative effects of anthropogenic mortality cannot be compensated for by immigration?

To derive estimates of the strength of connectivity between kittiwake colonies, it is proposed to develop a demographic model for kittiwake populations open to immigration/emigration and informed by empirical demographic and count data.

It is understood that the modelling approach will ultimately be dictated by factors including data availability, model structure, and computational time. Bidders should outline a proposed approach that is optimal to

achieve the objectives, including justification of modelling tools and strategies.

In particular, consideration should be given to the integration of models achieving the various objectives, and other relevant models and tools in the industry.

The choice of the modelling approach will ultimately be dictated by data availability and structure as well as computational time, and full details of the model structure should be provided by the Contractor.

Similarly to what was presented under Obj.1, a range of different modelling tools as well as data quality and availability issues should be considered, and the Contractor(s) would need to present detailed justification for using a particular modelling tool.

WP2 Deliverables:

D03: Pilot model tool

D04: Pilot modelling report

D05: Presentation to ORJIP Steering Group & Project Expert Panel

WP3

Source and sink modelling

Goal

Achieve Objective 3 by modelling "source" and "sink" population dynamics within the case-study region(s) – i.e., determine which colonies are self-sustaining vs. depend on immigration for their growth.

Activity

Conduct modelling to achieve Objective 3.

Key ecological questions are:

- How do different colonies differ in their demographic rates and intrinsic population growth rates?
- Are SPA colonies that are currently presenting a high consent risk for offshore wind development, acting as sources or sinks?
- If these colonies are acting as sinks, can we identify source colonies and what would happen if these source colonies stopped exporting birds?
- Can we identify source colonies within the network where compensatory measures are likely to be most effective?
- Does the source/sink status of colonies change over time, e.g. due to changes in local conditions?

	Some key features of the meta-population model to be developed to answer these questions will need to be considered, for example: • Spatial scale of the meta-population network; i.e. number of colonies and distance range from focal colony(ies) (this would be a compromise between biological relevance and computational time); • Availability and quality of demographic rate data to model spatial variation between colonies and population growth as a function of productivity, survival and immigration/emigration rates. *N.B. If the bidder proposes that combining WP2 and WP3 into a single work package and modelling exercise is optimal, then this should be explored and outlined in the proposal. Creative approaches are welcomed to achieve the project's objectives.*
WP3 Deliverables: **D06: Source and sink modelling tool** **D07: Source and sink modelling report** **D08: Presentation to ORJIP Steering Group & Project Expert Panel**	
WP4 **Incorporation of evidence and implications for assessments and compensation**	**Goal** Incorporate new evidence into the JNCC/Natural England PVA tool, make clear recommendations into how new evidence should be included in the assessment process, and produce best practice guidance for testing compensation scenarios. **Activity** Incorporate new evidence from WP1-WP3 into the population viability analysis (PVA) tool. Produce best practice guidance report for testing compensation scenarios within the tool and include recommendations for how new evidence should be included in the assessment process. In order to complete this activity, the Contractor will need to assess the functionality of current PVA tools in use in the assessment process, and any updates that need to be made to tools to enable further functionality. If this is required, such updates may be within the scope of the project and should be outlined in proposals. In particular, it may be necessary to add more functionality to the JNCC/Natural England PVA tool to allow movements between colonies. The Contractor should include recommendations for model validation and data requirements that will be needed to allow this.

	The Contractor should include consideration of how to apply the outcomes of the work when running PVAs for impact assessments at different scales. The Contractor should also consider how to apply the model to examine potential compensation scenarios (e.g., introduction of new artificial nesting structure colonies, improvement of demographic rates) to aid understanding of potential scales of requirements. It is hoped that this will enable the provision of a recommendation in terms of adaptive management strategies that could be applied to enhance the effectiveness of implemented compensatory measures. The Contractor should identify where key evidence gaps lie, which will help direct future data collection. The modelling tool is intended to be flexible so that outputs can be updated as and when new empirical evidence becomes available.
WP4 Deliverables: **D09: Updated PVA tool incorporating new evidence** **D10: Best practice guidance report** **D11: Presentation to ORJIP Steering Group & Project Expert Panel**	
WP5 **Summary report**	**Goal** Produce a summary report that could be published that summarises key results of earlier work packages, identifies evidence gaps, captures lessons learnt, and provides recommendations for future field and modelling work (including explaining how results from this study can be transferred to other UK regions of interest to the offshore wind industry, and how modelling kittiwake meta-population dynamics could be expanded to larger scale colony networks e.g. the UK and North Sea regions). **Activity** The Contractor should consolidate the findings of the study and modelling into one report that clearly explains how the models can be used, the outcomes of the analysis, and the limitations. Proposals should consider how this may be best achieved, including the potential to test theoretical case studies.
WP5 Deliverables: **D12: Summary report**	
WP6	**Goal**

Stakeholder presentation	Align stakeholders on the issues and survey results, facilitate guidance for industry, and propose next steps for environmental assessments, if appropriate. **Activity** Final presentation to stakeholders of key outcomes.
WP6 Deliverables: **D13: Final presentation to stakeholders of key outcomes**	
WP7 **Project validation**	**Goal** To provide a third-party review of the project deliverables to assess its accuracy and identify any shortfalls to progress the final report as a scientific publication. **Activity** Conduct peer review, potentially including: a) An independent review of project and outputs. b) Publication of scientific report. Proposals should set out the intended approach to peer review, including details such as the proposed publication. If it is deemed appropriate, this will include preparing documents for publication, including the final grammatical proofreading of documents for publication.
WP7 Deliverables: **D14: Project validation report**	
WPA **Project Management**	The contractor should stipulate how they will manage the project efficiently and effectively. This should include specific costs for project management time, including update calls with the Carbon Trust Project Manager and/or ORJIP OSW Steering Group as required. This should also include production of a brief executive summary for the whole project, for internal dissemination. The budget should also accommodate the production of a final presentation and time dedicated to presenting this in the form of a webinar to invitees from the participants of ORJIP OSW including the Advisory Network. Finally, if appropriate, resource should also be allocated to provide inputs into the 'ORJIP Risk Model'. The contractor is expected to produce a risk

	register and provide guidance on the effect of the research on inputs to the 'ORJIP Risk Model'.
WPA Deliverables: **D15: Project executive summary** **D16: Delivery of webinar** **D17: Project Risk Register inputs**	

Additional information

Additional information is included below that may be of use to bidders.

Modelling framework

When modelling population dynamics, a common approach for estimating demographic rates is to use capture-mark-recapture models. However, these models are data hungry, and for kittiwake a substantial mark-recapture effort would need to be deployed to obtain precise estimates of immigration and emigration rates (O'Hanlon et al. 2021). Moreover, field data will inevitably be patchy, of various quality, scattered across a small number of colonies and coming from different datasets. Time-series of kittiwake demographic parameters or count data are also likely to be truncated or associated to various levels of measurement error.

Various statistical approaches have been developed to overcome these limitations. One of them is state-space models (SSMs). SSMs have become an increasingly popular tool for modelling complex animal population dynamics, particularly imperfect time series (e.g. Auger-Méthé et al. 2021). One of the great advantages of SSMs is that they can account for two important levels of variability: biological stochasticity and imprecision in the data collection methodology. Because observations of cliff nesting birds are often associated with large measurement errors, SSMs are a desirable tool to derive demographic information from time-series of kittiwake colony data (as done in Miller et al. 2019).

When single datasets alone do not allow for the robust estimation of critical demographic parameters, there are clear advantages of combining time-series of population count data with additional demographic models, as commonly done in Integrated Population Models (IPMs) (e.g. Riecke et al. 2019). For example, while annual kittiwake colony count data alone would not be good enough to estimate movements between colonies, IPMs would provide the means for making inferences about the strength of connectivity between colonies by exploiting information from modelled demographic processes.

Furthermore, allowing the model to reconstruct missing data will improve model parameterisation and hence the robustness of the model predictions. For example, when count and demographic rate data are missing for a colony, empirical estimates may be reconstructed using prior knowledge of the relationship among these parameters obtained from other colonies (Horswill et al. 2021).

Fitting these models may be done either within a classical likelihood-based or Bayesian framework. Consideration should be given to a Bayesian approach, as it would allow the integration of multiple datasets of varying structures and quality, including expert opinions, old monitoring data and demographic information from closely-related species, within a single unified framework.

Model covariates

The meta-population model is primarily intended to estimate the strength of connectivity between kittiwake colonies as a function of distance between colonies and the arrangement of the entire colony network. Given the potential relative importance of density-dependence in regulating kittiwake populations (e.g. Miller et al. 2019), it is highly desirable to account for density-dependence when modelling meta-population dynamics. Although this would

increase biological realism, it would potentially also increase model complexity. In addition, it may also make sense to model connectivity rates across age classes. Ultimately, what can be achieved within this project will depend on data availability/quality and computational time, and this will be discussed with the Contractor(s) before the project starts (see also below a proposal for developing a pilot meta-population model).

Defining focal regions

When defining focal regions for modelling kittiwake meta-population dynamics, colonies where impacts of OWF on kittiwake populations are predicted to be highest will be prioritised. Meta-population regions will be defined using empirical knowledge of kittiwake inter-colony movements in North Sea regions (e.g. from telemetry and mark-recapture studies). As kittiwake movements from UK colonies are likely to extend over a wide spatial area (up to Norway), careful consideration should be given to the biological and ecological factors driving the spatial scale of movements (e.g. regional patterns of productivity, prey distribution). Defining the spatial extent of a region will be a compromise between ecological relevance and the number of possible connections between colonies. In addition, close consultation with offshore wind industry developers, SNCBs and kittiwake experts will be essential for defining and delineating focal colonies and regions that are relevant to both kittiwake ecology and OWF consenting.

Pilot meta-population modelling approach

Gathering empirical data to feed into a meta-population model is likely to constitute a substantial preliminary part of this work, especially if rolled out at large spatial scales. It may therefore be sensible to initiate this project by developing a pilot meta-population modelling approach on a relatively small geographic region with a few colonies, where demographic data on e.g. productivity and survival rates are available. This will allow testing and validating the proposed modelling framework, before increasing the spatial scale of the metapopulation model at a later stage. When considering large regional scales, the Contractor(s) will need to bring clear solutions for approximating meta-population dynamics of very large networks.

Model validation

A crucial part of the modelling process is the validation of model outputs. While developing a theoretical meta-population model and deriving “some” estimates of demographic parameters may not be too computationally demanding, without a robust model validation process, there is a high risk that any model predictions are not realistic. Any model predictions should therefore be tested against empirical data (e.g. from mark-recapture or telemetry studies, or any other means). The Contractor(s) will need to explicitly detail their model validation approach, specifying what ecological datasets will be used and how, in order to ensure model predictions are realistic.

A second objective of this Scope of Work is to evaluate the sensitivity of PVA models to the assumption of closed populations when modelling the impacts of predicted OWF mortality. For doing so, the information derived from modelling population dynamics under Obj.1 will be extracted and used as an input to PVA models for open populations. A range of plausible connectivity values would be used to develop a demographic model, and kittiwake populations would then be projected within a period of 25 years to reflect the operational

timeframe of an OWF. Various anthropogenic mortality scenarios could be applied to the system, and their relative impacts on kittiwake population persistence would be assessed by comparing population trajectories between open and closed population systems (as done in Miller et al. 2019). The outputs of this modelling exercise would then need to be interpreted in the context of offshore wind impact assessments; i.e. how much do the predictions of both modelled systems differ and what does it mean for the OWF industry in terms of both consent risk, and requirements for compensatory measures and scale of such?

5. Intellectual Property and Knowledge

5.1. Full details of the intellectual property requirements and conditions can be found in the attached ORJIP Offshore Wind Stage II Contractors' Conditions.

5.2. The Carbon Trust and/or the ORJIP Offshore Wind Partners are able to make available the following input data, background IP or other resources to the successful Bidder for the purposes of the completing the Project, subject to the confidentiality conditions in the ORJIP Offshore Wind Stage II Contractors' Conditions:

i) None.

6. Bid Pricing

6.1. To provide Bidders with greater clarity on the nature, level and type of work involved in the various Work Packages, the Total Budget for the delivery of this Project is expected to be a maximum of **£150,000**. If the proposed budget exceeds this value, a clear explanation should be included in the proposal.

6.2. The Bid Price submitted with the Tender must be derived from the cost breakdown in the Bid Price Calculation Sheet, and must include all expenses. The Bid Price is the price for the activities that will address the Scope of Work (and any Alternative Work proposed by the Bidder). The Bid Price Calculation Sheet and the Bid Price shall not include the price of any Additional Work suggested by the Bidder. Instead, the price for such Additional Work Packages shall be stated separately to the Bid Price in the Main Bid Document.

6.3. If the Bid Price exceeds the expected range of the Total Budget as stated under section 6.1, to avoid receiving a lower score for criterion 4, in the Main Bid Document the Bidder should provide a clear and justified reason why the Bid Price exceeds the expected budget.

6.4. All costs and rates quoted in the Main Bid Document and Bid Price Calculation Sheet must be in GBP (£) and all staff rates quoted in the Tender must represent the **Day Rate** for employment of staff members.

6.5. Any expenses that the Bidder expects to incur throughout the project must be separately included as a capped amount under Expenses. Expenses will be paid as incurred and any unused balance will not be paid.

7. Tender Evaluation Criteria

Bidders should take the following evaluation criteria into account when preparing and submitting their tenders. In the event of equivalent scores of two or more received Tenders, suppliers and sub-contractors who have committed to decarbonisation targets (see end of this section) will be preferred.

CRITERION 1: APPROACH TO WORK (WEIGHTING: 30%)

Description	*Information required from Bidders*
Proposed Approach	In the Main Bid Document, Bidders are required to provide a clear and detailed description on how they plan to deliver the work for this Project. The description should include an initial overview on the approach followed by a description on how each Work Package and task will be delivered. Also, Bidders need to justify how their proposed approach meets the objectives of the Project.
Additional Work	If there is any Additional Work proposed by the Bidder, these aspects will be evaluated separately. The suggestion of Additional Work by the Bidder will not have a negative impact on the evaluation of the Tender.
Project management	Bidders are required to describe how they will manage the Project utilising appropriate resources and describe how they will work with the various stakeholders, such as the relevant PEP, to get information and manage potentially conflicting relationships.

CRITERION 2: EXPERIENCE (WEIGHTING: 20%)

Description	*Information required from Bidders*
Desired experience	In the Main Bid Document, Bidders should elaborate on skills and experience listed below and explain how these past experiences are relevant for this Tender. Of particular importance will be the Bidder's understanding of the policy environment and the need for this project. In addition, Bidders should provide at least two examples (with reference to specific roles, responsibilities and activities the Bidder undertook) of previous work which illustrates the Bidder's skills, capabilities, and experience in all of these areas (Bidders may wish to make reference to submitted examples of previous work for other clients). Bidders are advised that experience is considered a key important criterion and partnerships with other companies to support certain areas of experience are welcomed. All experience / case studies should be attached as an appendix to the Main Bid Document. Bidders should provide evidence of their relevant skills and experience. It is anticipated that the successful bidder will exhibit, among others, the following range of skills and experience:

	• Understanding of the requirements under EU and UK legislation; • Practical understanding of the offshore wind industry, including consenting/licensing processes and operation of offshore wind farms; • Understanding of conservation science, including ornithology expertise and knowledge of offshore wind farms; • Knowledge of Kittiwake ecology in relation to offshore wind farm development; • A track record of satisfactory health, safety and quality management; • Experience of undertaking authoritative studies in relevant applied science areas; • Experience of reporting and presenting the results of studies in relevant applied science areas; • Experience of applying statistical skills to the design and undertaking of relevant studies; • Experience of working collaboratively with regulatory bodies and industry, ideally including the renewables industry and Statutory Nature Conservation Bodies.

CRITERION 3: STAFF SKILLS (WEIGHTING: 15%)

Description	*Information required from Bidders*
CVs/Resumes	Bidders are required to provide detailed CVs/Resumes for any key personnel who will be involved with this Contract together with proposed Project structure, intended position of the key personnel in the Project, and main responsibilities. CVs should include professional memberships of proposed staff working on this Project.
Applicable skills	Bidders should elaborate on the most relevant skills of the key personnel that will be involved in the Project.
Prior experience form involved staff	Please include examples of similar work performed by the proposed staff members, explaining how is relevant to the Approach to Work.
Expert engagement	A close working relationship with key stakeholders, such as government departments & agencies, regulatory bodies, statutory nature conservation bodies (SNCBs), non-governmental organisations (NGOs) and academia, who are seen relevant to the success of this Project. Please supply ideas of how these groups can be engaged and leveraged.

CRITERION 4: DATA ACQUISITION (WEIGHTING: 10%)

Description	*Information required from Bidders*
Knowledge and experience of relevant source data	It is understood Bidders may not be able to commit to access or use of 3rd party data without permission from the owner. A key criterion for scoring is that Bidders have a good understanding of what source

	data is likely to be available and who the owners are. Permission to use the data can be determined attained through coordination with ORJIP Offshore Wind.

CRITERION 5: BID PRICE (WEIGHTING: 25%)

Description	*Information required from Bidders*
Day rates and man hours (man-h) for all staff grades	In the Bid Price Calculation Sheet, Bidders are required to provide day rates for all staff grades and to input the man-h involved in each Work Package.
Price for the delivery of the Project	In the Bid Price Calculation Sheet, Bidders are required to provide a cost breakdown by Work Package, including man hours and day rates of personnel completing the work as specified in section 5. Bidders are required to specify expected expenses separate from the estimated budget for each Work Package. The Bid Price will be assessed on the price for the Approach to Work (which includes the price of the Work Packages in the Scope of Work and any Alternative Work proposed by the Bidder). If there is any Additional Work proposed by the Bidder, this will be evaluated separately. The suggestion of Additional Work by the Bidder will not have a negative impact on the evaluation of the Tender. Carbon Trust will reimburse reasonable expenses at cost and receipts may be requested. Pre-approval will be required for travel costs over £150 per return journey and combined hotels & subsistence cost exceeding £200 per day. Bidders will be required to confirm or comment on their ability to carry out the activities detailed in the Scope of Work within the initial term of the Contract and provide an outline plan of work.

The Carbon Trust has committed to reaching Net Zero by 2050. Our associated targets have been validated by the Science Based Targets Initiative (SBTi)[1]. To meet the initial targets that we have set for ourselves, we encourage all our suppliers and sub-contractors to themselves have equivalent plans in place by 2026 at the latest. Measuring your emissions, setting targets, and encouraging others to do so will help push the needle on decarbonisation together.

Accordingly, we have included climate change commitment clauses in the ORJIP Stage II Contractors' Conditions. Bidders may submit Tenders even if they cannot meet the defined conditions now, but if this is the case this should be clearly flagged in the Tender Certificate as a requested change to the ORJIP Stage II Contractors' Conditions. Please reach out if you need more information on this.

[1] https://sciencebasedtargets.org/

8. Glossary

Approach to Work	Has the meaning given to it in section 3.1.
Additional Work	Any activities that are proposed by the Bidder in addition to those in the Scope of Work. It is at the discretion of the Carbon Trust to consider Additional Work in the evaluation of the Tender. The suggestion of Additional Work by the Bidder will not have a negative impact on the evaluation of the Tender.
Alternative Work	Deviations from the Scope of Work that are proposed by the Bidder, which replace work or tasks in the Scope of Work. Alternative Work will be treated as non-optional in the evaluation of the Tender.
Award Letter	A letter, issued by Carbon Trust, informing the Contractor about the award of the Contract. The Award Letter is issued together with the Final Scope of Work and the ORJIP Offshore Wind Stage II Contractors' Conditions.
Bidder	An individual, a company, an organisation or a consortium submitting a bid for the Project.
Bid Price	Has the meaning given to it in section 6.2. The total price for the Bidder to complete the Project in line with the Approach to Work. In the Tender, the Bid Price shall include the price for the delivery of all Work Packages described in the Scope of Work and any Alternative Work proposed by the Bidder. If any Additional Work is suggested by the Bidder, the price for the Additional Work shall be stated separate to the Bid Price.
Bid Price Calculation Sheet	An Excel template provided by the Carbon Trust that is to be provided by the Bidder in addition to the Main Bid Document.
Carbon Trust Project Manager	The Carbon Trust employee who serves as first point of contact in relation to this ITT and the Project.
Clarification Document	A document containing all received clarification questions and Carbon Trust's responses to these questions.
Contract	A document consisting of the Award Letter, the Final Scope of Work, the ORJIP Offshore Wind Stage II Contractors' Conditions, and any clarifications agreed in writing.
Contractor	The Bidder (or in the case of a consortium, Bidders) selected for the delivery of the Project.
Description of Tender	This document.
Due Diligence Questionnaire	A questionnaire that is to be completed by shortlisted Bidders should Carbon Trust's bidders vetting process give reason to

	conduct a due diligence. In case of a consortium, the Due Diligence Questionnaire is to be filled-in by the designated Project Coordinator.
Executive Summary Report	A 3-10 pages report containing a high-level description of the Work Programme and a summary of the relevant results, findings and conclusions of the Project.
Final Scope of Work	The agreed Work Programme for the Project, based on the Scope of Work and the Approach to Work, which is mutually agreed between the Carbon Trust and the Contractor.
Financial Proposal	Any financial information provided as part of the Tender, including the Bid Price and the Bid Price Calculation Sheet.
Flash Report	A template provided by the Carbon Trust at Project start.
Invitation to Tender (ITT)	The following group of documents: Description of Tender (this document); ORJIP Offshore Wind Stage II Contractors' Conditions; Tender Certificate template; Bid Price Calculation Sheet template; and Clarification Document (if applicable[2]).
Main Bid Document	Has the meaning given to it in sections 3.1 and 3.2. No template is provided.
Project	The Modelling of kittiwake metapopulation dynamics or MetaKitti project.
Project Closeout Form	A template provided by the Carbon Trust towards the end of the Project.
Project Deliverables	The individual deliverables including, but not limited to, any reports, technical notes, documents, drawings, models, data, webinars to be produced by the Contractor according to the Scope of Work (see section 4) or as otherwise agreed in the Final Scope of Work.
ORJIP Offshore Wind	Offshore Renewables Joint Industry Programme for Offshore Wind
ORJIP Offshore Wind Partners	A group of leading offshore wind farm developers and public sector non-developers supporting ORJIP Offshore Wind.
ORJIP Offshore Wind Advisory Network	A network of stakeholders that voluntarily advise ORJIP offshore wind on the selection, implementation and delivery of ORJIP Offshore Wind projects.

ORJIP Offshore Wind Risk Model	The Contractor is not expected to produce a risk model of its own, but rather provide an estimate, with appropriate explanation, for potential risk reduction implications of the research undertaken within the frame of the delivered project. The Carbon Trust will provide a template to assist the Contractor in this process.
ORJIP Offshore Wind Risk Model Input Sheet	A form (to be provided by Carbon Trust) which the Contractor should complete in WPA to provide input into the ORJIP Offshore Wind Risk Model.
ORJIP Offshore Wind Steering Group	The Steering Group represents each of the ORJIP Offshore Wind partners and is the decision-making authority for ORJIP Offshore Wind projects.
Project Expert Panel or "PEP"	A group consisting of technical experts from the ORJIP Offshore Wind Advisory Network and ORJIP Offshore Wind Partners appointed by the ORJIP Offshore Wind Partners. The PEP will supervise the Project and where necessary make recommendation to the ORJIP Offshore Wind Steering Group.
Scope of Work	The (preliminary) Work Programme for the Project as defined in section 4 of this document. At Contract award, the Scope of Work will be replaced by the Final Scope of Work.
Technical Proposal	All parts of the Main Bid Document excluding the Financial Proposal.
Tender	Bidder's response to this ITT consisting of the following elements: - Main Bid Document (proposal); - signed Tender Certificate; and - Bid Price Calculation Sheet
Tender Certificate	A declaration that is to be provided by the Bidder (in case of a consortium: by the designated Project Coordinator) in addition to the Main Bid Document.
Total Budget	The expected amount of money available that will be made available from ORJIP Offshore Wind to the Contractor for the delivery the Project.
Work Package	A group of related tasks to be delivered under the Project.
Work Programme	The entirety of all Work Packages.