OFFSHORE RENEWABLES JOINT INDUSTRY PROGRAMME (ORJIP) FOR OFFSHORE WIND

Summary report – Stakeholder interviews (D04a)

Closing the Loop: Feasibility study to determine a feedback approach for post-consent monitoring to reduce consenting risk in future assessments

September 2025

working to accelerate offshore consenting

ORJIP Offshore Wind

The Offshore Renewables Joint Industry Programme (ORJIP) for Offshore Wind is a collaborative initiative that aims to:

Fund research to improve our understanding of the effects of offshore wind on the marine environment.

Reduce the risk of not getting, or delaying consent for, offshore wind developments.

Reduce the risk of getting consent with conditions that reduce viability of the project.

The programme pools resources from the private sector and public sector bodies to fund projects that provide empirical data to support consenting authorities in evaluating the environmental risk of offshore wind. Projects are prioritised and informed by the ORJIP Advisory Network which includes key stakeholders, including statutory nature conservation bodies, academics, non-governmental organisations and others.

The current stage is a collaboration between the Carbon Trust, EDF Energy Renewables Limited, Ocean Winds UK Limited, Equinor ASA, Ørsted Power (UK) Limited, RWE Offshore Wind GmbH, Shell Global Solutions International B.V., SSE Renewables Services (UK) Limited, TotalEnergies OneTech, Crown Estate Scotland, Scottish Government (acting through the Offshore Wind Directorate and the Marine Directorate) and The Crown Estate Commissioners.

For further information regarding the ORJIP Offshore Wind programme, please refer to the Carbon Trust website, or contact Ivan Savitsky (ivan.savitsky@carbontrust.com) and Žilvinas Valantiejus (zilvinas.valantiejus@carbontrust.com).

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- Natural England
- NatureScot
- Royal Society for the Protection of Birds (RSPB)

- Scottish Government Marine Directorate

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List of Abbreviations

CASE	Cooperative Awards in Science & Engineering
CES	Crown Estate Scotland
DEFRA	Department for Environment, Food and Rural Affairs
DESNZ	Department for Energy Security and Net Zero
DOI	Digital Object Identifier
ENGOs	Environmental Non-Governmental Organisations
FAIR	Findable, Accessible, Interoperable, Reusable
IPMP	In Principle Monitoring Plan
INTOG	Innovation and Targeted Oil & Gas leasing round through Crown Estate Scotland, including 'Innovation' projects and 'Targeted Oil and Gas' projects
MDE	Marine Data Exchange
MEDIN	Marine Environmental Data and Information Network
MHCLG	Ministry of Housing, Communities and Local Government
MMO	Marine Management Organisation
mNCEA	Marine Natural Capital Ecosystem Assessment Programme
OEP	Office of Environmental Protection
ORJIP	Offshore Renewables Joint Industry Programme
OWC	Offshore Wind Champion
OWEC	Offshore Wind Evidence and Change Programme
OWEKH	Offshore Wind Evidence and Knowledge Hub
OWFs	Offshore Windfarms
PCM	Post-Consent Monitoring
PINS	Planning Inspectorate
POSEIDON	Planning Offshore Wind Strategic Environmental Impact DecisiONs (OWEC)
QFAIR	Quality, Findable, Accessible, Interoperable, Reusable
RAG	Regional Advisory Group
RUK	Renewables UK
ScotMER	Scottish Marine Energy Research
SNCB	Statutory Nature Conservation Body
SPA	Specially Protected Area
TCE	The Crown Estate
UKRI	UK Research and Innovation

Executive summary

There is a recognised need to 'close the loop' and make better use of post-consent monitoring (PCM) reporting and data to improve assessment processes for offshore windfarm consenting, both in terms of cumulative impact and future project-based assessments. This report presents findings from semi-structured interviews with ten stakeholder organisations (a total of 15 interview participants) undertaken from July-September 2024, as part of the Closing the Loop project. The aim of the interviews was to understand some of the **procedural and policy barriers** to closing the loop within organisations involved in the consenting process (in setting requirements for data collection, managing data, and reviewing assessments), and consider ways to overcome those barriers.

The findings of our study are presented in terms of **procedural issues**, which includes issues relating to policy, governance, and organisational practices (section 3.1); and issues more directly relating to **data management and data management frameworks** (section 3.2). Our research identified a range of challenges in accessing PCM reporting and data, and in making use of such data for improving the understanding of the marine environment and improving assessment processes. A key challenge is in the transition from **data to evidence to guidance**, a complex process that involves many layers of expertise and resource need, and draws on multiple evidence sources, not just PCM data. While many of the challenges to using PCM reporting and data (for reasons other than fulfilling licencing or leasing requirements) are long-standing, our study also identified opportunities to improve procedures and practices facilitate better access to such data.

Procedural issues

- The collection and management of PCM reporting and data involves multiple stakeholders, including developers, consultants, subcontractors, regulators, oversight managers and statutory nature conservation bodies (SNCBs). Each of these actors has different roles, responsibilities, areas of operation, and potential uses for PCM data, presenting a governance challenge in relation to using PCM data to improve assessment processes.
- No single organisation has responsibility for overseeing or coordinating PCM reports and data: there is no central coordination or oversight of reporting that is due, and no formal process for informing relevant organisations when reporting and data have been received and uploaded.
- The pre-consenting phase of offshore wind development is driven by statutory deadlines and obligations, as well as expectations of transparency. The same does not apply to post-consent monitoring and reporting, resulting in an effectual downgrading of the importance of PCM data (which are effectively deprioritised in terms of staffing and resourcing), and mixed practices on data transparency.
- In Principle Monitoring Plans (IPMPs) are provided at application and agreed at consenting stage, but are often high-level, and require discussion with regulators and SNCBs about approaches and methodologies before monitoring begins. Yet final proposals for Monitoring Plans can be submitted by developers at relatively short notice before monitoring is due to being, leaving insufficient time for thorough review or discussion of PCM plans.
- Statutory Nature Conservation Bodies (SNCBs) and other organisations have internal processes for reviewing evidence and updating guidance; some of these processes are relatively formal (e.g. regular meetings of internal specialist networks); others are more informal and can rely on

individuals taking the initiative to disseminate information to relevant colleagues. All of these processes work to ensure staff are as up-to-date as possible on the latest knowledge and insights, but the reliance on individuals can leave processes vulnerable to staff turnover.

- The sign-off of PCM reporting can be delayed by review processes within regulators, with revisions and additional levels of sign-off often required, causing delays to PCM data and reporting becoming more widely available.

Data management and data management frameworks

- Data management is currently inconsistent and dispersed. Some systems are being used for purposes other than that for which they were originally developed (e.g. the MMO's public-facing database was originally an internal case management system) leading to challenges in knowledge about what data are available, and where they are stored.
- Data findability and accessibility is a significant challenge across systems. Even when knowing project names, it can be hard to track down raw data or reporting on existing systems, as search terms and metadata are unclear, and search terms return inconsistent results. PCM reporting and data often appear not to be uploaded after approval.
- Since 2024, The Crown Estate and Crown Estate Scotland (CES) have been working to align more closely on data management. The Marine Data Exchange (MDE), created in 2013 by TCE as a purpose-built data management system, is now established as the UK platform for offshore industry data. TCE and CES are working to migrate existing data held by CES to the MDE.
- TCE and CES are working to establish common data clauses in lease agreements, and implementing clear publication policies, aiming to provide greater consistency to operators across the UK. Both organisations are implementing stakeholder engagement activities to communicate and raise awareness of the MDE, and ensure developers can fulfil their data requirements in relation to lease agreements for establishing the site.
- There is a need across the board to improve metadata standards, and to ensure data uploads adhere to FAIR principles (Findable, Accessible, Interoperable and Reusable). Data practices adopted by the Marine Environmental Data and Information Network (MEDIN), including the use of digital object identifiers (DOIs) for long-term data accessibility, were welcomed.
- Investment in data management infrastructure is necessary to build resilience for the future, especially given large amounts of data, and large data files needing to be stored.
- Investment is also needed in expert Data Manager roles, to design, implement, and support data management frameworks and to provide support to users and stakeholders with handling and accessing data.

Moving from data -> evidence -> guidance

- Ensuring the better use of PCM data is not just about data availability. The challenge of turning data into evidence and then advice requires time, funding, resource and expertise.

- SNCBs are required to ensure any advice updates are based on robust evidence. Guidance cannot be updated based on one-off reporting, or peer reviewed academic papers based on one case study.
- Updating guidance involves internal review processes and consultation and sign-off across different work areas, and sometimes senior-level staff or scientific advisers; issuing joint SNCB guidance requires additional levels of sign-off across multiple organisations. All of these processes mean reviewing evidence and updating guidance and advice can take time.
- SNCBs have to manage the timing of guidance updates, recognising such updates have implications elsewhere in the consenting process. Some SNCBs in our study have started to introduce an annual update system, to provide a consistent approach for developers.
- Funding is needed to build the evidence base, including financial support for longer-term academic research and more strategic-level PCM monitoring, or consolidation of project-level monitoring into detailed aggregated evidence.
- There is a lack of consensus around a vision for PCM. Some interviewees indicated support for a more strategic or regional approach to monitoring, while others emphasised the substantial resource implications for developing and governing such an approach. Single project PCM reporting, was felt to deliver reporting, but not necessarily the insights needed to understand cumulative impacts.
- The developing role of the Offshore Wind Evidence and Knowledge Hub (OWEKH) was considered a potential source of expertise for translating evidence to insights, but this will require sustained resourcing, and input from a wide range of stakeholders and experts.

Potential solutions to help close the loop:

- Stakeholders across the industry work to establish greater clarity on the governance of and responsibility, aiming to co-develop a way of working for smoother management of PCM data and reporting, and how new information is taken forward.
- Regulators and oversight managers aim to develop a comprehensive overview about what monitoring reporting is due when, and to improve communications between key stakeholders when reporting is available.
- SNCBs, regulators, and other relevant stakeholders work to develop an annual programme of evidence review; an additional opportunity would be to produce a brief annual summary to update stakeholders on the latest evidence.
- To show the value of making data and reporting more open, SNCBs and others develop examples of how and where PCM data and reporting has been used to help update and improve their advice.
- TCE and CES continue to invest in the Marine Data Exchange to ensure it is able to fulfil its role as a resilient data management framework, able to cope with the continued expansion offshore wind off the UK coastline, and continuing to work with MEDIN on joint data and metadata standards.
- TCE and CES continue implementing commitments to work closely with developers to ensure data are uploaded and made available in an open and FAIR manner.

- The MDE works to further improve the searchability of its records, working with developers and researchers to improve the use of search terms.
- The wording of site leases and marine licencing conditions be developed such that FAIR data expectations and formats are clearly defined, and conditions include upload of data to the MDE within a defined timescale. Such conditions could also be included in contracts for data collection.
- Governments across the UK consider whether there are any policy tools or mechanisms that could be developed to improve the use of PCM data, such as statutory instruments from the Energy Act 2023.
- SNCBs, regulators, and other relevant organisations be resourced to invest in new staff to facilitate the scale of assessments needed with the continued expansion of offshore wind, including investing in data managers - people with skills and expertise to help manage and facilitate access to and use of PCM data
- The developing role of OWEKH include focus on ensuring better use of PCM data, and could potentially take on the role of disseminating information on PCM when papers and reporting becomes available.
- Stakeholders consider working with intermediary and representative organisations, such as OWEKH communities of practice or technical topic groups, to consolidate data across multiple projects, contributing to stronger opportunities for collation of regional or meta-analysis projects.
- SNCBs and regulators work together to co-produce a regular schedule for evidence review across all parts of the UK. This need not be resource intensive – it could be a database or a short summary document of key findings (e.g. species studied at each site; which potential impacts were/were not identified for each species).
- To ensure improved access to data results in the delivery of better evidence and advice, Government and industry invest in strategic research projects to enable academic researchers to undertake relevant pooled and meta-analyses drawing on PCM and other data sources, to continue to build the evidence base and better understand the impacts of Offshore Wind Farms (OWFs) on environmental receptors. This investment could be through projects such as the Offshore Wind Evidence and Change Programme (OWEC), Pathways to Growth and ORJIP, or through established academic funding sources such as UKRI or CASE studentships. The UK's engagement in the Horizon Europe research programme could be identified as a potential resource for international collaborative research in this area.

1. Introduction

1.1. Closing the loop of post-consent monitoring data

The expansion of renewable energy is a key concern for the UK Government as part its drive for a clean energy future and aims to meet Net Zero greenhouse gas emissions by 2050. Wind – and particularly offshore wind – are central to this transition, with targets of delivering 50GW of offshore wind by 2030.

The new UK Government has indicated an intention to increase ambitions for offshore wind to 60GW by 2030.

To achieve this target, there is a need to increase the pace of deployment of offshore wind. Yet it is widely recognised that there is uncertainty in understanding and detecting potential impacts of offshore wind developments on environmental receptors, such as seabirds and marine mammals. Assessing the impacts of offshore windfarms (OWF) is challenging, requiring the use of data from multiple sources and the application of different modelling approaches to understand the complexity of processes in the context of the marine environment (Searle et al, 2023).

Uncertainty in understanding the environmental impacts of offshore wind can be a major factor in delays to consenting for offshore windfarms (Nicholson, 2024), as the UK's SNCBs and other consenting bodies are often unable to provide unequivocal views on a wind project's approvability (Searle et al, 2023), since a precautionary approach to consenting is required in the context of uncertain impacts.

PCM data, collected by developers as part of their licence conditions, could be used to help refine understanding of the impacts of OWFs, enabling estimates on the key input parameters for birds, such as collision rates, avoidance behaviour and displacement rates to be improved, and modelling tools to be validated for use in future assessments (Searle et al, 2023). Yet PCM data is widely considered to be under-utilised, with no requirement for data collected during post-consent monitoring to be integrated back into future project-based or cumulative assessments, with data from individual OWFs rarely feeding into others.

Barriers to the use of PCM data have been identified in recent reports including from the Office of Environmental Protection (OEP, 2023) and the Independent Report of the UK's Offshore Wind Champion (OWC), Tim Pick (Pick, 2023). More comprehensively, in 2014, the MMO undertook a review of PCM in offshore windfarms, drawing on evidence and data collected in windfarms in the UK, Belgium, Germany, Denmark and The Netherlands.

- The MMO review (MMO, 2014) already at this stage was recommending more standardisation of data collection and analysis, improved coordination and monitoring at a strategic level (rather than on an individual project approach) and emphasising issues about the need for good metadata standards and the challenges of large datasets.
- The OEP report (OEP, 2023) about the UK's environmental assessment more broadly identified three fundamental challenges resulting in poor performance overall i) data accessibility, ii) PCM and iii) evaluation/reporting, and access to necessary expertise. In relation to integrating PCM data in environmental assessment processes, the OEP report highlighted the shortage of skills and expertise (including challenges in recruiting and retaining experienced staff); the costs of undertaking post-consent monitoring; and a lack of enforcement (pp52-63), with the report emphasising that these challenges are well-recognised and not easy to fix.
- Shortage of skills and expertise is an issue strongly echoed in the OWC report (Pick, 2023), especially given the expansion of offshore wind development, with the workforce available for monitoring in relevant stakeholders, such as SNCBs, the Planning Inspectorate (PINS) and developers, not growing at the same rate. The OWC report highlights research projects such as the Planning Offshore Wind Strategic Environmental Data and Information Network (POSEIDON), the OWEC (Offshore Wind Evidence and Change) programme, and research undertaken by the Scottish Marine Energy Research programme (ScotMER) among many

initiatives working to understanding challenges and technical issues relating to the standardisation of environmental data gathered. The report also made recommendations for improving the functionality of databases such as the Marine Data Exchange (MDE) and PINS; to work towards common data collection standards across the UK; and to develop the MDE as a UK-wide national database for environmental data.

The **Closing the Loop** project, of which this report forms part, builds on previous studies, taking a multi- and interdisciplinary approach to understanding some of the challenges to ensuring better use of PCM data in the UK context, and seeking the 'close the loop' of data to improve environmental consenting. The Closing the Loop project recognises there are different issues involved: **procedural (e.g. policy, processes, and data availability**, often relating to decision-making processes and practices within institutions involved in the consenting process), **scientific**, which are technical and statistical, involving the evaluation of transfer of evidence, and **future** post-consent monitoring requirements for improving cumulative and project-based assessments.

The research in this report seeks to understand the key procedural barriers to closing the loop, to consider where barriers to better data accessibility and data use exist in the current context, and to be able to propose potential solutions or ways of working that could be implemented by different organisations. This report outlines findings of qualitative interviews undertaken with stakeholders representing key organisations in the consenting and monitoring stages of offshore wind, as part of the interdisciplinary "Closing the Loop" project funded by ORJIP through The Carbon Trust.

The report is structured as follows: section 2 outlines the research approach adopted in this study. Sections 3.1 and 3.2 outline our findings: section 3.1 addresses procedural issues relating to policies, processes and licensing identified that are relevant for closing the data loop and for feeding insights from PCM data into the evidence base for improving environmental assessment. Section 3.2 discusses issues relating to data, including data management frameworks and the need to ensure FAIR data standards. Section 4 then discusses some potential solutions, emphasising the need to work across the industry to co-develop better ways of working for improving the use of PCM data and reporting in assessment processes.

2. Research approach: stakeholder interviews

To understand the procedural barriers to closing the loop, our study adopted a qualitative approach, seeking depth of insight about internal processes within stakeholder organisations by undertaking semi-structured interviews with key stakeholder organisations in the UK offshore wind consenting sector.

The aim of these interviews was to engage with stakeholders to understand their current processes for using post-consent monitoring data, and discuss opportunities for overcoming challenges about the availability of data. Our research aimed to capture a detailed understanding of barriers to 'closing the loop' and potential mechanisms for resolving them. As such, our broad research questions are:

- What are the procedural barriers to (and opportunities for) 'closing the loop' of data within the UK offshore wind sector?
- What are the policies and processes that are preventing better use of post-consent monitoring data, and how could these be improved?

- What are the challenges with data availability, and how might these be overcome?
- What potential changes could be made to improve the use of PCM data?

2.1. Research methodology: qualitative interviews

Interviews are widely used in social science to enable in-depth discussion around a particular topic, (Knott et al, 2022) and are useful for gaining insight from experts (Döringer, 2021). **Semi-structured interviews** are developed with a set of open questions around key topics, while allowing space for the conversation to develop in different directions, and to ask follow-up questions. Whilst not all interviews are confidential, it is common for them to be so, and we have adopted that approach in this study, to enable interviewees to share openly, and draw on insights beyond their current roles.

2.1.1. Who did we interview?

Our research questions focused on the policies and practices about PCM data within regulatory and advisory organisations, and our interviewee sample was identified through a purposive sampling approach in conjunction with the Carbon Trust/ORJIP project steering group. Through this approach, the research team and steering group members identified potential interviewees according to their roles and responsibilities within relevant organisations in relation to PCM data. Interviewees included representatives of oversight managers, regulatory bodies, and SNCBs from across the different UK administrations, along with one consultant and one industry representative. Interviewees were approached during the summer of 2024 with an invitation to participate, with clear information about the nature and scope of the study. In total, ten organisations were represented in the interview sample, with one or two people representing each organisation (fifteen interviewees in total) (see

Table 1). One organisation opted not to participate in the research.

Examples of questions asked during interviews:

- How would you describe current policy & processes to using and managing post-consent monitoring data within your organisation?
- How would you describe the barriers in terms of data availability and data access, for integrating post-consent monitoring data in future environmental assessments?
- How would you describe the barriers or bottlenecks for integrating post-consent monitoring data in future environmental assessments?
- What would you change to enable better use & dissemination of post-consent data, if you were able to do so?

The intention of the study was to understand barriers and challenges within organisations with responsibilities for improving assessment approaches, and how those organisations apply legislation with respect to PCM data. Questions in our interview schedule (see Appendix 1: Interview schedule) focused on current policies and processes around post-consent monitoring data within organisations, particularly relating to how PCM data is used to feed back into advice for future environmental assessments. Further research with additional organisations with interests the development of offshore wind, including a selection of developers, consultants, environmental non-governmental organisations (ENGOs) and others involved in the collection of data from offshore windfarms, would provide insights as to the challenges faced by other stakeholders to closing the loop for PCM data.

Prior to beginning the study, the research proposal was reviewed by the Research Ethics Committee of the James Hutton Institute (reference: JHI-HRE-0261) to ensure the interviews would be conducted in line with good practice ethical research guidelines (see Appendix 2: Interview consent form and Appendix 3: Information sheet).

Interviews were undertaken online using MS Teams from July-September 2024, and lasted around an hour (mean interview length: 62 mins 21 seconds). Recordings were professionally transcribed, providing a total of 174 pages of transcription data.

These data were then analysed thematically using Lumivero's NVivo 12 software package (a qualitative data analysis software package) as a tool to support the analysis. The data were coded using a process of data reduction, coding and analysis (Halperin & Heath, 2017, 304-308), using a coding frame developed both deductively and inductively[1]. The data were systematically analysed against this coding frame, and then the content of each code was subsequently reviewed for consistency.

Table 1: Overview of interviewees

Interview number	Organisation represented	Number of interviewees
01	Statutory Nature Conservation Body (SNCB)	2
02	Regulator	2
03	Regulator	1
04	Statutory Nature Conservation Body (SNCB)	2
05	Consultant	1
06	Oversight manager	2
07	Industry	1
08	Regulator	1
09	Statutory Nature Conservation Body (SNCB)	2
10	Oversight manager	1

3. Findings

3.1. Procedural barriers to closing the loop

Our research sought to identify issues relating to policy, process, and data, that are relevant to overcoming barriers to better use of PCM data in environmental assessments. Overall, interviewees felt more could be done, internally within their institutional contexts, and across the industry, to overcome some of these

[1] Data from semi-structured interviews are often analysed both deductively and inductively. By deductive, the data are coded against pre-determined themes, in this project including 'policies'; 'processes'; 'data availability'; 'data accessibility'; and 'barriers'. By inductive, close analysis of the interview text by the researcher leads to the identification of additional themes, which are then created as new 'codes' for analysis (in this project, examples of inductive codes included 'solutions'; 'resource need' and 'data-to-evidence gap'). These codes overall form the 'coding frame' used to analyse the interview data.

barriers. Interviewees also highlighted that some of the challenges are long-standing, and will require significant staffing and/or financial resourcing to resolve.

Interviewees indicated that action is already being taken to try and improve processes and practices within and between organisations, highlighting improved communications between stakeholders, and initiatives underway to gather experts and evidence across the industry to understand the impacts of new evidence. Interviewees also outlined processes for evidence review, including internal networks, and regular contacts with colleagues across the UK. Similarly, interviewees emphasised other projects and initiatives either underway (such as Natural England's multi-year POSEIDON project, part of the OWEC programme) or currently in development, aiming to overcome some of the challenges of using PCM data. The development of the Offshore Wind Evidence and Knowledge Hub (OWEKH), another OWEC programme within The Crown Estate, is another avenue where improvements are being made to improve knowledge exchange try and close evidence gaps in the industry in relation to assessment processes.

As explained throughout this report, our research indicates that **some of the challenges in improving the use of PCM data are procedural or institutional**, and others relate to the **availability, findability, and usability of data already created**. However, interviewees indicated how, even if data are more easily accessible and usable, the need to analyse and interpret those data, and understand the impacts of such evidence beyond individual projects, is a key challenge that needs additional resourcing. Our research findings emphasise that the process of transforming **data to evidence to advice** needs robust input and evidence from multiple sources. The development of such evidence requires substantial resourcing and inputs from a wide range of experts.

3.1.1. Policies

Policy responsibility for offshore wind lies across UK Government and the Devolved Administrations. Within the UK Government, responsibility for energy policy lies with the Department for Energy Security and Net Zero (DESNZ); whereas other departments have responsibility for other areas of policy in England (Department for Environment, Food and Rural Affairs (DEFRA – environmental protection) and the Ministry of Housing, Communities and Local Government (MHCLG – planning policy); responsibility within the Scottish and Welsh Governments similarly crosses different directorates and departments.

Current legislation defines the roles and responsibilities of SNCBs, regulators, and oversight managers we interviewed. A comprehensive overview of current responsibilities can be found in the report **Closing the Loop – Synthesis of Evidence (D01)**.

- Oversight managers (The Crown Estate (TCE) for England, Wales and Northern Ireland and Crown Estate Scotland (CES) for Scotland) manage the seabed around the UK, and are responsible for issuing and approving lease conditions, a contract between the relevant oversight manager and developers or other customers, who lease the seabed. TCE and CES have recently committed to work together on further development of the Marine Data Exchange (MDE) as the principal repository for data from offshore wind in the UK, and are working with offshore tenants to ensure data are made available on the MDE in a timely manner, in fulfilment of leasing conditions.
- Government ministers in England, and ministers in the relevant devolved governments, issue licences for development of offshore windfarms.

- Regulators, in discussion with relevant Statutory Nature Conservation Bodies (SNCBs), provide advice to Ministers on what should be included in licences; and then are responsible for discharging the licences on completion of PCM reporting.
- SNCB roles include being statutory consultees, responsible for ensuring offshore wind developments are undertaken in line with environmental legislation; and for responding to evidence presented in applications for development. SNCBs have responsibility for Specially Protected Areas (SPAs). SNCBs also provide advice to regulators, Government, devolved administrations, and developers to inform decision-making; and issue guidance and advice around how developers should design, collect, analyse and present data in their applications for consent to build offshore windfarms.

The interviews for this study took place during the summer of 2024, shortly after a UK General Election, which resulted in a change of government in Westminster. As such, some interviewees were unable to comment on potential new policy initiatives under the new Government. However, in England, the Department for Environment, Food and Rural Affairs (DEFRA) is progressing plans for a strategic monitoring approach as part of the Offshore Wind Environmental Improvement Package. Staff in different UK administrations work closely together, but can take different policy directions. One interviewee described how government policy "*should set the vision and direction*" but, given the strong commercial context for the implementation of policy, industry partners should work to deliver that policy. It was also felt that changes to legislation were not necessarily the best approach to improve the use of PCM data and reporting, with opportunities instead for alternative policy delivery mechanisms to be considered, whether through the use of statutory instruments being developed under the Energy Act (2023) or other mechanisms, such as National Policy Statements (relevant to Nationally Significant Infrastructure Projects in England and Wales). Interviewees in different organisations emphasised their desire to **work across the industry** with developers and other experts, fostering an **enabling environment** and **implementing best practice to improve the use and management of data, including PCM data**, which should result in benefits on all sides (including that examination processes should progress more smoothly) rather than through legislative change.

3.1.2. Leasing and licencing conditions

Statutory deadlines at the pre-consenting/examination stage mean that the pre-consent stage dominates organisationally, as staff resource is prioritised to **meet these statutory deadlines, defined in current legislation.** The sheer volume of pre-consent documentation (potentially hundreds of documents) takes substantial resourcing for review and consultation. The **transparency built into the pre-consenting phase**, with documentation made publicly available once consent is awarded, is not replicated for the post-consent phase, resulting in PCM data being less accessible.

> *"I don't think it's the role of industry to be doing wider monitoring which should be being done elsewhere; if there's a direct benefit back to the industry then maybe they would be willing to contribute towards that. But… monitoring conditions need to have a reason to be on licenses."* Interview 07 – industry

In-Principle Monitoring Plans (IPMPs), included in pre-consenting documentation, are agreed with regulators, SNCBs and other relevant parties as part of the licencing process, with communication between SNCBs and developers about approaches to monitoring at that stage. **IPMPs are typically very high-level**, and the final details of these monitoring plans do not

need to be confirmed with the regulator until nearer the time that monitoring will be undertaken. This flexibility in the development of monitoring plans was considered a valuable opportunity to improve the scientific basis for determining what post-consent monitoring should be collected. IPMPs and the conditions and consents in the licence issued by the Minister are central to the development of full monitoring plans, but the **time lag between pre-consent approval of IPMP, and confirmation of that plan is often substantial**, during which time technological developments, as well as knowledge about a topic, may have changed. This time lag is of course substantially caused by the time taken to construct the windfarm. However, while welcoming the opportunity for input on proposed final monitoring plans, SNCBs interviewees commented they are sometimes asked to review final monitoring plans submitted at relatively short notice, with a **very constrained time period for consultation**. This situation can lead to challenges in further discussing or advising on proposed approaches (which may include newly developed methodologies that are unfamiliar or might collect data in a different way from previously) leading to poor design.

Overall, a number of interviewees were unsure about whether data were successfully or fully uploaded to relevant data management systems, even when licencing or leasing conditions require that data are uploaded. Access to some PCM reporting can be delayed by review processes; others by confidentiality concerns (see section 3.2.1). Interviewees representing the oversight managers of the UK seabed indicated that, while the exact wording of data clauses may vary slightly, a **standard data clause for seabed licencing** is used, which requires survey data to be provided on an ongoing basis to the relevant oversight manager. Communication and engagement processes are also being implemented to support developers to manage and deliver their data responsibilities in accordance with their lease conditions (see section 3.2). Due to technical, resource or staffing limitations by different actors in the chain, it appears that the expectation of uploading data to relevant repositories is sometimes not completed. One recommendation to 'close the loop' at this stage is to include a clause in contracts for data collection relating to delivery of data to relevant repository.

3.1.3. Determining monitoring requirements

Interviewees identified a need for a clear understanding and indication of the rationale behind which data are requested to be collected through PCM, and why those data should be collected i.e. what questions are surveys being required to answer? Interviewees emphasised that monitoring conditions need a reason to be included on licences, and for that reason to be clearly communicated. Such conditions should be 'reasonable,' 'necessary' and 'justifiable,' issued in a balanced manner, while making sure there is a potential benefit to the monitoring being requested and data are not just being collected for the sake of collecting data.

There were differing views on whether PCM should be undertaken at a more strategic level or whether the project-specific approach is sufficient, given opportunities to monitor particular issues raised within an environmental impact assessment. There was a sense that the current project-specific approach for PCM delivers a lot of reporting and data, some validating the impacts of offshore wind developments, but in some cases not definitively being able to attribute impacts clearly. Interviewees also suggested providing clarity about where PCM requirements are required for monitoring purposes broadly, potentially addressing particular issues within an environmental impact assessment, for example; and where they could be anticipated to contribute to 'the greater good', adding to the evidence base about OWFs in the marine environment.

Interviewees discussed some of the benefits of the regional approach currently implemented through Regional Advisory Groups in the Scottish context, although noted the administration load to establish and maintain such an approach is not insignificant. One interviewee highlighted that, rather than validating predictions made in environmental surveys, monitoring requirements should instead focus on learning from what impacts tell us, gathering data to enable improved understanding of the impacts of OWFs, and thus create better models and modelling on which assessments are undertaken. Relating to ornithology, this interviewee described the approach to assessment of collisions and displacement as "head and shoulders above everything else" as far as birds are concerned, yet neither of which is fully understood. They continued: "*We are getting towards a place where we might have an idea of how many birds, what sort of percentages might be displaced. But we still don't really understand what the consequences might be*." (interview 05 – consultant).

3.1.4. Discharging licence and leasing conditions

PCM reports are submitted to the relevant regulator for approval and sign-off. Consultation with SNCBs and others is part of that sign-off process, but the **discharge of licencing conditions is between the developer and the regulator**.

Interviewees described how **resourcing, funding and technical issues** can delay sign-off of reporting in relation to approving PCM reports. PCM reporting needs to be reviewed & signed off by relevant regulators, with the involvement of statutory consultees such as SNCBs, and capacity and/or resourcing challenges within these organisations can cause delays in discharging PCM reporting, and thus subsequently delay data uploads (especially if potentially contentious issues have arisen in the reporting). Interviewees also highlighted how delays in one project could cause a knock-on effect to other reporting. As such, the **review and discharge of some PCM reporting** is recognised as a current cause of delays in making data and reporting more publicly available.

Once reporting is signed off, organisations such as TCE and CES, as well as SNCBs and other organisations who could potentially make use of the reporting and data, are **not notified directly about successful discharge of licencing conditions** for a project or the **resultant expectation of data availability**. Notification of licence conditions being discharged thus currently relies on good relationships and contacts between stakeholders and developers. Additionally, while the MMO in England aims to publish reports on their public register, that register was developed as an internal case management system rather than an external-facing data repository. While it has an external-facing role for reporting, this is aimed at keeping a record of compliance with consenting conditions (as is the regulatory role), rather than to facilitate data availability, as would be expected of a public-facing repository. **Creating a register of reporting that is due**, and **improving communication between relevant stakeholders** about completion of reporting and/or where reporting is being delayed procedurally, could thus be another opportunity to close another part of the data loop.

3.1.5. Processes and mechanisms for reviewing guidance and advice

A number of formal and informal processes and practices are in place within and across organisations in the industry, for reviewing evidence and updating guidance. While the interviews were not exhaustive, the topics raised during interviews highlighted particularly relevant topics for discussion of PCM data.

3.1.6. Formal and informal processes for reviewing evidence

SNCBs issue advice and best practice guidance. SNCBs regularly review evidence, develop advice, and issue guidance notes around industry best practice. Although not obligatory, if developers and consultants do not follow such guidance, there is a higher risk of delay in the consenting process.

The SNCB representatives in our study described **internal processes** for reviewing new evidence on a regular basis, including internal and cross-organisation networks of knowledge sharing, and **longstanding practices of internal, inter-agency and cross-stakeholder networks** and workshops to share knowledge and review new evidence, and potentially develop new guidance. These processes draw on PCM and other reporting, commissioned evidence reviews and peer-reviewed academic publications, to create a robust evidence base for decision-making.

Staff also frequently participate **in project advisory groups for research** undertaken by a range of funders, with examples including (but not limited to) projects funded by ORJIP, OWEC and ScotMER. Many of the SNCB interviewees in our study described being in conversation with colleagues elsewhere in the UK, or with other relevant organisations, on a regular (often weekly) basis, and others described **connection with international networks** as useful resources as well. Some of these discussions are formalised, whereas others are more informal.

Internally, interviewees described processes including monthly network meetings for feedback and learning; information sharing practices connecting colleagues with new evidence and academic publications; and the development of new ways of working to help expand practices previously developed (when the industry was much smaller) to be able to deal effectively with the much-expanded industry today, and taking into account new patterns of increased hybrid working.

3.1.7. Updating guidance and advice

SNCB representatives in our study also described processes for updating guidance about environmental assessments, highlighting **practical issues where they work to manage the timing of releases for updates to guidance and advice**. These processes can be iterative, seeking to be **responsive to new insights** and learning from previous projects to feed that learning into subsequent projects, but also recognise that projects are at different stages of the consenting and post-consent processes, hence the SNCBs aimed to ensure consistency in the timing of **updating guidance notes to avoid causing complications for other developments in the assessment process**.

Interviewees also highlighted how updating of advice may take additional time due to the need to consult with colleagues (internally, and across the UK), or where more senior-level involvement and approval is necessary. If a suggested update is considered potentially more substantive or technical, where implications go beyond offshore wind to other areas or users of the marine environment, or where new guidance might be developed that diverges from practice in other UK administrations, it is likely to need **senior level consultation and sign-off**, including up to the level of Scientific Advisory Boards, or Board level, which takes time. Similarly, developing more formal positions on an issue, especially seeking to provide joint SNCB positions across different UK jurisdictions, takes time, due to the need to consult and seek signoff across different organisations.

While this study focuses on PCM data, interviewees emphasised how progressing knowledge about the impacts of OWFs for the assessment process relies on combining insights across multiple sources. Participants emphasised the value of programmes such as ScotMER, OWEC, ECOWIND, ECOFLOW, and

other academic research, as well as data collected by other actors such as ENGOs, and the need to have an open discussion around, and integrate outputs from, multiple projects. One interviewee suggested establishing existing OWFs as a 'test bed' for research, but acknowledged that would require permissions and access from developers, which may or may not be forthcoming. Interviewees also highlighted that other sectors have interests in, and responsibility for the marine environment, including through the Marine Natural Capital Ecosystem Assessment Programme (mNCEA) which means additional departments and teams might need to be involved in evaluating evidence and updating recommendations before it can be implemented, to consider the wider evidence and user base.

3.1.8. Resources and capacity

Many of the challenges identified relate to **resource and capacity limitations across stakeholders** that are limiting the ability to integrate PCM data into assessment processes.

Discussion around potentially adopting more **regional or broader-scale studies for post-consent monitoring also highlighted the necessity of staffing and infrastructure resource to make such approaches possible**. Participants also highlighted the time commitments required by multiple stakeholders in the governance of evidence review and data management systems.

> *"I think the resourcing bit is really key. The willingness is there, it's just the capacity"* (Interview 07 - industry)

While recognising current financial limitations, several interviewees pointed to prioritising staffing resource as an important part of closing the loop:

> "Q: What would you do to enable better use and dissemination of that post-consent data?
>
> A: *I would fund more posts in the regulators and the SNCBs. Ringfenced resource to do this job, because the capability and the knowledge is there, but there's just not enough people to go around to cover everything that needs covering.*
>
> *We've known for years we need to do a better job with post-consent monitoring. We need to close that feedback loop, make reviews happen more frequently in, in more real time; and everyone's bought into the idea. We just don't have the resource and capacity where it's needed to actually do that.".* (Interview 10, oversight manager)

Resourcing challenges are well-known and long-standing, and have been highlighted by previous studies. Additionally, interviewees shared insights from current projects such as POSEIDON, illustrating the substantial staffing, funding and technical resource being invested in overcoming some of the challenges. Importantly, the continued expansion of offshore wind capacity, and subsequent future increase in data and reporting for these new developments, means that without action, overcoming resource barriers to integration of PCM data will continue to be a challenge in the future.

Natural England's Best Practice Advice

Since 2022, Natural England has four best practice advice documents about how data and evidence are used in supporting the development of offshore wind farms and consenting in English waters, focusing on key ecological receptors (seabirds, marine mammals, seafloor habitats and species, and fish). These documents provide advice for baseline characterisation surveys, pre-application engagement, data and evidence expectations (at the application stage) and post-consent monitoring plans. As these documents are relatively new, their impact at the PCM stage is not yet being realised, but there are indications they are being adopted at the application stage.

The advice documents are considered 'live', with an intention to update them annually, to ensure consideration of the latest evidence while providing consistency on timelines for updating advice.

3.2. Data issues

Beyond policies and processes that impact the use of PCM data, issues relating to data, specifically whether data are FAIR (findable; accessible; interoperable; and reusable); data management frameworks (physical infrastructure; staffing resource to manage data and infrastructure supporting it) and concerns about commercial confidentiality or sensitivity were discussed in-depth throughout the interviews.

3.2.1. The lack of FAIR data

Several interviewees outlined concerns about the findability of data that have already been made publicly available, highlighting how key words searches on the MDE seem not to return relevant reporting, or how even project details does not necessarily lead to easy discoverability of PCM data and reporting, due to the lack of clear metadata, or the lack of usable search terms.

> *"If you don't know where it is, you don't know it exists at the moment"* (Interview 01 – SNCB)

Interviewees discussed different places where PCM data and reporting might be considered findable, including the website of the Planning Inspectorate (PINS) for England (where documentation is made public after consent is awarded); the MDE (established by TCE, and now a collaboration with CES); the MMO's public register (the public-facing side of its case management system), websites of Scottish Regional Advisory Groups (RAGs - for developments in the Forth & Tay and Moray Firth regions); developers' own websites; and MEDIN. As far as we can tell, these systems were predominantly not originally established as data repositories (with the exception of the MDE), instead working as databases and case management tools. Additionally, the variability and different ownerships of websites being used as data repositories could cause future challenges in data accessibility, especially beyond the lifetime of an organisation and its website.

While the MDE, established in 2013 by TCE, and working in partnership with CES since 2024, is becoming the focus as the main UK data management system, evolving methods of data collection and production, and requests and requirements on developers, mean that the role of the MDE has also evolved. Interviewees expressed support for ensuring standardisation of data and metadata formats, improving searchability, and ensuring that uploaded data and reports are managed in a manner consistent with good

scientific practice, such that they are FAIR. Interviewees pointed to the good practice of MEDIN in working to raise the standard and quality of metadata deposited there, and supported MDE's adoption of these principles. Subsequent to the interviews for this study, a recent report from the MDE (MDE, 2024), makes it clear that Q-FAIR principles (that data are Quality, Findable, Accessible, Interoperable and Reusable) and MEDIN discovery metadata standard and MEDIN data guidelines are being adopted.

As well as data availability, **having the right tools to extract data easily was highlighted as key to facilitating how widespread the use of data will become**, recognising that ease of use is key for maximising the benefits of data that has been created.

Interviewees also highlighted previous, ongoing and possible future research projects aimed at identifying and overcoming data gaps, and in some cases discussed how previous attempts at undertaking evidence review projects had struggled with completion due to challenges in data availability and accessibility.

3.2.2. Data ownership and availability

Data created through PCM are ultimately owned by the relevant developer which has paid substantial amounts for surveys to be undertaken. They are however gathered under marine licence, and once the PCM report is discharged by the relevant regulator, reports are made available as a public document; similarly, there is a stated intention within site leases for data to be provided to the relevant oversight managers, as such, there is a clear intention for data created through PCM to be made publicly available. When the creation and collation of data has been subcontracted to consultants or survey companies, contracts will likely ensure that data continues to be owned by the developer; consultants could not share data without permission, although they may be contractually required to store the data on behalf of a developer. **Developers and their subcontractors focus their reporting on fulfilling their licence requirements,** and once these have been fulfilled and discharged, uploading data to the MDE or other data repository may not be an immediate priority. Other potential delays or blocks to data being uploaded discussed during the interviews included that required data formats may have not been clear to subcontractors, or subcontractors may have concluded their contracts prior to PCM reporting being approved, and thus no longer available to support or undertake data upload.

One interviewee described how data collection undertaken by e.g. Digital Aerial Survey providers on behalf of developers (in fulfilment of licencing requirements), is undertaken as an agreement between the developer and the survey provider. There is often a requirement to store the data for a time-limited period (e.g. 5-10 years) but with no clear indication what should happen thereafter, resulting in data potentially being deleted by consultants and subcontractors when it could be used for longer-term analyses.

> *"After that ten years… I don't know that they or the developers know what's supposed to happen with that data. And so they are holding a lot of data. And that's obviously taking up a lot of space. And they don't know what to do with it at the end of it. There hasn't been a steer from anybody as to where that's supposed to go. And that's a lot of information […] in terms of post-consent monitoring, we maybe want to look at habituation. Or you know, those kind of longer-term trends and things like that. All that data that is maybe ten years old actually might be quite important."* (Interview 04 - SNCB)

Another respondent emphasised the staffing intensity of making data more easily available affects developers as much as the public sector organisations in the industry.

"And it's equally a real pain for them to go and—and time consuming for them - to go and find that data and make that data available […] If you're an offshore wind developer and somebody says, "Oh, can I have all your data on [topic]?" It's probably not that easy to just pull out and there's potentially a whole bunch of issues around sharing it," (Interview 09 - SNCB)

3.2.3. Concerns about commercial confidentiality

Concerns about **commercial confidentiality** or sensitivity of monitoring data were raised as a potential barrier to data availability. Acknowledging the limitations of our interviewee sample in terms of commercial representation (two of our ten interviewees were from industry/consultancy), respondents recognised that information and data relating to operations (i.e. financial and operational documentation) is commercially sensitive, but differed in their views whether ecological monitoring data about biodiversity receptors would be commercially restricted. Some interviewees indicated that monitoring data typically would not contain commercially sensitive data, while others were more hesitant, given that such data might reveal unfavourable information about the impacts of a windfarm, or could impact a different project's consent process.

Some interviewees felt that developers can be reluctant to share any project-specific information because of potential commercial sensitivities. Indeed, with different offshore wind projects at different stages of market development, one interviewee wondered whether decisions about openness to data sharing are made in boardrooms, rather than the operational level, given the substantial costs of data collection and analysis, and potential benefit to competitors of releasing data. It was felt that allowing a delay to publication of such data can help alleviate commercial confidentiality concerns, while still ensuring the data are delivered in a timely manner.

Some interviewees suggested developers may have concerns about how the data provided for upload (and thus wider access) might be used, and/or whether further analysis might reveal negative findings that could damage reputations, even if causation is not clearly established (e.g. are measured impacts on receptor populations being detected because of the impacts of an offshore wind farm, or is the potential cause of impact another factors (in-combination impacts, in relation to seabirds), such as climate change?).

> *"Is that sharing your raw survey data? Is it sharing the analysis reports that went alongside that? … And then what would that actually be used for?"* (Interview 07 - industry)

To address these concerns, it was felt that demonstrating the benefits of sharing data from post-consent monitoring to developers, and of being specific about what data is being requested and for what purpose, should be emphasised.

"*I think selling the benefits of it is probably something that needs to be done… Something that I've wondered is whether there are examples of case studies of where post-consent data has been used to… reduce uncertainty or what have you, and if that helps make the case for why there should be a focus on sharing it*." (interview 8 - Regulator)

"*There's another benefit from sharing the data as well. Longer-term. Because we know the marine environment isn't as well understood or surveyed as the terrestrial environment. We know after this round, there will be future rounds. At the moment, the onus is on individual developers to collect data. But the site selection for planning is quite a key consideration that*

> *I don't think people make that link back to. And the more understanding we have and the more data there is to inform it, the better site selection in the future could be."* (Interview 04 - SNCB)

Other interviewees discussed the potential insights that could be gained from collating and reviewing evidence across different projects, potentially working through an intermediary organisation (e.g. a cross-industry body) to aggregate returns from individual projects, if revealing project identities is a concern.

3.2.4. Providing support for uploading data

Oversight managers representatives we spoke with described a process of ongoing engagement created to support developers to meet their data requirements. Developed partly in response to the 2023 report from the OWC (Pick, 2023) which encouraged TCE and CES to work together on data, these processes are relatively new, and thus not yet in operation in regard to PCM data, but are being implemented at the pre-consent stage. These processes include collaborating to match polices on data collection and publication, as well as ongoing engagement with developers to provide practical support and clarity about expectations regarding data management and upload, to ensure relevant data are uploaded in a timely manner. These processes also seek to address concerns about data confidentiality.

The oversight manager representatives in our study outlined their commitment to working with developers on agreeing timescales for making data publicly available in a timely manner. Seeking to act as '*a responsible data curator*,' interviewees outlined clear data policy guidance (MDE, 2024) which includes an aim to publish data they receive as part of leasing conditions, but engagement to reach agreement about what and when to publish data, considering commercial considerations, where relevant:

> *"The organisation will aim to publish all data. However, all uploads are initially confidential, and then reviewed for release to the public when certain confidentiality gateways are met, based on the theme of the submitted data, the phase of the project, and agreement with the supplier."* Interview 06 – oversight manager

"The Crown Estate and Crown Estate Scotland understand that confidentiality is a key concern surrounding data that has been collected at significant cost. When data is delivered to the MDE, it is held confidentially until a decision to publish it is made. However, all data has a confidentiality shelf life and once it has served its original purpose there are many benefits that can be realised by making it publicly available."

("Providing Data to the Marine Data Exchange" p.5. Sept 2024, Marine Data Exchange)

3.2.5. The need for common data and metadata standards:

Discussions around agreeing common standards for data and metadata emphasised issues such as the need for greater standardisation, and particularly that data and metadata are prepared and developed in a manner that is consistent with **FAIR principles.** Many interviewees expressed support for more standardisation – as long as such standards are developed in a manner that includes actors across the industry, and ideally should also draw on international experience, with interviewees pointing to work undertaken by Tethys in the US, and the Dutch Offshore Wind Ecological Programme (WOZEP) which one interviewee highlighted as having an interesting model with "fairly prescriptive" data standards. Comparison was made by one interviewee with the Oil & Gas industry as a mature industry with more standardisation. While not wanting to prescribe data formats, oversight managers are engaging with their

clients and working to emphasise the importance of adhering to MEDIN metadata file standards, intending that that MEDIN metadata can then direct users to the data that itself sits on the MDE.

3.2.6. Data issues - storage and data management structures

Making PCM data more accessible and available for use relies on **physical and infrastructure needs for handling the large volumes** of data being created now, and in the future, given the scale and pace of development of the industry. While this limitation has clear resourcing implications, interviewees emphasised the importance of a resilient data storage infrastructure, especially given continued technological developments and potential changes in data formats. There is a sense already that existing data require substantial amounts of storage space, as one interviewee described:

> *"We don't have the resources to tackle this issue right now, but we are aware it's an issue. We're aware we need to tackle it. We just haven't quite figured out how to do it with the resources we have available right now, and the technology we have available; not just capital, but human resources, the ongoing operation, maintenance of it."* (Interview 02)

One current challenge relates to the **different infrastructures** currently used to try and track and/or hold different types of data and reporting. The MDE is increasingly being recognised as an important **data management system**, and with CES having recently joined in partnership with TCE on the MDE in relation to developments in Scottish territorial waters, oversight managers are working hard to engage their tenants in making data available for upload to the MDE. It was however established as a repository and not a database.

However, interviewees also discussed how some Scottish PCM data is held on the **websites of the two RAGs** and were unsure as to whether these websites would suffice as long-term storage options; other interviewees referenced the **MMO's Public Register**, which is principally as a case management tool for the MMO, rather than a data repository (indeed, some reporting is potentially on the MMO register but not yet the public-facing side of that register, as it is awaiting sign-off).

Developments made by MEDIN, and particularly the facility to issue DOI registrations (Digital object identifiers, a permanent weblink for referencing data) and its requirements for FAIR data were recognised as important for improving access to available data, with participants emphasising that data management structures are necessary both to store data, but also to enable data to be used – i.e. that it is possible to extract data from repositories for further analysis. Additionally, the role of data managers, and potentially ringfencing resource for such roles, was proposed by some interviewees as part of the potential solution.

> *"Maybe it's a case of making existing systems more robust and agile to adapt to new processes. And to foster that collaboration as well; because you don't want it to be that for every new technology, you have to create a whole new data repository because the data doesn't match. And that then makes it very difficult. I guess it's about making a clear path to make collaboration easy and to not make it a burden."* (Interview 03 - regulator)

3.2.7. Data-evidence-advice gap

The issue of translating data into evidence, and reviewing that evidence so it can be considered for updating guidance for impact assessments, was highlighted as clear challenge, in what we are describing as the '**data-evidence-advice gap**'. Interviewees we spoke with emphasised the importance making sure to ask 'so what?' of PCM reporting. Moving from data-evidence-advice thus requires an overview of why monitoring is being required of developers; but also, the time and capacity to ask "what does this mean?".

> *"We're not doing a good enough job of learning from experience, of pulling that knowledge gained from the monitoring and seeing what actually happens in practice and feeding that through into subsequent impact assessments and consent decisions"* (interview 10 – asset manager).

One of the major challenges for improving the use of PCM data discussed during interviews is the challenge in moving from gathering data and receiving the PCM reports; to analysing those data to provide evidence; and understanding the implications of that evidence for improving the assessment system.

Monitoring reports are the common currency, rather than the raw data, and some of the SNCB interviewees indicated that access to the raw data could help them further analyse the data and gain insights about what is being reported. In most cases, people we spoke with emphasised that even if they did have access to the raw data, additional steps are necessary to be able to use and understand those data. While one interviewee advised caution about whether there really are substantial amounts of data available (suggesting the amount of monitoring work to date was at a lesser scale than might be expected), overall there was a strong sense that the volume of data that could be accessed and analysed is itself a barrier to closing the loop.

Responsibility for updating advice currently lies with SNCBs. Yet the process of turning data from PCM (and other sources) into evidence, and then subsequently into guidance, draws on the expertise and knowledge of multiple stakeholders and networks, both in the across UK and internationally.

The distinction between data, evidence and advice is important for closing the loop: the issue of FAIR data has been addressed and physically links with data management structures such as the MDE and MEDIN. But the translation of data to insights and evidence that can then be used by SNCBs in updating their advice falls across and between multiple stakeholders with different areas of responsibility, expertise, and interest.

While interviewees indicated that ensuring the better understanding and use of PCM data is a collective, industry-wide responsibility, there are currently no clear lines of responsibility in relation to PCM data beyond fulfilling leasing or licencing conditions, and no clear indication of which organisation(s) should be tasked with – and resourced for – closing the PCM loop.

3.2.8. Raw data, reports, and peer-reviewed publications

One of the challenges in gathering evidence and updating advice is the need to **review data across multiple projects and data points**, and **ensure evidence is robust**. Networks described above can help with that process, as does connection with international initiatives, including the Dutch WOZEP and US Tethys programmes.

Peer-reviewed academic publications, often drawing on multiple evidence sources (not just PCM) and international collaborations, were considered a **robust evidence source**, more so than so-called 'grey literature', where there is more discussion of post-consent monitoring, but which is not peer-reviewed.

Peer-review publications are seen to provide in-depth understanding of the impacts of OWFs on ecological habitats, but can involve **lengthy periods of time to publication,** and some of the knowledge and expertise around PCM data is held by consultants, who may have contractually limitations that do not allow time for developing peer-review publications, or to consolidate data across multiple sources.

> "*The reality of this stuff is it's slow. And that it would be to me the biggest hurdle. Because offshore wind, since I started working on it more than fifteen years ago, has progressed at a pace way faster than the evidence loop can keep up with. And so we are advising on the next project before we know what the impacts of that project were and whether they were greater or less than predicted. […] for a lot of these things it's several years between the point of data collection, and the point at which [those] more widely beyond the organisation that collected it, actually have the opportunity to consider those data*." (Interview 09, SNCB)

SNCB representatives suggested that academics could improve the usability and applicability of their research findings by being clear about limitations of studies and transferability of findings for other contexts within publications. Additionally, one interviewee felt there was a role for those commissioning research to be more specific about the potential outputs of research projects, to ensure that intended research products are clearly defined including e.g. providing advice for updating guidance being required as part of the research process, thus going beyond a research report (which is then left with the commissioning organisation to understand the wider implications or potential use of such findings).

> "*Consensus is really hard to reach because naturally, as soon as you put people in, people have different views and opinions. But how you can step towards a vague form of consensus is by building an evidence base that is robust, that stands up to scrutiny. Then you have someone that goes, "I disagree with you," and you go, "Okay, show me the evidence to back up your perspective and I can interpret and interrogate that evidence", and if that evidence is robust, then you can bring yourselves together towards consensus. And that is what we're trying to do here […] We have to have evidence to back it up. It must be evidence-based. And we're happy for people to have different views because that means we can look at it from different angles and ensure that robustness of the science*" (Interview 02 – regulator)

4. Working together for potential solutions

Given the importance of the offshore wind industry as part of accelerating Net Zero, improving knowledge to understand the actual impacts of OWFs could help streamline consenting processes, improving our ability to build windfarms as an energy source.

Interviewees suggested a range of priority areas they felt should be addressed to overcome barriers to the use of PCM. Some of these potential solutions have previously been identified, or are well-known within the industry, and many will require additional resource, they offer opportunities for action and a sense that progress on some of these issues can be key to change.

- There was widespread recognition of the need to **work together across the industry** on solutions, and that any recommendations from this study or other research needs industry-wide buy-in for successful implementation.
- There is an opportunity for a central, or more **coordinated approach for oversight of PCM, including clarity about roles and responsibilities** for PCM. Such coordination could include creation of a **system for sharing information** about expected timing for PCM across the sector (and on a UK-wide level), and better communication between relevant stakeholders about when reporting has been signed-off and data uploaded. This role could be coordinated by OWEKH, using expert groups for strategic oversight, and distribution lists for dissemination of information to wider stakeholders.
- Some interviewees suggested creating an **annual review cycle** to consolidate knowledge about what has been learned from monitoring over the past 12 months, and consideration of the implications of such learnings for advice and guidance. While interviewees were keen to avoid establishing another working group, there was broad support for working within existing structures and institutions to enable this function. Suggestions included creating a **short annual summary report outlining what has been learnt from monitoring in the past 12 months,** in a format that can be widely and easily distributed; or **an annual workshop, specifically addressing PCM**.
- The developing role of the Offshore Wind Evidence and Knowledge Hub (**OWEKH**) was considered an opportunity for more coordinated overview of insights about PCM (albeit interviewees were hesitant to specify responsibilities for an organisation beyond their own). Some interviewees suggested an OWEKH Community of Practice in relation to PCM could be implemented. OWEKH's joint governance system (including government and industry co-chairs) was considered important in establishing trust across the industry, and its developing position as a hub for knowledge exchange (rather than a data repository) having potential for addressing some of the challenges in translating data to useful evidence and knowledge for the industry.
- There was support for **posts in regulators and SNCBs to be ring-fenced and resourced** (and worth noting that these comments came from interviewees not based within SNCBs), to enable evidence review to be more efficiently processed and fed back into the system; the role of **Data Managers** was also highlighted as needing additional support and resource, to help facilitate better management of, and access to, PCM data.

> *"If we want to maintain seabird populations going forward, we need to be making these decisions on the best available evidence… it's not a future problem: it's a now problem in terms of where those populations are going…"* (interview 04 – SNCB)

- As discussed in section 3.2, action to ensure resilient and robust data management frameworks is vital to ensure long-term storage and access to data. There was clear support that such frameworks should operationalise FAIR data principles, and ideally that they should work with nationally and internationally agreed metadata standards, to ensure data really are reusable.
- A suggestion was also made that **contracts for data collection** could include a **clause relating to data delivery to a relevant data repository**, to improve processes to uploading data to repositories.

- Another suggestion was for better clarity from those undertaking evidence reviews and other research about implications, limitations or recommendations from research findings. This was suggested to apply to academic research projects as well as in response to commercial tender requests from SNCBs. In the case of commercially tendered research, it was suggested that tenderers be more specific about required outputs, including clarity of implications for updating guidance, or even requiring updated guidance as a project output.

- Other interviewees highlighted opportunities for **strategic or regional monitoring** at the post-consent stage, rather than the current single-project approach, which was described as 'piecemeal' by one interviewee. It was felt that such a strategic approach would increase the spatial coverage of datasets and enable monitoring to be undertaken at a larger scale, albeit such an approach would require existing OWF developers to be willing to make their windfarms available for more research projects, despite that they will have completed PCM requirements.

- A suggestion was made that developers be required to pay into a central fund to support such strategic monitoring as a way to increase consistency and broaden the scope beyond what individual projects are, or would be able to collect, with an associated independent body that could be tasked with feeding evidence back into decision-making; other interviewees however highlighted how such an approach would require substantial infrastructure and investment to realise.

> *"I guess it's almost that it's too piecemeal. I think, because these monitoring conditions are always tied to individual projects, it means that you end up doing lots of small things. And actually, what we probably need is fewer big things…" (interview 05 – consultant)*

- Some people we spoke with highlighted the **Regional Advisory Groups** that were seen to be functioning well in the Scottish context as a potential model for wider implementation, albeit others expressed concern about the resource needed to manage such groupings, and whether the model could be feasibly replicated with the rate of expansion of the offshore wind industry.

In conclusion, our study has highlighted a range of challenges for improving the use of PCM data and reporting in environmental assessments experienced by experts working in the offshore wind sector. While some of the constraints relate to resourcing limitations, the continued expansion and importance of the offshore wind sector to the UK means that it is important that these limitations are addressed. The interviewees in our study also outlined potential solutions where action could be taken within existing networks and framework, to improve access to, and gain additional insights from, PCM data and reporting.

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Appendix 1: Interview schedule

Interview schedule:

Introductions & housekeeping (consent form; funder; project context; recording interview).

To start with, can you briefly introduce yourself, and your role and responsibilities within your organisation?

Context:

- As discussed, we're interested in how the decision-making processes around assessments currently operate in relation to the use of post-consent monitoring data, and potential mechanisms for adapting these processes.
- Thinking about data from post-consent monitoring… can you describe current policy & processes to using and managing post-consent monitoring data within your organisation?

Current processes:

- And building on that - related to the policy and processes for using and managing post-consent monitoring data, what do you feel are the key procedural issues internally that we should be aware of when thinking about developing a framework to I kmprove the use of data in assessments?
- How would you describe the barriers in terms of data availability and data access, for integrating post-consent monitoring data in future environmental assessments?

Data availability & access barriers:

- And relating to data availability - what is missing, or could be improved up in your organisation, to help close that data loop?
- In relation to post-consent monitoring how would you describe roles and responsibilities between organisations involved in the consenting process?
- Overall, what do you consider to be the key bottlenecks, in terms of delivery of post-consent monitoring?
- And how might these bottlenecks be overcome?

Wider perspective:

- If you were in charge, what would you change to enable better use & dissemination of post-consent data?
- Is there anything else you think we should be aware of regarding the use of post-consent monitoring data within your organisation?

Appendix 2: Interview consent form

RESEARCH CONSENT FORM – please return to [name, email]

Participant Identification Number:

Title of Project:	Closing the Loop – feasibility study to determine a feedback approach for post-consent monitoring to reduce consent monitoring risk in future assessments
Principal Researcher:	[name]
Study Number:	[number]

Please Initial Box

I have read (or had read to me) and understand the information sheet for "CLOSING THE LOOP." I have had the opportunity to ask questions, and these have been answered clearly.	
I understand that my participation in this interview is voluntary, and I am free to withdraw at any time, without providing any reason, and without my legal rights being affected.	
I understand the study is being conducted by researchers from The James Hutton Institute and partner organisations, funded through The Carbon Trust/Offshore Renewables Joint Industry Programme (ORJIP).	
I understand that taking part in the study will involve being interviewed and I understand that the interview will be recorded (on MS Teams) and transcribed.	
I understand and agree that my words may be quoted in publications, reports, and other research outputs in anonymised format (e.g. 'an industry representative' 'SNCB representative').	
I agree that my personal contact details can be retained in a secure database so that the researchers can contact me about future studies.	
I agree to being contacted at a later date in relation to this or other relevant studies.	
I confirm that I have read and understood the privacy notice (please see next page).	

Your name: (please print) Signature: Date

Researcher Name (please print) Signature: Date

Privacy Notice

The James Hutton Institute ("Hutton", "us" or "we") will use your personal data for the purposes of the research undertaken in the project 'Closing the Loop in accordance with our privacy notice at https://www.hutton.ac.uk/privacy-notice. The James Hutton Institute is a data controller for the data collected in this study.
This project is part of a project funded by the Carbon Trust/Offshore Renewables Joint Industry Programme.
Personal data will be retained for a period after the completion of the project. We will store data for a maximum of 5 years. Our main privacy notice will explain what we do with personal data in more detail as well as your rights.
If you have any queries about your personal data, you can contact our Data Protection Officer [name]

Researcher contact details:
[name]
The James Hutton Institute
Craigiebuckler, Aberdeen
AB15 8QH

Email: [email address]

Telephone: [tel number]

Appendix 3: Information sheet

CLOSING THE LOOP: PARTICIPANT INFORMATION SHEET (21 June 2024)

Feasibility study to determine a feedback approach for post-consent monitoring to reduce consent monitoring risk in future assessments

You are being invited to take part in research about the barriers and potential solutions of incorporating post-consent monitoring data back into the consenting process for offshore renewable developments, thereby 'closing the loop' as part of the wider adaptative management paradigm.

WHAT ARE THE AIMS OF THIS RESEARCH?

In the offshore wind sector, developers are typically required to conduct post-consent monitoring of offshore wind farm impacts as part of their licence conditions. This task is costly, and can be challenging to implement. Yet this data and lessons learned are invaluable to the further development of the industry; using these data effectively could reduce uncertainty in the consenting process, and be crucial in the context of cumulative assessments, where the large numbers of projects will typically translate into high levels of uncertainty, and where impact estimates for a development will be used repeatedly across multiple environmental impact assessments and appraisals.

As part of a wider project to understand the institutional, technical, scientific and statistical challenges to 'closing the loop' of post-consent monitoring data, we are undertaking research with key institutions involved in the consenting process and in establishing requirements and standards in relation to post-consent monitoring data. Findings from this research will inform the development of a strategic framework, relevant across devolved administrations, for improving the use of post-consent monitoring data, and will lead to recommendations on how post-consent monitoring data can be integrated into the environmental assessment process.

We will be discussing questions such as: what are the procedural barriers to 'closing the loop' (e.g. relating to policy, process, and data availability/access) – and what are the internal complexities within different institutions that are part of the challenge? How do the decision-making processes around assessments currently operate in relation to the use of post-consent monitoring data, and what are the potential mechanisms for adapting these processes?

Post-consent monitoring is a broad term, but for the purposes of this study, we include data collected post-consent, whether pre-construction, during construction, or post-construction. The primary, although not exclusive, focus, is on project-level data collected by developers as a requirement of licensing conditions.

WHO IS FUNDING THE PROJECT?

This research is funded by ORJIP – the Offshore Renewables Joint Industry Programme.

WHO IS INVOLVED?

The project team is led by [name], Strategy & Development Lead for Offshore Renewables at BioSS (Biomathematics and Statistics Scotland), and includes colleagues from the James Hutton Institute,

UKCEH, ABPMer, SMRU Consulting, the University of St Andrews and SEFARI Gateway. The lead researcher for this part of the study is [name], Senior Social Scientist at the James Hutton Institute.

WHY HAVE I BEEN INVITED TO TAKE PART?

You have been invited to take part as a representative of an organisation with a key role in the consenting process of offshore wind in the UK. We acknowledge that we cannot cover everyone or everything, but are keen to gain a rapid, in-depth understanding of each organisation's processes and challenges.

WHAT WILL I BE ASKED TO DO?

We would like to invite you to an MS Teams meeting lasting approx. 60 minutes. No preparation work will be necessary. The interview will be led by [name], a social scientist at the James Hutton Institute, alongside another colleague from the project team.

If you give permission in the consent form, the interview will be video recorded (in MS Teams) to allow the researchers to focus on the conversation and ensure an accurate record of the discussion. The recorded interview will only be available to the research team and a professional transcriber, all of whom are bound by relevant data privacy and confidentiality agreements. We will not use your name or identify your organisation in any outputs or reporting.

HOW WILL MY DATA BE STORED?

Any personal information will be confidential and will only be seen by the research team and transcriber. The interview will be sent to a professional transcriber via a secure file transfer system. The interview data will be used to inform our research and develop presentations, reports and academic publications. Your information will be stored securely on Hutton systems for no longer than 5 years.

DO I HAVE TO TAKE PART?

No. Participation is voluntary and you can withdraw from the study at any point without giving reasons and without any negative consequences.

HOW CAN I WITHDRAW FROM THE STUDY?

If you wish to withdraw from the study, please contact [name, email]. Please note, it will be difficult to remove data after analysis of the interview data has begun, so please contact us within two weeks of your interview if you do wish to withdraw from the study.

WHAT ARE THE BENEFITS OF TAKING PART?

By taking part, you will be contributing to the development of a strategic approach for 'Closing the Loop' aimed at identifying and resolving barriers to the use of post-consent monitoring data to improve assessments, thereby reducing consent risk. There will be an additional opportunity for involvement in a feedback workshop about the proposed approach (currently planned for spring 2025).

ETHICAL REVIEW

The project has been reviewed by the Research Ethics Committee of the James Hutton Institute. If you have any concerns about the way in which the project has been conducted, or you wish to make a complaint, please contact [email].

FURTHER INFORMATION

If you have any further questions, please contact [name, email].

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