

REPORT SUMMARY

North Seas offshore wind port study 2030 - 2050

SUMMARY

Client: Netherlands Enterprise Agency (RVO)

Reference: BJ2751-RHD-XX-XX-RP-X-0004

Status: Final/01

Date: 3 November 2023



HASKONINGDHV NEDERLAND B.V.

Laan 1914 no.35
3818 EX Amersfoort
Netherlands
Water & Maritime

+31 88 348 20 00 **T**
+31 33 463 36 52 **F**
info@rhdhv.com **E**
royalhaskoningdhv.com **W**

Document title: North Seas offshore wind port study 2030 - 2050

Subtitle: SUMMARY

Reference: BJ2751-RHD-XX-XX-RP-X-0004

Status: Final/01

Date: 3 November 2023

Project name: North Seas offshore wind port study

Project number: BJ2751

Author(s): Leon Lammers, Patrick Walison, Sytske Stuij

Drafted by: Leon Lammers, Patrick Walison, Sytske Stuij,
Yarden Sela, Job van den Berg, Jolke Helbing,
Wim Klomp, Leo de Vrees, Robin van den Berg,
Eduardo Negrodo Martin

Advisory board: European Commission,
WindEurope Ports Platform,
Netherlands Enterprise Agency (RVO),
Netherlands Wind Energy Association (NWEA),
Ministry of Economic Affairs and Climate Policy,
Ministry of Infrastructure and Water Management

Date: October 2023

Approved by: Leon Lammers

Date: 3 November 2023

Classification

Open

Open

Unless otherwise agreed with the Client, no part of this document may be reproduced or made public or used for any purpose other than that for which the document was produced. HaskoningDHV Nederland B.V. accepts no responsibility or liability whatsoever for this document other than towards the Client.

Please note: this document contains personal data of employees of HaskoningDHV Nederland B.V.. Before publication or any other way of disclosing, this report needs to be anonymized, unless anonymisation of this document is prohibited by legislation.

Executive Summary

The objective of this study is to analyse the offshore wind port infrastructure needs in each of the NSEC member countries, both at a political and technical level. The study aims to serve as a high-level platform for addressing key issues relevant to this sector.

The intended outcome of this study is to provide clear conclusions and actionable recommendations for the development of offshore wind port infrastructure in the NSEC region.

High ambitions

Offshore wind energy ambitions in Europe are soaring. The nine North Seas Energy Cooperation (NSEC) countries¹ and the United Kingdom agreed in a Joint Statement to realise an installed capacity of offshore wind energy of at least 120 GW in 2030 and 300 GW by 2050. In 2023 these countries have a combined installed capacity of about 33 GW in the North Seas.



The role of ports

This staggering growth of offshore wind energy poses a challenge for the entire supply chain. While various stakeholders have been outspoken about the scale of the task at hand, the critical role of ports has only just begun to receive the high-profile attention it urgently demands.

Ports serve as indispensable hubs in the ongoing expansion of offshore wind energy and the energy transition. They fulfil key functions in construction, operations & maintenance (O&M), and often in the landing and system integration of the generated power for instance by accommodating green hydrogen production facilities. To offer these services, ports need to invest substantially in infrastructure enhancements and expansions. While this presents a challenge, it also offers a unique opportunity for ports to actively contribute to the energy transition and grow sustainable business paths. However, this study finds that port developments are not keeping up with the demands.

Port capacity will be a serious bottleneck

Without swift action to develop new port infrastructure and upgrade existing facilities for offshore wind installation and manufacturing, the offshore wind energy targets set for 2030 are unlikely to be met. The most urgent bottleneck is installation port capacity in the North Sea region. The targets for 2030 cause a strong peak in annual deployment between 2029 and 2031.

To serve the peak demand, the study estimates a total gross storage area requirement of roughly 850 to 1,300 hectares for the North Sea area. The current gross storage area in the region stands at approximately 600 hectares, with an additional 200 hectares planned for expansion projects. This results in an expected deficit of between 250 and 700 hectares. Even when all planned expansions are realised, there will still be

¹ The North Seas Energy Cooperation (NSEC) is based on a political declaration, with membership comprised of 9 countries (Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, Norway, Sweden) and the European Commission.

Open

a shortage ranging from 50 to 500 hectares. Furthermore, the port storage areas need to have direct access to the sea with state of the art and high load bearing quay infrastructure.

In addition to increasing quayside storage capacity through port expansion projects, the following technical solutions could help alleviate congestion:

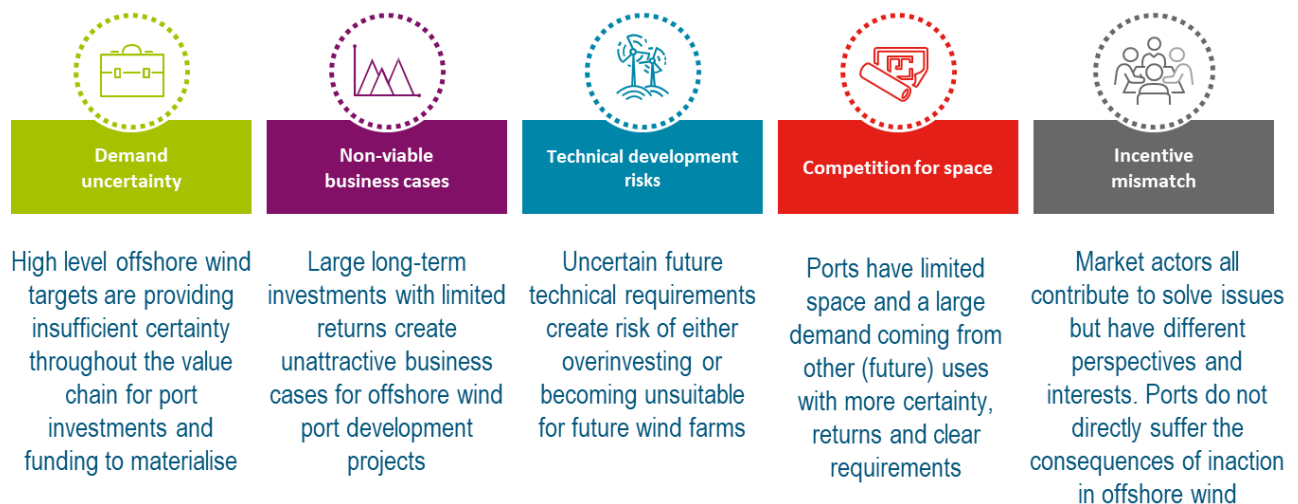
- Identifying additional storage facilities (e.g., off-dock storage yards situated within close proximity to the port or terminal)
- Reducing component dwell times (by adopting Just-in-Time production methods)
- Minimising the ground area required per component (e.g., through component stacking)
- Working towards higher storage yard occupancy (by optimising logistics)
- Implementing more efficient terminal layouts (to create additional storage area in existing terminals)

The consensus among key stakeholders however is that these measures will not result in significant gains. For other regions such as Ireland, Norway, and France, new port infrastructure and improvements to existing facilities are also required to guarantee the smooth deployment of (floating) offshore wind.

In planning offshore wind O&M bases, foresight is essential. Numerous warehouses (one for each wind farm) will be needed for storage and should be strategically located close to waterside for quick access.

Five key challenges for port development have been identified

Many ports have identified the need for more port capacity and have expansion plans in place. However, ports struggle to realise the required infrastructure in time. This study identifies five key challenges for the development of port infrastructure that require urgent action from all stakeholders involved.








All five challenges need to be addressed to bring the port infrastructure in line with the offshore wind ambitions and to facilitate the timely realisation of targets for offshore wind. Therefore, this study answers the following question:

How can public and private stakeholders address the key challenges relating to seaport infrastructure development for offshore wind in the NSEC region and secure the realisation of the offshore wind targets?

The solutions

This study gathered an extensive list of solutions to solve the key challenges. The solutions emerged through literature study, interviews with public and private stakeholders from the entire supply chain as well as a port survey among more than 20 European ports. Some potential actions would be the private sector's responsibility, while other actions require active support from public stakeholders at regional, national or EU level. Collaboration and coordination between public and private stakeholders alike are vital in solving these key challenges.

Objective	Solutions
 <p>Reduce demand uncertainty through increased tender pipeline visibility, collaboration and coordination</p>	<ul style="list-style-type: none"> ✓ Translate ambitions into a shared project pipeline ✓ Collaborate and produce a multi-year strategy ✓ Setting up the dialogue ✓ Programmatic procurement ✓ Optimise sizing and timing of tenders ✓ Early-stage port selection ✓ Early-stage tendering and extension of time towards execution
 <p>Improve business case viability by mobilising investments and strengthening port revenues</p>	<ul style="list-style-type: none"> ✓ Broaden the definition and purpose of TEN-T ✓ Special offshore wind facility under Connecting Europe Facility (CEF) fund ✓ Channel EU Recovery funds and Net Zero Industry Act support to offshore wind supply chain development ✓ European Investment Bank (EIB) focus on offshore wind port development ✓ Use of Cost Benefit Analysis methodology ✓ Value chain collaboration on infrastructure investments ✓ Strengthen port revenues ✓ Develop more attractive revenue models ✓ Build a business case based on multi-purpose revenue ✓ Stimulation of terminal operator models ✓ Revenue support
 <p>Reduce technical development risks</p>	<ul style="list-style-type: none"> ✓ Technology and requirements collaboration for port planning ✓ Locking technology or standardisation to confirm port requirements ✓ Support new logistics concepts to reduce port requirements ✓ Develop and stimulate a multi-port strategy
 <p>Improve spatial use and planning</p>	<ul style="list-style-type: none"> ✓ Futureproof spatial planning ✓ From competition of space to cooperation ✓ Accelerate permitting procedures ✓ Easing legal and administrative procedures ✓ Set Renewable Acceleration Areas for ports
 <p>Create urgency, incentives and collaboration</p>	<ul style="list-style-type: none"> ✓ Government recognition of the sense of urgency and value ✓ Incentivise ports to act ✓ Coordination on securing port capacity needs to be improved ✓ Involvement of European and national governments to drive offshore wind port capacity

Recommendations for action

The solutions that have been collected from this research provide a starting point for further plans and recommendations for actions. This study identifies separate recommendations for three stakeholder groups:

- **Public Sector:** Governments and public bodies should increase demand certainty and facilitate coordination.
- **Private Sector:** Ports and the supply chain need to collaborate on infrastructure needs and secure proper funding.
- **Financial Institutions:** Should have a clear mandate to invest in offshore wind ports, balancing EU grants and public funding to mobilise private investments.

For each group, some recommendations focus on the short term and immediate action for the upcoming peak, while other recommendations are aimed at structural transformation and need more time to implement. This study prioritises the recommendations using the 'Three Horizons Model', a well-established framework for long-term planning that helps to connect the solutions to the common goal of establishing a robust and thriving offshore wind port ecosystem. This model has been adapted to address the challenges and timelines specific to offshore wind port development in the following way:

Horizon 1 – Immediate action: This phase focuses on the immediate actions that stakeholders must take to optimise the existing systems and prepare for the anticipated peak in offshore wind energy deployment between 2029 and 2031. These actions include for instance realising the port infrastructure developments that are already planned to handle short-term demands.

Horizon 2 – Structural transformation: Beginning in the present while focused on the future, this horizon describes actions for a structural transformation of the existing port ecosystem. Serving as a bridge from the near-term to the distant future, the objective is to form a resilient port infrastructure capable of meeting evolving demands in the offshore wind sector.

Horizon 3 – Long-term vision for thriving ports: The final horizon describes the long-term vision of a thriving port ecosystem, where robust and resilient business models for ports are developed, ensuring long-term profitability and suitability. It defines what Horizon 2 works towards.

The approach of the 'Three Horizons Model' is presented in Figure 1. Key is starting with formulating a vision and end-goal, followed by identifying the short-term actions (Horizon 1) and finally the mid-term initiatives (Horizon 2).

Horizon 3: Long term vision formation

Based on this study, the long-term vision for offshore wind port infrastructure should encompass several key elements. First and foremost, in the ideal future, there is clear visibility of demand, not only in terms of volume but also with respect to technical requirements. This will enable better planning and resource allocation to make ports fit for purpose. Secondly, in the future vision ports can develop healthy business cases and sustainable business models to ensure long-term viability and profitability. Lastly, ports and governments have earmarked and reserved space alongside deep-water quays to accommodate the specific needs of offshore wind projects, thereby facilitating efficient operations and future growth. While these elements are important for a thriving port ecosystem, in the end it is up to the ports, governments, financial institutions and supply chain stakeholders to determine their shared vision of an ideal port ecosystem.

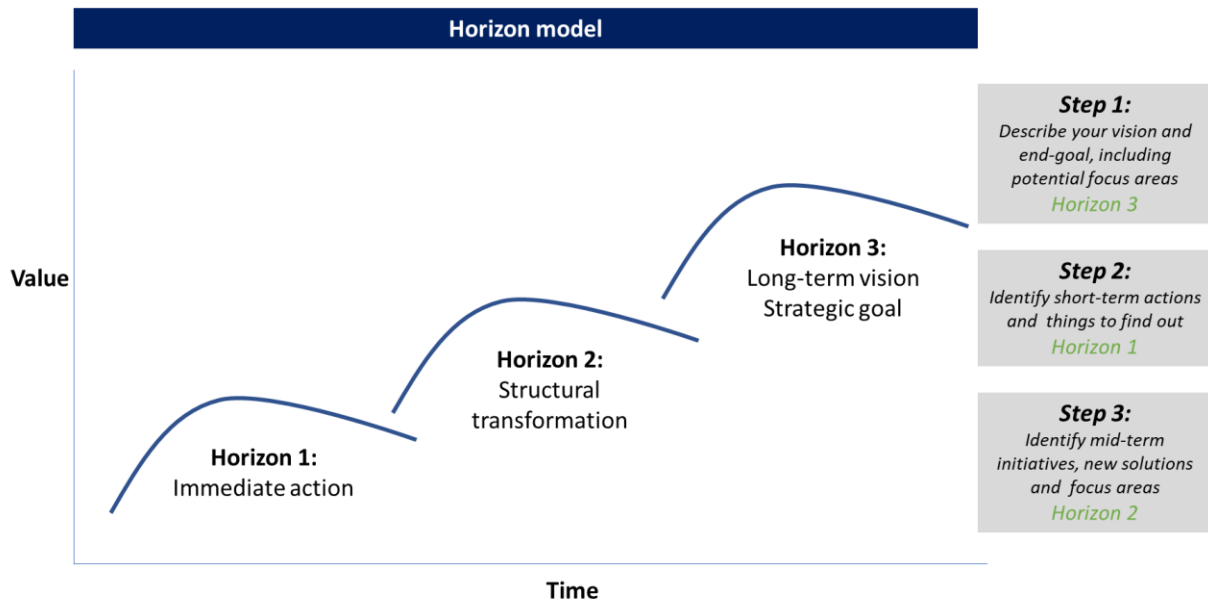


Figure 1: Visualisation of the Horizon Model and how to define the horizons

The following recommendations offer a deep dive into the application of the horizons across the diverse stakeholder landscape in offshore wind energy.

Recommendation for public stakeholders

Increased offshore wind planning, coordination and port integration (Horizon 1 and 2)

To create more demand and investment certainty in the offshore wind industry, this report identifies different actions for public authorities with growing levels of ambition depending on the severity of the bottleneck. For the North Sea, all these levels are part of Horizon 1: immediate action. Other regions could choose a different ambition level if they see fit and for instance realise level 3 on a longer term.

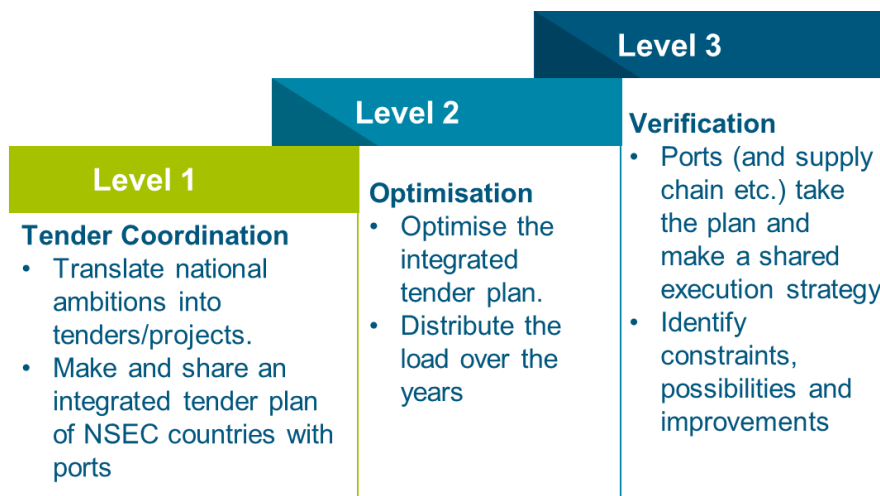


Figure 2: Actions for public stakeholders with different levels of ambition

Public authorities must prioritise the establishment of clear, well-paced, and coordinated plans for their offshore wind ambitions. This will create a healthy investment climate for offshore wind ports to attract the

needed private and public investments. When plans are clear and timelines are predictable companies and investors will be encouraged to commit capital and commercial efforts.

Even without legal guarantees that the tenders will be executed as planned, this approach creates more forward visibility and trust, enabling ports to make investment decisions. The approach will encourage cooperation between ports and supply chain entities to avoid redundancy of facilities and encourage specialization.

Facilitating access to finance (Horizon 1)

To make sure the necessary investments in ports are made, public authorities should actively facilitate improved access to financial resources for ports². This can be accomplished through various initiatives, such as allocating designated funds or offering financial guarantees to port projects, especially when traditional investors are hesitant. Potential (non-exhaustive) ways for earmarking funds or guarantees include:

- Utilising National Investment or Development Funds / Banks as primary financial sources.
- Allocating budgets from targeted national port policy frameworks, such as the UK's FLOWMIS³. These could be initiated based on required national plans for offshore wind (OW) development, potentially influenced by European directives and associated funding.
- Designating proceeds from offshore wind auctions specifically for investments in offshore wind port infrastructure.

European collaboration framework (Horizon 2)

To achieve structural transformation, a permanent collaboration framework needs to be established. A key benefit of the coordination framework is that it creates a platform where key stakeholders can share and discuss bottlenecks and ideas for a more efficient roll out of offshore wind energy. This way, the framework promotes further collaboration and efficiency by discussing specific challenges like lengthy permitting processes or legal complications and sharing solutions. The framework can continue the initiatives started under the tender coordination actions. The following building blocks contribute to successful implementation:

- Clear goal and mandate: Establish a distinct purpose and authority for the framework.
- Acknowledge existing initiatives: Leverage pre-existing dialogues and actions.
- Address uncertainties: Amplify awareness and urgency for public entities to act.
- Stakeholder identification: Identify key players in different regions for effective dialogue.
- Information sharing: Transition from mere overview to active collaboration across various platforms.
- Governance structure: Periodically update the coordination framework.

The collaboration framework can also contribute to formulating a shared vision for the future (Horizon 3).

Recommendation for ports and supply chain stakeholders

Structured industry collaboration (Horizon 1 and Horizon 2)

For private sector development, the key solutions initially focus on improving supply chain collaboration, coordination, and knowledge exchange. Improving industry collaboration will not only improve supply chain development and efficiency but will also result in stronger platforms that can interact with public and financial institutions to improve policy and investments. Three levels of collaboration can be identified for ports and industry stakeholders. Similar to the public actions, the urgency for actions is highest in the North Sea region. For this region it is advised that at least Level 1 and 2 are realised as part of Horizon 1 (immediate action). Discussions around standardisation have already started and are typically associated with longer term structural changes as this will not solve the port challenge for 2030.

² Subject to state aid rules or other fiscal-legal frameworks

³ Successor of the OWMIS (Offshore Wind Manufacturing Investment Support Scheme) focussed on Floating Wind

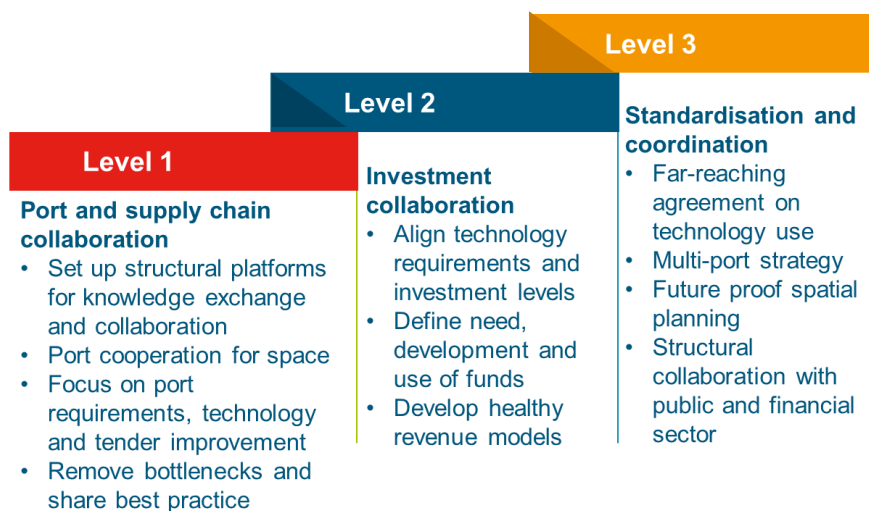


Figure 3: Levels of port and supply chain collaboration

Ports can adopt Adaptive Port Planning. This is a flexible and responsive approach to port development that aims to accommodate changing conditions over time. It is therefore more resilient in the face of uncertainties. This makes it very suitable for offshore wind port development.

Recommendation for financial stakeholders

Establish a specialised finance workgroup

Funding is a key issue for offshore wind port infrastructure. Uncertainty in demand, the lack of an established business model and investment obstacles mean business proposals are often deemed unviable. This study identifies the need for a structured approach to tackle the funding challenges.

Core recommendation: Establish a specialised finance workgroup to mobilise both public and private sector funding for offshore wind port infrastructure, for example, within the NSEC framework or as an EIB taskforce. The workgroup should focus on actions that will tackle lack of funding caused by demand uncertainty and underdeveloped business models:

- Optimise existing financial options and develop best practices.
- Determine solutions to use specific funds from facilities like TEN-T, CEF, or other industry funds.
- Develop port revenue and terminal operator models together with industry players.
- Develop a CBA methodology to highlight wider economic and societal benefits to secure public funding.

This initial support and solution focus should be further defined, discussed and coordinated together with the recommended focus on facilitating access to public finance. This working group should be directly connected to the proposed public and private collaboration framework in order to work demand-driven and to receive signals from the industry. This will create a clear mandate and direction for its efforts. The mentioned actions are a first set of options but depending on the feasibility and the emergence of other solutions the focus of the working group can broaden or change.

By focusing on the establishment of a dedicated finance workgroup, the strategy is to address core funding challenges and create a structured approach for long-term investment in offshore wind port infrastructure.