Agreement on the Conservation of Albatrosses and Petrels

Joint Twelfth Meeting of the Seabird Bycatch Working Group and Eighth Meeting of the Population and Conservation Status Working Group

Lima, Peru, 8 August 2024

Making A Start - ACAP Best Practice Advice Toward Prevention of Offshore Wind Farm Seabird Impacts

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SUMMARY

The potential risks to seabirds from Offshore Wind Farm (OWF) developments in the Southern Hemisphere have previously been outlined to Parties (SBWG11/PaCSWG7 Doc 03, Inf 01 and 09). Consequentially, the issue was added to Advisory Committee Work Programme in May 2023 (AC13 Doc12 Rev1 agenda item 12.1.5). The Advisory Committee adopted three Working Group (WG) recommendations, including to recognise the potential adverse effects of OWF infrastructure on albatrosses and petrels, undertake research and share knowledge.

While these are important steps in gaining improved understanding of issues associated with OWF impacts on seabirds, OWF developments are beginning to roll out at scale, and the rate of development is likely to accelerate as the world increasingly recognises the need for a rapid transition to renewable energy. Impacts on seabirds arising from the inappropriate siting and/or operation of OWFs will continue for decades. Given the existing poor conservation status of many seabird populations and their high susceptibility to existing threats, a large, new source of industrialisation in seabird habitat with new impacts should be considered a significant population risk.

As a result, there is an urgent need to develop Best Practice Advice (BPA) on measures to avoid to the maximum extent possible, and then mitigate any remaining, impacts from OWF on seabirds. BPA will need to be adapted to local conditions but should be based on a common set of principles to inform assessment of OWF suitability. Recognising the current low knowledge base on how direct and ecosystem scale impacts will play out in the southern hemisphere, BPA on the minimum requirements, assessment and implementation of OWF will necessarily need to be precautionary and reviewed and updated regularly as new information becomes available.

RECOMMENDATIONS

That the Joint Seabird Bycatch Working Group and Population and Conservation Status Working Group:

1. Agree to develop principles that Parties should use to inform Offshore Wind Farm proponents about measures required to avoid and mitigate seabird impacts and give consideration to the principles proposed here.
2. Agree to develop Best Practice Advice for the minimum design and operational parameters and environmental impact assessment requirements for Offshore Wind Farm proposals.
3. Recommend that the Advisory Committee adopt the finalised principles and Best Practice Advice and provide these documents to the Parties.
4. Recommend that the Advisory Committee provide the adopted principles and Best Practice Advice to all other entities involved in Offshore Wind Farm developments in the southern hemisphere.

Un punto de partida: Recomendaciones de mejores prácticas del ACAP para la prevención de impactos de parques eólicos marinos en las aves marinas

RESUMEN

Los posibles riesgos para las aves marinas derivados de los desarrollos de parques eólicos marinos en el hemisferio sur se han esbozado previamente a las Partes (SBWG11/PaCSWG7 Doc 03, Inf 01 y 09). En consecuencia, la cuestión se añadió al Programa de Trabajo del Comité Asesor en mayo de 2023 (CA13 Doc12 Rev1, punto 12.1.5 de la agenda). El Comité Asesor adoptó tres Recomendaciones de los Grupos de Trabajo (GdT), entre ellas la de reconocer los posibles efectos adversos de la infraestructura de parques eólicos marinos en albatros y petreles, realizar investigaciones y compartir conocimientos.

Si bien estos son pasos importantes para obtener una mejor comprensión de los problemas asociados con los impactos de los parques eólicos marinos en las aves marinas, estos desarrollos están comenzando a implementarse a gran escala, y es probable que el ritmo de desarrollo se acelere a medida que el mundo reconozca cada vez más la necesidad de una transición rápida a la energía renovable. Los impactos en las aves marinas derivados de la ubicación o el funcionamiento inadecuados de los parques eólicos marinos continuarán durante décadas. Dado el deficiente estado de conservación de muchas poblaciones de aves marinas y su alta susceptibilidad a las amenazas existentes, una nueva gran fuente de industrialización en su hábitat con nuevos impactos asociados debe considerarse un riesgo poblacional significativo.

En consecuencia, existe una necesidad urgente de desarrollar Recomendaciones de Mejores Prácticas sobre medidas para evitar lo más que se pueda el impacto de los parques eólicos marinos en las aves marinas y luego mitigar cualquier impacto restante. Las Recomendaciones de Mejores Prácticas deberán adaptarse a las condiciones locales, pero deben basarse en un conjunto común de principios en los cuales basar la evaluación de la idoneidad de los parques eólicos marinos. Reconociendo la escasa base de conocimientos actual sobre cómo se desarrollarán los impactos directos y a escala de los

ecosistemas en el hemisferio sur, las Recomendaciones de Mejores Prácticas sobre los requisitos mínimos, la evaluación y la aplicación de los parques eólicos marinos tendrán que ser necesariamente precautorias, y revisarse y actualizarse periódicamente a medida que se disponga de nueva información.

RECOMENDACIONES

Que el Grupo de Trabajo Conjunto sobre Captura Secundaria de Aves Marinas y sobre Población y Estado de Conservación tome las siguientes medidas:

1. Acordar el desarrollo de principios que las Partes deben utilizar para informar a los proponentes de parques eólicos marinos sobre las medidas necesarias para evitar y mitigar los impactos en las aves marinas, así como tener en cuenta los principios aquí propuestos.
2. Acordar el desarrollo de Recomendaciones de Mejores Prácticas para los parámetros mínimos de diseño y operación, así como para los requisitos de evaluación de impacto ambiental para las propuestas de parques eólicos marinos.
3. Recomendar que el Comité Asesor adopte los principios y las Recomendaciones sobre Mejores Prácticas finales y que facilite estos documentos a las Partes.
4. Recomendar que el Comité Asesor proporcione los principios adoptados y las Recomendaciones sobre Mejores Prácticas a todas las demás entidades involucradas en el desarrollo de parques eólicos marinos en el hemisferio sur.

Prendre son envol - Conseils de l'ACAP en matière de bonnes pratiques pour la prévention des impacts des parcs éoliens en mer sur les oiseaux de mer

RÉSUMÉ

Les risques potentiels pour les oiseaux de mer de l'exploitation de parcs éoliens en mer (PEM) dans l'hémisphère Sud ont déjà été présentés aux Parties (SBWG11/PaCSWG7 Doc 03, Inf 01 and 09). La question a donc été ajoutée au programme de travail du Comité consultatif en mai 2023 (CC13 Doc12 Rev1, point 12.1.5 de l'ordre du jour). Le Comité consultatif a adopté trois recommandations du groupe de travail, notamment : reconnaître les effets négatifs potentiels des PEM sur les albatros et les pétrels, entreprendre des recherches et partager les connaissances.

Ces étapes sont, certes, importantes pour mieux comprendre les problèmes associés aux impacts des PEM sur les oiseaux de mer, mais ces infrastructures commencent à se déployer à grande échelle, et le rythme de leur développement est susceptible de s'accélérer à mesure que le monde prend conscience de la nécessité d'une transition rapide vers les énergies renouvelables. Les impacts sur les oiseaux de mer découlant d'une localisation inappropriée et/ou de l'exploitation des PEM perdureront pendant des décennies. Compte tenu du mauvais état de conservation actuel de nombreuses

populations d'oiseaux de mer et de leur forte vulnérabilité face aux menaces existantes, cette nouvelle source importante d'industrialisation de leur habitat, associée à de nouveaux impacts, doit être considérée comme un risque important pour les populations.

Il est donc urgent d'élaborer des conseils en matière de bonnes pratiques sur les mesures à prendre pour que les impacts des PEM sur les oiseaux de mer puissent être évités autant que possible, ou atténués lorsqu'ils ne sont pas évitables. Ces conseils en matière de bonnes pratiques devront être adaptés aux conditions locales, mais basés sur un ensemble de principes communs pour mieux déterminer le bien-fondé des projets de PEM. Compte tenu de la faible base de connaissances actuelle sur le déroulement réel, dans l'hémisphère sud, des impacts directs et à l'échelle de l'écosystème, les conseils en matière de bonnes pratiques sur les critères minimum, l'évaluation et la mise en œuvre de PEM devront nécessairement appliquer le principe de précaution, et être examinés et mis à jour régulièrement à mesure que de nouvelles informations deviendront disponibles.

RECOMMANDATIONS

Que le Groupe de travail conjoint sur les captures accessoires et sur le statut des populations et de la conservation :

1. Convienne d'élaborer des principes à utiliser par les Parties pour informer les promoteurs de parcs éoliens en mer des mesures nécessaires pour éviter et atténuer les impacts sur les oiseaux de mer et tienne compte des principes proposés ici.
2. Convienne d'élaborer des conseils en matière de bonnes pratiques concernant les paramètres minimaux de conception et d'exploitation et les exigences d'évaluation d'impact sur l'environnement pour les projets de parcs éoliens en mer.
3. Recommande au Comité consultatif d'adopter les principes et les conseils en matière de bonnes pratiques finalisés et de fournir ces documents aux Parties.
4. Recommande au Comité consultatif de fournir les principes adoptés et les conseils en matière de bonnes pratiques à toutes les autres entités impliquées dans le développement de parcs éoliens en mer dans l'hémisphère sud.

1. CURRENT SITUATION

Offshore Wind Farms (OWFs) in the southern hemisphere are expected to roll out at scale in the near term. It has been established in the northern hemisphere that OWFs will impact seabirds in three main ways – collision impacts, barrier impacts and displacement impacts (see for example Bailey *et al.* (2014) and Best & Halpin (2019)). Exactly how these impacts will unfold in the southern hemisphere, with its high seabird concentration and high number of species whose behavioural and physiological traits make them particularly susceptible to these risks, is unclear. However, given the susceptibility of seabirds to existing threats, a large, new source of industrialisation with novel impacts in seabird habitat should be considered a significant population risk, and a proactive approach to implementing management measures to avoid and then mitigate these impacts should be implemented.

Since information was provided to ACAP via SBWG11/PaCSWG7 Doc 03, Inf 01 and 09, Australia has identified six priority areas for offshore wind with decision-making based on wind

resources, proximity to infrastructure and need, and industry interest. Three areas have been formally declared and the boundaries of three other areas remain under consideration. Proposals for individual developments within declared regions will be subject to feasibility studies and environmental assessment. Of the three declared areas, feasibility licences have been issued in one, one has feasibility licences currently under consideration, and one is currently open for feasibility licence applications (as of June 2024) (DCCEEW, 2024).

South America also has significant offshore wind resources with Colombia having recently undertaken a pre-qualification round for South America's first offshore wind tender process. Shadman *et al.* (2023) identified that Brazil has over 60 projects in the environmental licencing process. Extensive offshore wind resources have been identified around the continent, with the World Bank estimating approximately 8,000GW of technical potential in Latin America alone (ESMAP, 2019).

In Africa, GWEC (2023) identified that "the greatest offshore wind potential in Africa is concentrated in the Western African coast and the Southern African Coast followed by the Red Sea and Mediterranean Coast as well as the East African Coast." In assessing the potential of offshore renewable energy in Africa, the African Development Bank (2021) concluded that in the short term, offshore wind technology is most likely to be taken up by small island states. While no projects are currently under development, the ADB acknowledged that with sufficient downward pressure on cost, offshore wind has the potential for broad take up across Africa.

According to the New Zealand Wind Energy Association (2024), while there are currently no OWFs in operation in New Zealand, there are a number of proponents undertaking feasibility studies for future OWF development.

The Joint Seabird Bycatch Working Group and Population and Conservation Status Working Group (Joint WG) have previously agreed that it is appropriate to:

1. Recognise the potential adverse effects that OWF may have on ACAP-listed albatross and petrel species, and other seabirds.
2. Highlight the importance of undertaking dedicated research to improve the understanding of potential impacts of OWF on ACAP-listed albatrosses and petrels, and other seabirds.
3. Encourage Parties to share research findings concerning interactions and adverse effects of OWF on ACAP-listed albatross and petrel species, and other seabirds.

This work remains important but given the increasingly rapid transition to renewable energy, the speed at which OWF will roll out is likely to exceed the pace at which detailed knowledge of each wind zone will be developed. OWF will inevitably impact seabirds and while the exact nature of those impacts is unknown, they will contribute to the cumulative threats to these already at-risk species and do so in an environment where the impacts of climate change are also rapidly increasing. Conventionally, ACAP has relied upon existing detailed knowledge and practice to create Best Practice Advice (BPA). This has largely been made possible by the fact that the threats to seabirds (e.g. from fisheries bycatch) were already long-standing and quantified, with mitigation clearly a necessity. In the case of OWFs there is sufficient evidence from the northern hemisphere to have confidence that negative impacts to seabirds will occur, but the current absence of wind farm technology in the southern hemisphere means the scale and extent of impacts remains unclear and management practices from the northern hemisphere will need to be applied based on expert elucidation of the likely impacts on southern hemisphere species.

Given the current conservation status of seabirds that will be impacted, countries in the southern hemisphere should aim to implement better avoidance and mitigation action than was initially possible in the northern hemisphere. In order to minimise the risk that OWFs will cause to seabirds, it is appropriate to take a proactive approach to guiding Parties and the OWF industry on the measures that will be necessary to minimise seabird impacts. As new information becomes available it will be necessary to update this guidance on a regular basis.

This paper sets out six principles to guide OWF development that could be used to inform BPA for assessing and implementing individual projects.

2. PRINCIPLES TO INFORM BPA ON OWF SUITABILITY

The overarching environmental management goal for seabirds in the development of OWFs must be to avoid impacts to the maximum extent possible. The ability to mitigate any remaining impacts on seabirds, once an OWF is fully operational, remains uncertain and as such the priority must be on avoidance during planning, development, installation and operation. Nonetheless, OWFs must plan to mitigate any remaining impacts after all possible avoidance measures have been undertaken. Each of the principles outlined here would need to be applied in a way that responds to local environmental conditions and will need to be reviewed regularly as new information becomes available and as environments change, including as a consequence of climate change.

2.1 Design OWF to minimise impacts

The long-term nature of OWF operations (potentially 40-50 years) and the limited adaptive management measures available, mean that preventing harm from the outset, rather than attempting to mitigate problems post-construction, is the only way OWFs and seabird interactions may be effectively managed. Five key avoidance measures are available:

1. Prioritising least impacting technologies in the renewable energy transition. Development of OWF involves the introduction of a large, new source of industrialisation with novel impacts in seabird habitat. Planning for the renewable energy transition must involve consideration of whether overall objectives can be achieved through the development of renewable energy infrastructure in already degraded landscapes and seascapes, rather than moving into new areas.
2. OWFs must be situated to avoid collisions with seabirds to the greatest extent possible. Pre-site surveys are essential and identified migratory and dispersive routes should be avoided wherever possible.
3. Prioritisation of development sites, so that OWFs are implemented first in areas of least risk to seabirds. This will provide for the minimisation of impacts in the short term and give time for development of new, safer turbine-design options and other mitigation measures to be developed.
4. Selecting technologies that will reduce collision risk. OWF developments must be required to use the safest turbine types, currently expected to be vertical axis wind turbines (VAWTs) rather than horizontal axis wind turbines (HAWTs), and there should be a mandatory minimum safe blade clearance above water for individual turbines (currently recommended as 40m for HAWT).

5. Turbine spacings and configurations must be designed to minimise collision, barrier and displacement risks. Birds flying below rotor height are still likely to be impacted by OWFs through displacement, attraction, and/or barrier effects and management measures to address these risks should be implemented. It will also be important to require that large areas of ocean in areas of high seabird abundance remain free from OWFs to ensure that species have sufficient OWF free area available to meet their ecological needs.

2.2 Fill priority data gaps prior to large scale roll out of OWF technology

While feasibility testing of OWF is already underway in some southern hemisphere countries, the implementation of large scale OWF projects has long lead times. This provides an opportunity to conduct research in the hope of addressing priority data gaps including:

1. Improved understanding of vertical flight behaviours, initially focussed on higher-risk species, and for all age groups.
2. Seabird response to infrastructure, including behaviour around individual turbines and across one or more OWFs, including how responses to OWFs affect ecosystem interactions.
3. Seabird response to different environmental conditions and the associated consequences for collision risk and other interactions with OWFs.
4. Detection techniques and technologies to support future planning and adaptive management.
5. Efficacy of mitigation measures.

2.3 Implement OWF to mitigate unavoidable impacts

Even with careful site selection and safer turbine design requirements, collision risks will remain. The effectiveness of mitigation measures will likely be limited by seabird vision capabilities, with traits making them unlikely to search for obstructions and therefore more susceptible to collisions. Seabirds are also active during the day and night, and potential mitigation measures will be ineffective for nocturnally-active birds. Mitigation measures must be designed to reduce risks to the greatest extent possible, including consideration of the following matters.

1. Maximise tower and blade visibility without increasing seabird attraction, including by requiring visual enhancements to counteract both motion smear and visual perception constraints of seabirds. This would include, for example, mandatory flicker-creating paint patterns on HAWT.
2. Restrict turbine lighting practices and industry vessel lighting to meet seabird safe light guidelines and regulations.[1] This should include limiting night-illuminated work under higher risk conditions (e.g. fog with wind in particular) by either avoiding such work or requiring the use of lights that will not attract seabirds. These measures will be particularly necessary to prevent nocturnally-active seabirds from becoming

[1] Guidelines that may be adapted to suit this purpose include Commonwealth of Australia (2020), International Electrotechnical Commission (2023) and New Zealand Department of Conservation resources.

disorientated by intense sources of artificial light and being drawn to the lights of structures, thereby increasing collision risks.

3. Ensure structures do not create food sources or seabird resting and nesting opportunities that attract seabirds and increase collision risk. Fisheries management arrangements in surrounding waters will also be needed to ensure that fishing vessels are not attracting seabirds towards OWFs.

4. Develop methods to monitor turbine interaction and quantify cryptic mortality until sufficient knowledge has been obtained to be able to adequately model and plan for collision risks. This would require, for example, 10% of all turbines in random order placement across all development sites to be made capable of allowing short to medium-term on-board observer deployment.

2.4 Develop and implement protocols for curtailment and adaptive management

Adaptive management must include the ability to curtail or shut down OWFs if there are unforeseen and unacceptable impacts on seabirds. Early warning systems will need to be developed for increased collision risk events, such as an influx of at-risk species. Triggers for when adaptive management measures will be implemented must be pre-determined for all high-risk species, including shut-down requirements where needed, as well as ensuring management is responsive to unforeseen impacts.

Seabird collisions with ships and other marine infrastructure is already known to be more frequent during periods of poor weather and/or poor visibility, such as fog and misty conditions, and during storms with high wind speeds. In the case of OWFs, this means that the conditions that create an elevated collision risk also make it impossible to make visual observation of collisions. Monitoring techniques will need to be developed to take account of these factors.

Emerging technologies to detect when seabirds are approaching and to understand when impacts are likely to occur must be deployed immediately and improved over time. Currently, this would include the use of radar, binocular cameras systems operating in the visual and infrared fields, and artificial intelligence to learn to recognise and respond to bird approaches. Sensors on blades and towers that can detect impacts will also be necessary to understand when avoidance systems have failed and to build understanding of the highest collision risk situations.

2.5 Plan for rehabilitation

An important consideration in the design phase must be how turbines will be removed and sites rehabilitated after their productive life. Evidence from terrestrial and other offshore extractive industries shows that if planning and funding for rehabilitation is not built into project design upfront, there is a significant risk that infrastructure will not be removed or the cost of removal will be transferred to governments and the community. If structures remain in place, collision and displacement risks will remain indefinitely.

Each project should be required to develop a life of OWF plan, including detailed rehabilitation proposals, to be provided as part of feasibility studies and initial development assessment. The rehabilitation requirements would be included in conditions of consent and subsequent management plans. Such an approach will help to ensure that decision-makers and the community have a more in-depth understanding of the expected outcomes and long-term impacts arising from OWF and ensure that companies build-in appropriate operational procedures to minimise costs of eventual rehabilitation.

Rehabilitation bonds that cover the full cost of rehabilitation should also be required. This would include ongoing monitoring requirements, and contingency costs for works that become needed to ensure ecological and biophysical processes are restored. Rehabilitation bonds should be held in trust until rehabilitation has been completed or can be returned, or until a company has failed to implement its rehabilitation requirements and funds must be drawn down to complete the works. To ensure that the costs of rehabilitation are incurred as environmental harm is caused (and profits are generated), rehabilitation bonds should be adjusted annually.

2.6 Review and improve OWF management

Given the paucity of data on seabird flight distributions and heights, it will be important for the data gathered by proponents and OWF operators to be shared with regulators and other operators in real-time. Data sharing and transparency requirements should be a condition of any approvals. Data sharing and open access data is currently implemented in other jurisdictions, including the European Union, and is being undertaken by wind farm proponents in jurisdictions as such New Zealand.

Principles and guidelines should be reviewed, initially on an annual basis to ensure that they are updated as new information becomes available. As knowledge improves and the technology matures, review timeframes could be extended, but should always be conducted at least every three years to ensure guidelines remain up to date and environment changes, including those arising as a consequence of climate change, are appropriately responded to.

3. ACAP BEST PRACTICE ADVICE ON OWF

Ensuring that individual projects are designed to meet the principles articulated above, will require specification of the minimum design and operational parameters for OWFs, comprehensive assessment of environmental impacts, and articulation of proposed management measures through a robust environmental impact assessment (EIA) process. While EIA processes will be required to be broader than an examination of impacts on seabirds, it will be important to ensure that seabirds are a key consideration in such assessments.

It is recommended that the Joint WG develop BPA for guiding design of OWF projects and integrating impacts on seabirds into EIA. It would be appropriate to collaborate with other relevant organisations, such as the Convention on the Conservation of Migratory Species of Wild Animals (CMS) Energy Taskforce, in developing this advice. While not intended to be comprehensive, the type of issues requiring consideration in this process have been outlined below.

An important transparency and accountability measure in ensuring appropriate assessment is that EIA should be conducted by independent experts identified through an appropriate ecological consultant accreditation system.

3.1 Specifying minimum design and operational parameters

The principles described above should be used to specify the minimum design and operational parameters that OWFs must meet to ensure impacts on seabirds are minimised to the greatest extent possible. Site specific EIA should examine how these parameters will be implemented in each specific location.

3.2 Identifying data requirements to assess impacts and ensuring open access to baseline and monitoring data

Substantial additional upfront data on likely seabird interactions with OWFs and potential ecosystem level impacts of OWFs is required to facilitate adequate environmental assessment of individual proposals. Minimum data requirements should be identified and proponents should be required to demonstrate how they have met these requirements. Community and expert consultation must be undertaken to ensure EIAs are based on the best available information.

Requirements for open data sharing should be built into research contracts, feasibility studies, EIA processes and other data collection systems to ensure that all proposals are able to respond to new information as it becomes available.

3.3 Determining proponent suitability and project need

Prior to individual projects proceeding, there must be a wholistic consideration of broader energy transition requirements, and whether proceeding with OWF projects in a specific location will result in least overall environmental impact and be able to be conducted in a way that avoids impact on seabirds to the maximum extent possible. This must include a robust consideration of project alternatives.

Given the high risk of additional seabird mortalities from OWFs, project proponents should be required to have demonstrated expertise in managing OWF developments in a way that minimises impacts and responds to new information.

3.4 Assessing potential impacts on and risks to individuals, populations and species

3.4.1 Understanding the existing environment

To assess potential risks, there must be a robust understanding of the existing physical and biological environment.

In relation to understanding impacts on seabirds, this will require appropriate investigation and documentation of the physical environment that includes at least:

- Oceanic resources and hydrodynamics.
- Air and wind patterns.
- Climate.
- Noise and vibration.

In relation to the biological environment, this will require appropriate investigation and documentation of biological systems that includes at least:

- Seabird presence, habitats and prey species.
- Relevant ecosystem interactions.

3.4.2 Understanding potential impacts

Understanding the potential impacts an individual OWF will have on seabirds both in isolation and cumulatively requires understanding how the presence, behaviour and habitat requirements of seabirds interact with, at least, each of the following factors:

- Turbine (blade and tower) interactions – direct injury and mortality through collision risk.
- Turbine attraction – prey aggregation and/or creation of resting or nesting sites increasing interaction risk.
- Physical presence – barrier effects and displacement both within OWFs and between OWFs.
- Light emissions – potential to increase attractiveness and associated interaction risk.
- Hydrodynamic effects – impacts on food chains and habitat requirements.
- Changes to wind speeds – impacts on flight behaviour and associated energy expenditure and changes to turbine interaction risk.
- Construction, maintenance and repair vessel interactions – direct injury and mortality.
- Interaction with other marine users – including fishing vessels in the vicinity making sites more attractive and increasing interaction risk.
- Underwater noise – behavioural effects on prey species.
- Seabed disturbance – harm to benthic habitats and consequences for prey species.

Cumulative impacts are a key consideration. The already threatened status of many seabirds mean that existing cumulative impacts are driving decline. OWFs add an additional, and potentially unsustainable, impact. EIA must recognise existing cumulative impacts and start from the premise that additional seabird impacts from OWFs need to be avoided to the greatest extent possible and then mitigated, rather than assuming that any particular population level impact would be considered acceptable. A cumulative impact assessment framework must consider the impacts outlined above, as well as other relevant impacts, in conjunction with existing impacts, and any potential to reduce those impacts. This must occur within appropriately defined resource and ecosystem components, geographic boundaries and time periods.

Given the current lack of knowledge about many seabird species and potential interactions, existing predictive tools for modelling impact are likely to be of limited value. For that reason, requirements for input data and modelling processes need to be developed. At a minimum, this should include:

- Appropriate geographic boundaries for assessment of impacts.
- Baseline data requirements and sources.
- How to determine whether input assumptions are appropriate.
- Evaluation methods for the significance of impacts.

3.5 Mitigating unavoidable impacts

Mitigation measures must be outlined in an Environmental Management Plan (EMP). Each EMP must respond to the seabird impacts that have been identified as likely to occur in the region and for the likely impacted species. Proposed management measures must articulate both location and design features to be employed; ensure that all mitigation measures have been demonstrated to be feasible; and provide confidence that the proposed mitigation measures are likely to mitigate impacts to the extent suggested. EMPs must contain commitments that are auditable and enforceable.

3.6 Monitoring and applying adaptive management

Any project approvals should specify the type of monitoring that will be required and the frequency of reporting, mandating open access reporting. These requirements should be included in the EMP. There must also be a requirement to regularly review monitoring plans to ensure that the latest and most effective technology is being used.

The primary design focus should be to avoid seabird impacts to the maximum extent possible. However, given that impacts will inevitably occur, transparent and measurable thresholds to trigger additional management intervention should be specified for each species likely to be impacted. The management response that will be implemented to deliver a goal of no further impacts should the threshold be triggered must be specified, and the proponents must be required to implement this management measures within a pre-determined timeframe. Adaptive management measures must include requirements to curtail or shut down operations where this is necessary to avoid further impacts.

In addition to impact thresholds for individual projects, governments should specify regional thresholds that apply to all OWFs in a region. Where OWFs cumulatively exceed regional thresholds, adaptive management measures that apply to all OWFs should be applied.

3.7 Rehabilitating sites post productive life

Closure and decommissioning processes must be determined upfront. In the first instance, these processes must be based on the assumption that OWF technology will be removed from the environment at the end of life to avoid ongoing impacts. A rehabilitation management plan must be provided as part of the EIA process and regularly reviewed to ensure that the plan reflects current best practice.

Financial mechanisms to ensure adequate rehabilitation bonds will be place to implement the rehabilitation management plan must be specified.

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