Renewables Grid Initiative

NID4BirdLIFE

# STATE OF THE ART REPORT

## Innovative Nature-Inclusive Design solutions for Birdlife near offshore energy infrastructure

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# INTRODUCTION

As Europe accelerates the deployment of offshore renewable energy infrastructure to meet climate and energy targets, there is an increasing need to integrate biodiversity considerations from the earliest planning stages. Decisions taken at this point determine the location, design and operation of infrastructure for decades. Early integration of biodiversity objectives can therefore reduce environmental impacts, increase public acceptance, minimise costly retrofitting and support nature-positive goals.

Nature-Inclusive Design (NID) offers a key opportunity to ensure that offshore renewable infrastructure contributes positively to nature while fulfilling financial and energy objectives. While NID has been explored mainly in relation to underwater habitats, its potential to benefit seabirds and other avian species, for instance by providing safe nesting and resting opportunities, remains largely unexplored. Given the significant expansion of offshore energy projects planned by 2030 and beyond[1], the coming years represent a critical window to develop, test and implement NID measures for seabirds and to generate lessons that can guide their wider application and scaling in the future.

In this context, the **NID4BirdLIFE project**[2] was launched in 2024, which aimed to help reverse the sharp decline of Black-legged Kittiwakes by installing NID solutions on the walls of the **Princess Elisabeth Energy Island** (PEI) in the Belgian North Sea, creating suitable nesting sites and fostering a stable breeding colony. Moreover, a further goal of the project was to collect, analyse, and monitor the different approaches, perspectives, and experiences of various stakeholders regarding NID for birds. A central pillar of this effort was also to create opportunities for mutual learning and collaboration among experts from diverse sectors, including Transmission System Operators (TSO), wind developers, NGOs, research institutes, consultancies and service providers.

1 The European Commission has set in 2020 a target of at least 60 GW of offshore wind by 2030 and 300 GW by 2050. **An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future.**

2 The NID4BirdLIFE project was a 6.5-year initiative co-financed by the European Union's LIFE Programme, aimed at supporting the black-legged kittiwake population, by creating a durable breeding stronghold on the Princess Elisabeth Energy Island. The consortium of partners consisting of the **Royal Belgian Institute of Natural Sciences** (RBINS), **Research Institute for Nature and Forest Flanders** (INBO), **Elia** and RGI.



In line with those objectives, in 2025, the **Renewables Grid Initiative** (RGI) organised a series of activities to engage with key actors and gather their perspectives, including a dedicated survey, a series of online interviews and an in-person workshop. Specifically, the workshop, held on 18 November in Brussels, provided a platform to discuss opportunities and challenges and to co-create principles that can guide the future roll-out of NID for birds. This report summarises the main challenges and potential solutions identified by stakeholders during all these activities and sets out proposed principles to support more effective implementation in future projects.

# STAKEHOLDERS INVOLVED

The survey was completed by 16 organisations representing NGOs, wind developers, TSOs, government authorities, consultancies and research institutes (see Annex). This mix brought together expertise in ecology, engineering, policy and regulation, providing a broad, cross-sectoral perspective on the perceived role of NID for birds and the challenges associated with its application in offshore renewable development. Building on the survey, 10 participants were selected for in-depth interviews, allowing key topics to be explored in greater detail. The selection was made on the basis of their responses to the survey and specific expertise. Finally, around 30 stakeholders attended the workshop, where they shared their experience and ideas, and jointly reflected on practical ways forward for the design, implementation and testing of NID solutions for birds.



# PRINCIPLES IDENTIFIED

## 1 Defining Nature-Inclusive Design for birds

A recurring point of divergence concerns how NID solutions for birds are defined, and whether mitigation and compensation measures should be considered part of NID.

Within the NID4BirdLIFE project, partners agree that NID solutions are ***"options that can be integrated in, or added to, the design of an anthropogenic structure with the aim to enhance ecological functioning."*** [3]

For birds specifically,
***"NID involves designing structures that actively enhance populations, for example by providing nesting opportunities or safe foraging areas."***

However, stakeholders may interpret the implementation of NID measures differently. Many NGO representatives consider NID to be additional, voluntary actions that enhance biodiversity beyond what is legally required and clearly separated from mitigation and compensation obligations. By contrast, some wind developers, TSOs and authorities, involved in RGI's stakeholder engagement activities, tend to adopt a broader understanding, under which measures with a positive ecological outcome, including innovative mitigation measures or even compensation requirements, may be considered as NID. This blurred boundary between compliance and enhancement creates semantic ambiguity, adds a layer of complexity in policy frameworks and makes it difficult to compare and evaluate NID outcomes across projects and countries. Participants suggested **developing clear, cross-sectoral guidance and common definitions of NID[4], including bird-specific ones, ideally at EU level and consistent with the mitigation hierarchy.**

3 Based on Hermans, A., Bos, O. G., & Prusina, I. (2020). **Nature-Inclusive Design: a catalogue for offshore wind infrastructure.**

4 See example of existing glossary of definition: Cornacchia, L., Degraer, S., van Duren, L., Petersen, J. K., Ziemba, A., Van Gerven, A., et al. (2025). **ULTFARMS NID Glossary: Glossary of terms and common definitions related to Nature-inclusive Design.**

## 2 Developing guidance and robust regulatory frameworks

Existing regulatory frameworks provide limited direction on how NID for birds should be treated in the context of offshore energy infrastructure. Those solutions are rarely referenced explicitly in legislation or guidance and are often absent from tender requirements, which creates uncertainty for authorities and developers. While environmental assessment procedures and the nature restoration frameworks could provide important entry points, their use for NID remains largely unexplored. Examples such as the United Kingdom's Biodiversity Net Gain (BNG) requirement[5], which mandates at least 10% net gain and took around a decade of debate to establish, illustrate both the potential and the complexity of embedding nature-positive obligations in law. At sea, challenges in defining and quantifying ecological baselines further complicate the application of "net gain" concepts. Participants noted that EU instruments such as the Marine Strategy Framework Directive[6] (MSDF) and the Nature Restoration Regulation[7] (NRR) could act as anchors for nature-positive offshore approaches.

A lack of detailed governmental guidance on how to initiate NID for birds, interpret regulatory expectations and identify opportunities contributes to uncertainty and uneven adoption. To address these gaps, stakeholders called for **clearer, yet flexible, guidance and regulation**. One suggestion was to develop a practical NID guidance document at national, and ideally regional, level that sets out the basic principles and rules of NIDs: what qualifies as an NID (see section 1), what options exist, their objectives, associated risks (see section 4), when they should be considered, how to ensure successful installation, how to monitor them, and how to decommission them where relevant.

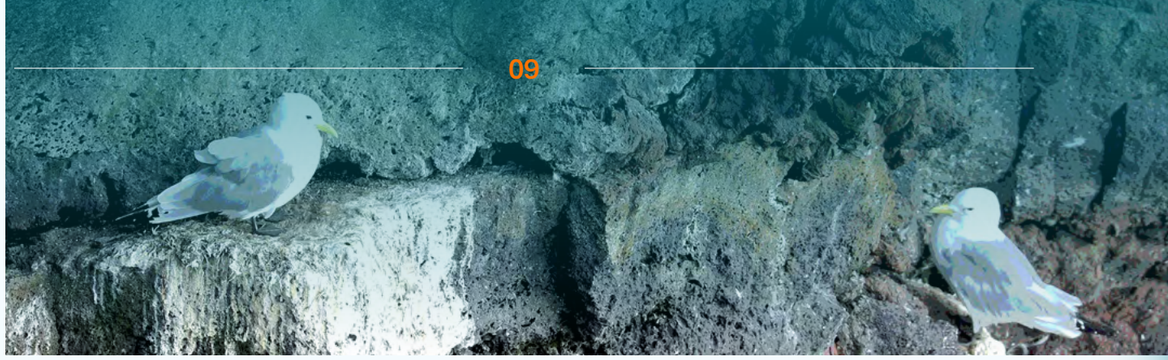
When offshore structures reach the end of their operational life, the absence of clear guidance on what should happen to NID assets emerges as a significant challenge. In some jurisdictions there is a legal obligation to remove all infrastructure, even where it has developed into valuable habitat.

5 In England, BNG is mandatory under **Schedule 7A of the Town and Country Planning Act 1990 (as inserted by Schedule 14 of the Environment Act 2021).**

6 **Directive 2008/56/EC** of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy.

7 **Regulation (EU) 2024/1991** of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869.





Participants stressed the **need to integrate decommissioning considerations from the planning phase** and to allow for options where **NID elements can be left in place**, where ecologically appropriate and safe. They also suggested exploring models under which ownership and responsibility for residual NID-only structures, such as artificial nesting habitats, would transfer to public authorities once energy production ends, provided that regulatory frameworks clearly define the conditions and procedures for such transitions.

More broadly, regulations should be designed to accommodate innovation and adaptive management, enabling new technical solutions and iterative design changes to be implemented without triggering full re-approval processes for modifications. A combination of clearer expectations, workable long-term ownership models and regulatory flexibility is seen as essential to integrate NID into mainstream offshore planning while maintaining pace in renewable energy deployment.

## 3 Ensuring effectiveness and evidence-based measures

A major concern raised across interviews and the workshop was how to assess whether NID measures for birds are truly effective. Participants highlighted persistent difficulty in agreeing what constitutes success and which baselines should be used. NGOs and scientists in particular questioned the ecological validity of certain existing practices, arguing that these can lack robust evidence of population-level benefits and may involve high costs while delivering limited positive impact. They also referred to the risk of creating ecological traps, in which NID structures may attract birds to areas with high collision risk or insufficient food resources.

Industry representatives acknowledged these knowledge gaps, however, they also stressed that testing is essential to prove the effectiveness of innovative solutions and that robust evidence take a significant amount of time to collect (5 to 10 years).

Across all groups there was broad agreement that the lack of long-term monitoring data severely limits the ability to assess outcomes at population level, especially as bird populations and environmental conditions change over time. In this context, the absence of clear baselines and agreed metrics makes it difficult to compare projects and/or demonstrate net ecological gain.

Participants proposed several ways to strengthen the evidence base and improve effectiveness over time. Firstly, **NID for birds should be deployed, when possible, where there is a clear ecological foundation**, for example creating breeding habitats in areas where nesting opportunities are a documented limiting factor. Secondly, **a framework should be established from the start to evaluate effectiveness and potential net gain**, including explicit success criteria, indicators and metrics at project level. This framework should be developed in collaboration with relevant stakeholders and authorities to ensure cross-sectoral expertise. Third, **adaptive management** must be implemented to allow measures to be adjusted as new evidence emerges, rather than remaining fixed over time. This would require **long-term monitoring programmes** to track colonisation, breeding success and population responses over many years (5-10 years), ideally supported by an independent evaluation. Finally, participants emphasised the need for **better data sharing across projects and countries**, to refine NID approaches, identify what works and avoid repeating ineffective or low-impact measures.

## 4 Advancing NID for birds: Innovation versus Risk

Innovation in ecological solutions such as NID for birds is crucial to advance our knowledge and implementation of measures that can support nature. However, innovation often arises in contexts where evidence is limited and perceived risks are high. This creates challenges between the aspiration to test new concepts and the need to manage operational, financial and ecological uncertainty. Moreover, some stakeholders questioned whether NID for birds is appropriate at all in the offshore environment, especially where there is no clear ecological justification.

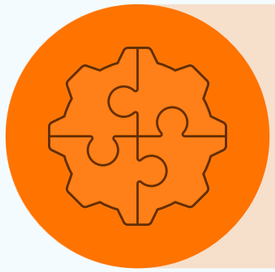
To balance the trade-off between innovation versus risk, participants advocated for a more explicitly **experimental and strategic approach**. Pilot projects at sea were seen as particularly valuable for testing concepts, gathering data and refining designs before wider deployment.



In some cases, participants raised the option for NID installations to be temporary, operating only for the lifetime of an infrastructure or for a defined funding period, if this helps build experience without creating disproportionate long-term obligations and costs for operators.

**Catalogues of bird-focused NID options**, drawing on examples from early projects and aligned with ecological best practice, would offer operators a set of partially tested solutions rather than requiring each project to start from scratch.

Crucially, **co-creation of measures** between different actors needs to be extended from design phase to the implementation, adjustment, monitoring and decommissioning. Collaboration between developers, TSOs, NGOs, scientists and regulators can help ensure that innovation is accompanied by shared learning, transparent allocation of responsibilities and fair distribution of risks and benefits.



## 5 Addressing technical and operational complexity

Technical and operational constraints can easily push NID for birds to the limits of offshore project design. Many project engineers have limited exposure to bird ecology, which means that ecological considerations may be deprioritised as engineering solutions become more complex. Secondly, NID features must be robust enough to withstand harsh offshore conditions, including storms and long operating lifetimes, while taking into account other essential structures such as helidecks, walkways or safety lights. For example, in the case of the Princess Elisabeth Island, the provision of nesting space for birds in close proximity to helicopter landing and take-off routes conflicted with international safety guidelines required for helideck certification, due to the increased risk of bird strikes.

Moreover, on platforms and substations, operation and maintenance (O&M) teams are often reluctant to encourage bird presence due to concerns about safety, access and cleanliness.

Bird droppings can reduce grip, impair visibility and obscure navigation lights and may require additional cleaning and inspection costs. Aggressive behaviour during the bird breeding season in the vicinity of O&M operations adds further risk. Furthermore, the long-term costs of operating and maintaining NID features are not always well quantified, which reinforces hesitancy.

To address these issues, stakeholders pointed to a mix of design innovations, operational adjustments and organisational changes. At design stage, NID can be better integrated through **flexible engineering approaches** (see section 6) and close collaboration with service providers, so that features can be adapted and upgraded over time without excessive costs. Designers could be supported by **technical catalogues of NID options for birds** (see section 4), comparable to existing catalogues for underwater measures, providing technical and ecological concepts that can be adapted to local conditions. Finally, the co-creation of NID measures between various experts (e.g, civil society, engineering, scientists and industry representatives) can be considered as a good practice to generate innovative concepts and make sure all voices and expertise are taken into account from the start.

On the operational side, projects could incorporate the higher maintenance requirements associated with NIDs, such as cleaning and inspection, into their budgets from the start. **Staff training on safety, security and working on bird-friendly structures, backed by guidance reports and best practice for O&M** on NID-equipped infrastructure, was seen as essential to normalise these new conditions. **Regular dialogue between engineers, ecologists and O&M teams** can then be used to refine solutions over time, share experience of what works in practice and phase out designs that repeatedly cause operational problems.

# 6 Providing financing pathways

All stakeholder groups identified finance as central constraints on the wider deployment of NID for birds in offshore renewable projects. Industry representatives highlighted the substantial costs associated with the development, installation, monitoring and long-term maintenance of NIDs, particularly offshore. For instance, the NID4BirdLIFE project faced severe project cost increases during the procurement, construction, and installation of bird ledges. Subcontracting costs tripled due to inflation, sharp rises in the prices of raw materials and supplies, and increasing complexity in both the ledges design and installation methodology.



Because offshore renewables developers and operators seek to minimise costs and NID measures typically go beyond legal requirements, there are limited regulatory or financial drivers for their adoption, making it difficult to develop a robust business case. On the other hand, several civil society organisations underlined that, given the limited nature conservation budgets available at the project level, priority should be given to measures with demonstrable ecological benefit, rather than low-impact solutions.

**Although financial challenges for Nature-Inclusive Design solutions will always be a constrain, workshop participants outlined several options to address them:**

### At the European Level

Mobilise EU funding streams such as Horizon Europe and the LIFE Programme, to support the implementation of innovative practices and long-term monitoring. These could be complemented by national and regional instruments.

### At the National Level

Integrate NID for birds as non-price criteria in offshore wind tenders to incentivise innovation and regulate their implementation. However, the objectives of these solutions, and the unintended ecological risks they could represent, should be clearly defined by authorities before tender design (see sections 2 and 5).

### At the Project Level

Adopt **flexible engineering and adaptable or modular design** to reduce long-term costs and avoid expensive modifications (see section 5). It is essential to consider contingency budgets, as NIDs may require adjustments during planning and construction. Realistic cost estimates will improve the overall financial viability of NID over the lifetime of the infrastructure.

Taken together, these measures could help shift NID for birds from a discretionary addition to a standard, and financially supported component of offshore renewable development.

# CONCLUSION

The experience gathered through the NID4BirdLIFE project, and through the associated survey, interviews and workshop, shows that NID for birds in offshore energy infrastructure is both promising and challenging. There is broad support across sectors for the idea that offshore infrastructure should contribute to biodiversity objectives, yet significant **practical, regulatory, financial, technical and organisational barriers remain.**

Several overarching messages emerge from this state-of-the-art assessment. A first priority is clarity of purpose and definition. A shared understanding of what constitutes NID for birds is a prerequisite for coherent policy design and transparent expectations. **Clear definitions and guidance at EU, regional and national levels** would help distinguish between compliance obligations and additional nature-positive measures.

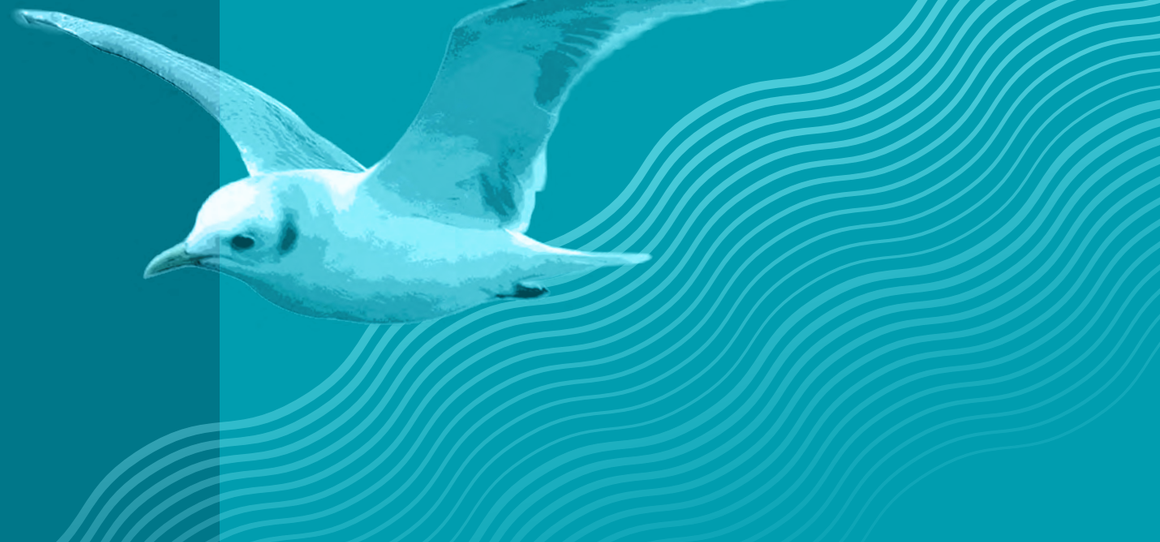
A second priority is to ensure that effectiveness is grounded in evidence. NID for birds needs a **robust ecological foundation, clearly defined success criteria and long-term monitoring**. Adaptive management, independent evaluation and data sharing are essential to avoid ecological traps, learn from early projects and improve designs over time. All of these elements should also be part of a governments lead guidance documents.

A third priority lies in aligning regulation and finance. NID will not scale if it remains a voluntary add-on. Integrating NID into planning, tendering and permitting, potentially supported by non-price criteria, targeted funding instruments and flexible regulatory frameworks, could provide the predictability that developers need. Thoughtful approaches to decommissioning and long-term ownership are equally important to secure the future of NID structures that become valuable habitat for birds.

A fourth priority is to manage technical and operational complexity through joint solutions. Technical robustness, safety and cost control are legitimate concerns for operators. These can be addressed through **flexible engineering, well-designed operation and maintenance practices, staff training and structured dialogue** between engineers and ecologists. Finally, advancing NID for birds will require a more careful approach to innovation and risk. **Pilot projects, shared design resources and co-creation** that continues beyond the design stage could help to manage uncertainty while building practical experience.



Taken together, the findings point to a clear opportunity. If NID for birds is planned early, grounded in ecological evidence, supported by coherent governance and regulation, and co-developed with those who design and operate offshore assets and scientists, it could become a standard feature of offshore energy infrastructure. Doing so would not only support vulnerable species, such as the Black-legged Kittiwake, but also contribute to wider efforts to align Europe’s energy transition with its biodiversity and nature restoration goals.



# ANNEX

This annexe provides additional detail on RGI's stakeholder engagement activities, survey questions and the interview-based thematic analysis that underpin the findings in the main report.

## 1 Stakeholders involved

The **survey** was shared via email to stakeholders involved in offshore energy, grid planning and operation, and nature protection (from NGOs, wind developers, transmission system operators, government authorities, consultancies, and research institutes.) Responses from 16 organisations were received. From these, 9 participants were selected for semi-structured interviews, in order to capture a range of perspectives and allowing key topics to be explored in greater detail. Table 1 summarises the organisations involved and their participation in the engagement activities.

***Table 1.* Summary of stakeholders involved in engagement activities**

| Organisation | Type of Organisation | Survey | Interview |
|---|---|---|---|
| BirdLife Europe | NGO | ✗ | ✓ |
| Flanders Research Institute for Agriculture, Fishery and Food (ILVO) | Research Institute | ✓ | ✗ |
| Blue Cluster | Consortium of various organisations | ✓ | ✓ |
| WWF Belgium | NGO | ✓ | ✓ |
| Federal Public Service Health, Food Chain Safety and Environment | Authority | ✓ | ✓ |



| Organisation | Type of Organisation | Survey | Interview |
|---|---|---|---|
| Jan de Nul | Engineers | ✓ | ✗ |
| ORG Permanent Modernity | Engineers | ✓ | ✗ |
| DEME group | Engineers | ✓ | ✗ |
| IMDC | Engineers | ✓ | ✓ |
| Energinet | TSO | ✓ | ✗ |
| TenneT | TSO | ✓ | ✓ |
| RTE | TSO | ✓ | ✗ |
| Ørsted | Wind developer | ✓ | ✓ |
| DMEC | NGO | ✓ | ✓ |
| Wageningen Marine Research | Research Institute | ✓ | ✗ |
| Waardenburg Ecology | Marine Research Consultancy | ✓ | ✗ |
| RSPB | NGO | ✓ | ✓ |

## 2 Survey questions

### Participant Background

- Name and position
- What type of organisation do you represent?
- What is your primary area of expertise?
- What is your experience with NID in the offshore energy, grid or other sectors?

## Understanding NID

- How effective are existing mitigation measures in reducing the potential negative impacts of offshore energy infrastructure (offshore wind, substations, oil and gas platforms) on bird populations?
- Would you consider mitigation measures as being part of NID solutions in their role for the enhancement of biodiversity?
- ***"Nature-inclusive design for birds specifically involves designing structures that actively enhance the populations, such as by providing nesting opportunities or safe foraging areas. These designs aim to harmonise human development with ecological sustainability and nature restoration, fostering coexistence between infrastructure and nature."*** Would you agree with this definition? If not, how would you define NID for birds in the context of offshore energy infrastructure?
- Are you aware of any NID solutions for bird species in the context of offshore energy infrastructure or any other type of infrastructure (e.g, ports, landing points)? Has your organisation implemented any of those solutions or will do so in the future?
- In case of experience implementing NID solutions, how do you monitor the applied measures? What are the results (even if preliminary) of the monitoring actions?
- Based on your experience or knowledge, what are the potential benefits of NID for birds (e.g., habitat creation or restoration, enhancement of breeding success)?

## Challenges and Opportunities

- What are the main challenges your organisation has encountered or anticipated in implementing NID for birds in the context of offshore energy and grid projects? Could you provide examples of challenges for the following aspects? Technical, ecological, economic and regulatory.
- What opportunities do you see in incorporating NID for birds in offshore energy and grid projects? Could you provide examples of opportunities for the following aspects? Technical, ecological, economic and regulatory.

## NID4BirdLIFE Project

- What do you see as the challenges and opportunities of the proposed design and placement of the NID elements on the Princess Elisabeth Island wall to support a breeding site for the Black-legged kittiwake?



- How likely are you or your organisation to participate in or encourage participation in the Citizen Science initiative?
- In your perspective which of the proposed activities – state-of-the-art report, best practices manual, or open data sharing – could be the most beneficial for advancing NID adoption in offshore projects? How beneficial could they be for your organisation's work?

# 3 Interview-based thematic analysis

The qualitative interviews provide deeper insight into motivations and challenges shaping NID implementation. **Four key themes emerge consistently across all stakeholder types:**

- Definition and semantics
- Effectiveness and evidence
- Governance and finance
- Monitoring and scale-up

The tables 2 and 3 summarise the key topics mentioned by the different stakeholder groups and the priority given by each group.

***Table 2.*** **Summary of key themes mentioned by stakeholder group**

| Theme | NGO | Wind Developer | TSO | Authority |
|---|---|---|---|---|
| **Definition and semantics** | Stressed that NID must go beyond mitigation; warned against conflating compliance with enhancement. | Viewed NID broadly as any measure benefiting nature; open to flexible interpretation. | Supported clearer terminology to align internal engineering standards. | Recognised confusion; called for harmonised national guidance and EU definitions. |
| **Effectiveness and evidence** | Questioned empirical basis of artificial structures (e.g., kittiwake towers). | Acknowledged gaps but promoted experimentation and adaptive learning. | Requested evidence-based technical validation before large-scale rollout. | Called for coordinated monitoring and transparent evaluation criteria. |

| Theme | NGO | Wind Developer | TSO | Authority |
|---|---|---|---|---|
| **Governance and finance** | Urged that public funds support ecologically proven solutions. | Highlighted cost uncertainty and maintenance responsibilities; asked for incentives in tenders. | Wanted predictable regulatory requirements and cost-sharing mechanisms. | Proposed integrating NID into permitting frameworks via non-price criteria. |
| **Monitoring and scale-up** | Emphasised long-term, population-level tracking and open data. | Favoured pragmatic, proportional monitoring requirements. | Supported centralised data platform to aggregate results across projects. | Advocated harmonised baselines and regional cooperation among states. |

***Table 3.*** **Summary of which groups emphasised each theme most strongly**

| Theme | NGO | Wind Developer | TSO | Authority |
|---|---|---|---|---|
| **Definition and semantics** | **Very strong** | Moderate | Moderate | **Strong** |
| **Effectiveness and evidence** | **Very strong** | **Strong** | Moderate | **Strong** |
| **Governance and finance** | **Strong** | **Very strong** | **Strong** | **Very strong** |
| **Monitoring and scale-up** | **Very strong** | Moderate | **Strong** | **Very strong** |

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