The Hague Centre
for Strategic Studies

Two Agenda's, One Sea

How security and nature in the North Sea can reinforce each other

Frank Bekkers

July 2026

The Hague Centre
for Strategic Studies

Two Agenda's, One Sea

How security and nature in the North Sea can reinforce each other

Author:
Frank Bekkers

Contributor:
Pieter-Jan Vandoren

Cover image:
De Rijke Noordzee

July 2026

The research was commissioned by the Gieskes-Strijbis Fund. Responsibility for the contents and for the opinions expressed, rests solely with the authors.

This report is an English translation of a publication originally issued in Dutch by HCSS in April 2026: "Twee agenda's, één zee: Hoe veiligheid en natuur op de Noordzee elkaar kunnen versterken". While the translation has been prepared with due care, the Dutch-language version remains the authoritative text. In the event of any differences in interpretation or content between the two versions, the Dutch version shall take precedence.

Table of Contents

1. Introduction

1.1. This report

Economics, security, and ecology have traditionally been treated as separate policy domains, each with its own actors and interests. In the North Sea,[1] however, these domains are becoming closely intertwined, driven by the development of large-scale economic activities and associated offshore infrastructure and set against a dramatically deteriorated international security environment. As a result, spatial planning decisions in the North Sea increasingly require economic, ecological, and security interests to be considered in concert.

This report examines where ecological and security interests may overlap. The analysis shows that better alignment between the security and ecological agendas for the North Sea can yield concrete added value for both sides. The areas of (potential) cooperation include:

1. The use of sensor networks for data collection and monitoring.
2. The development of layered situational awareness reflecting the status of and dynamics on the North Sea in real time and over time, including pattern recognition, significance, and scenario development.
3. The physical and regulatory restriction of human activity in combined hotspots where the protection of critical infrastructure and ecological recovery potentially coincide.
4. Consistent follow-through – oversight and enforcement, incident response – without which the other forms of cooperation remain non-committal and of limited value.

To explore these potential synergies further, this report proposes a number of pilot projects that can demonstrate the feasibility and added value of joint measures at relatively modest cost. A next step would be to bring together the relevant parties to concretely shape one or more of these pilots, and to subsequently initiate them in practice.

[1] Throughout this report, 'the North Sea' refers to 'the Dutch part of the North Sea'. That is, Dutch territorial waters and the Exclusive Economic Zone (EEZ). It should be noted that many of the themes and issues addressed also apply to other littoral North Sea countries.

1.2. **Broader context: national security**

In terms of the National Security Strategy, all national vital interests converse on the North Sea (see text box).[2]

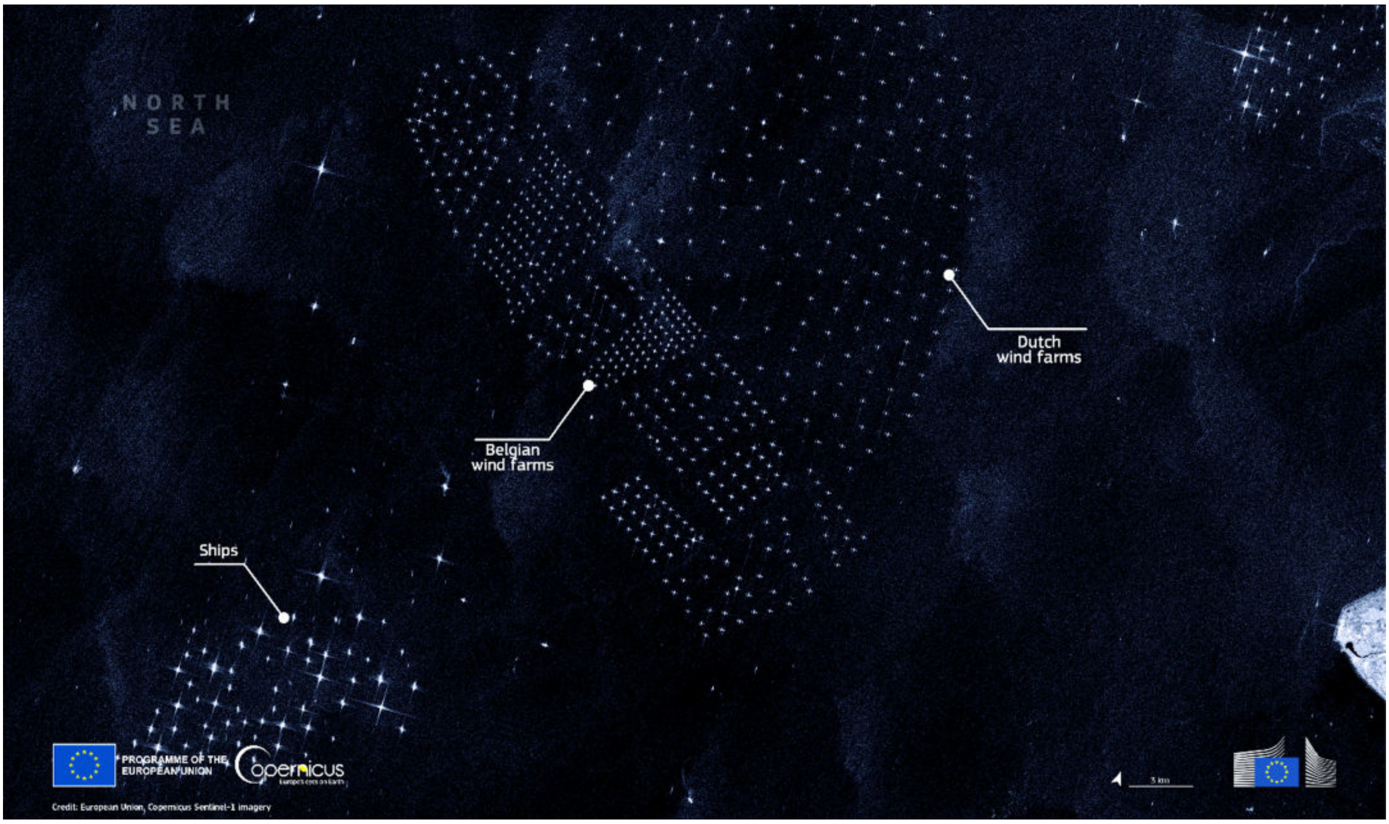
The six national security interests:

1. Territorial security. The unimpeded functioning of the Kingdom of the Netherlands and its EU and NATO allies as independent states in the widest sense, or territorial integrity in a narrow sense.
2. Physical security. The unimpeded functioning of people in the Kingdom of the Netherlands and their surroundings.
3. Economic security. The unimpeded functioning of the Kingdom of the Netherlands as an effective and efficient economy.
4. Ecological security. The unimpeded continued existence of the natural living environment in and around the Kingdom of the Netherlands.
5. Social and political stability. The unimpeded and continued existence of a social climate in which individuals can function without disruption and groups of people enjoy living together within the benefits of the democratic constitutional system of the Kingdom of the Netherlands and values shared therein.
6. International legal order. The proper functioning of the international system of norms and agreements aimed at promoting international peace and security, including human rights and effective multilateral institutions and regimes, as well as the proper functioning of the states bordering the Kingdom of the Netherlands and in direct vicinity to the European Union.

The *international legal order* finds expression in the principle of freedom of navigation, enshrined in the law of the sea (UNCLOS, United Nations Convention on the Law of the Sea), which is essential for the Netherlands as a trading nation. Offshore wind farms strengthen *economic security* by reducing dependence on energy imports and contribute to *ecological security* through the reduction of fossil fuel consumption. Moreover, given its growing economic importance, offshore infrastructure has become a potential target for sabotage by geopolitical adversaries. This brings *physical security* into play, and in the event of an escalating crisis, *territorial security* as well, with an important role for the armed forces in its protection. Sustained large-scale disruption of the economic functions of the North Sea would have considerable consequences for Dutch society, and thereby for *social and political stability*.

[2] Rijksoverheid, *Veiligheidsstrategie voor het Koninkrijk der* Nederlanden, 2023

Figure 1. The North Sea as a strategic space: a satellite radar image of clusters of wind turbines and vessels on the North Sea[3]



The combination of the North Sea's growing strategic importance and rising geopolitical tensions, both globally and within Europe, has generated considerable attention and substantial investment flows directed at maritime security.[4] Such investments may potentially come at the expense of marine nature conservation. At the same time, they present an opportunity: ecological measures may be able to reap the benefits of security investments in the North Sea. This does, however, require that policymakers and practitioners on the ecological side understand how their counterparts on the security side think and operate — and vice versa. This consideration is reflected in the objective of this report.

1.3. Objective and research questions

Point of departure for this report is the necessity of an integrated approach to the North Sea as a strategic space, one in which security, ecological, and economic interests must be jointly considered. The report is oriented toward two, effectively mirrored, objectives and audiences. On the one hand, actors in the ecological domain — policymakers, experts, and practitioners — are made aware of the dynamics surrounding the surveillance and protection of critical North Sea infrastructure. On the other hand, actors in the security domain are alerted to the

3 Offshore wind farms in the North Sea | Copernicus

4 Maritime security encompasses both navigational *safety* and maritime *security*. Whereas, until a few years ago, the focus lay primarily on *safety*, in the current era of geopolitical competition and conflict the emphasis has shifted toward *security*.

opportunities for incorporating ecological considerations and objectives into security tasks and investments. Where the two policy fields are currently insufficiently aligned, this report seeks to foster mutual understanding.

This report addresses three questions, with the first two necessary to answer the central third. The time horizon is approximately two to five years, with a broader forward-looking perspective:

1. What is the security situation in the North Sea, and what measures are being taken or considered to advance it? In other words: what is the security agenda for the North Sea?
2. What is the ecological situation of the North Sea, and what measures are being taken or considered to advance it? In other words: what is the ecological agenda for the North Sea?
3. Where and how can both agendas be better aligned, so that previously separate objectives can be brought into coherence and measures derived from those objectives can reinforce one another?

The report exhibits a degree of asymmetry. Although it seeks mutual reinforcement, the primary angle of approach is how the ecological agenda can be connected to the security agenda, rather than the reverse. This is not intended to position ecology as a secondary concern, but reflects the fact that security currently ranks high on the policy agenda and is generating new dynamics around the development of the North Sea. Riding the momentum of those dynamics may open new opportunities for nature restoration and development on the North Sea. Conversely, security measures benefit from broad societal support, including from an ecological perspective; and environmental legislation may potentially serve as a framework for promoting the physical protection of infrastructure as well.

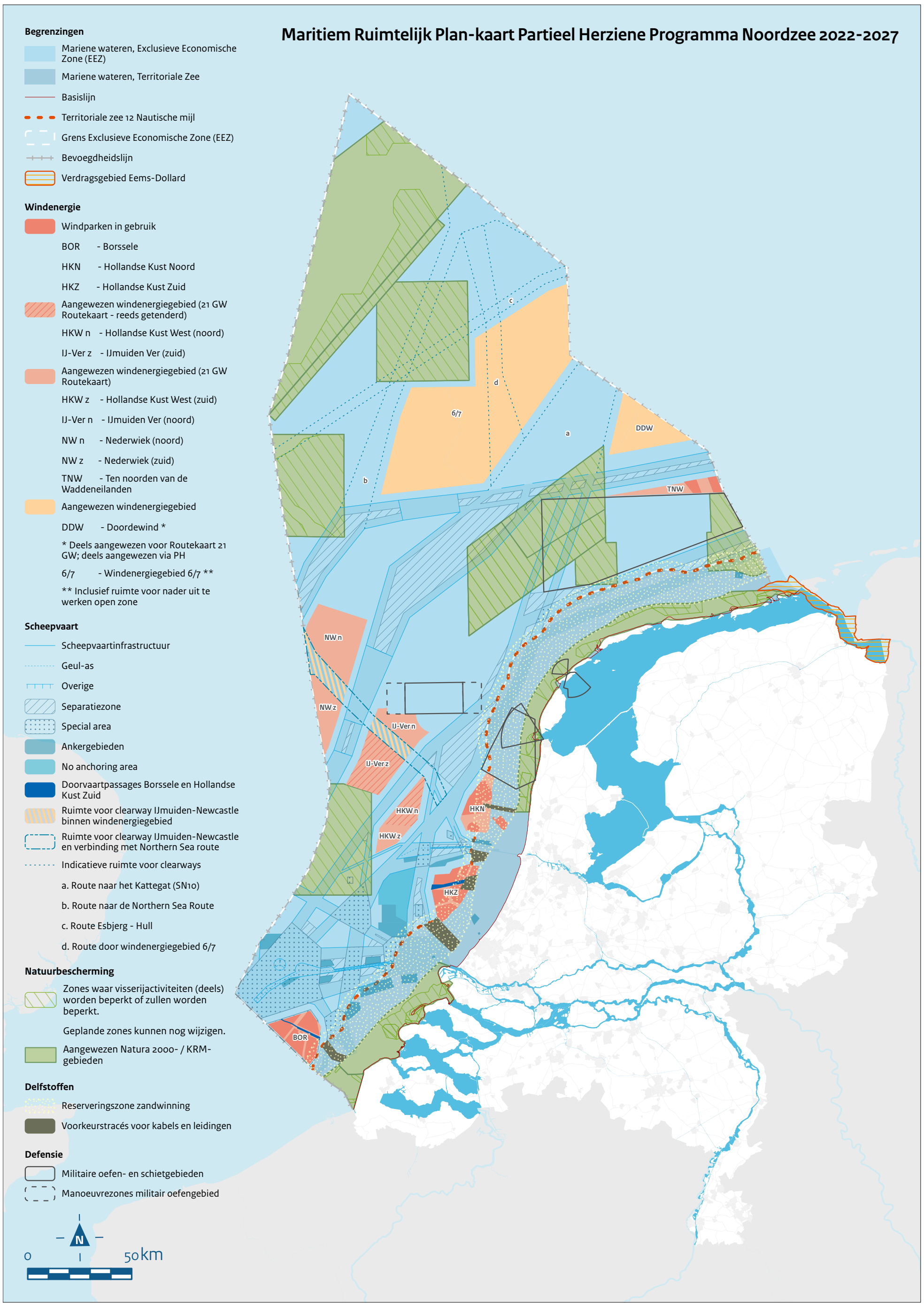
1.4. Approach

This report combines information from three lines of research. The first consists of desktop research based on relevant literature. The second comprises interviews with experts in marine ecology and with officials involved in maritime security from the Dutch Ministry of Defence and Ministry of Infrastructure and Water Management, from knowledge institutions, and from managers of North Sea infrastructure. Most of those interviewed also participated in an expert session held on 10 February 2026. This expert session constitutes the third line of the research approach. The integration of the information derived from these three lines has produced the present report.

2. **Pressure on the North Sea**

2.1. **Uses and developments**

Figure 2. Current usage of the North Sea[5]



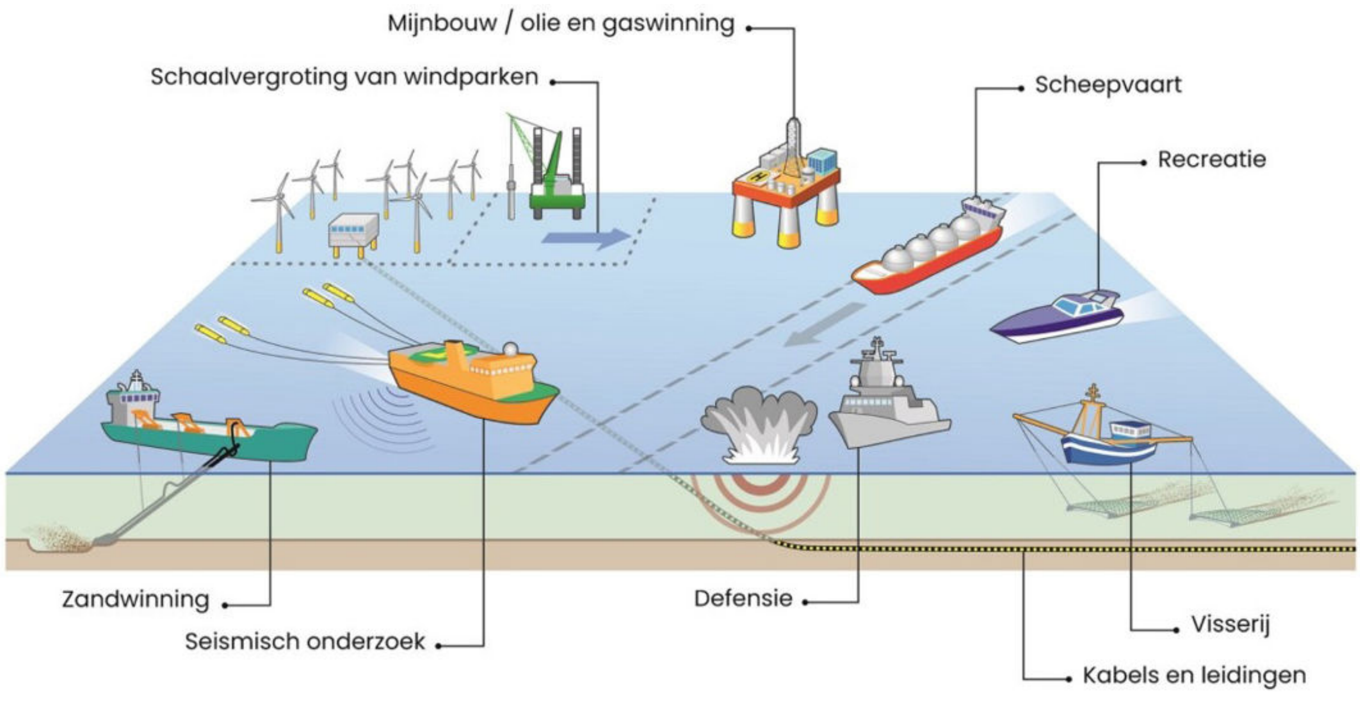
---

5 *Programma Noordzee 2022-2027*, p5.

The North Sea is becoming increasingly congested. The spatial footprint of wind farms in particular is growing rapidly. The target of 21 GW of offshore wind capacity by 2032 (up from the current 5 GW) will claim around 6% (roughly 3,800 km²) of the Dutch part of the North Sea. The Netherlands' ambition of a fully CO_2-neutral energy system by 2050 requires 70 to 72 GW of installed capacity (the total amount of electricity that turbines can collectively produce at full output). This would imply that an estimated 12.5% of the Dutch part of the North Sea is given over to wind farms. To this must be added plans for, among other things, floating solar panels, hydrogen production installations, and shellfish or seaweed cultivation, adding thousands of fixed structures after 2032. At the same time, the average size of vessels is increasing, although current projections suggest that the number of ship movements will remain broadly stable.

The allocation of scarce space on the North Sea thus constitutes an ever more complex puzzle: shipping corridors running alongside turbine clusters; migration routes of birds, bats, and fish affected by noise and light regimes; military exercise areas interacting with other uses; emergency procedures made more complicated by overlapping zones; and so on.

Figure 3. Many different activities on the North Sea (source: Stichting de Noordzee)[6]



As noted, this report brings together an economic, security, and ecological perspective on the spatial planning of the North Sea. The following sections set out what this report specifically understands as the economy, security, and ecology of the North Sea.

6 Voorkom een botsing tussen natuur en klimaat in de Noordzee - Stichting De Noordzee

2.2. **The Economy of the North Sea**

The economy of the North Sea encompasses the totality of economic activities at sea. The economic value of the North Sea was estimated at €25 billion in 2022 (equivalent to 4% of GDP)[7] and is set to grow substantially in the coming decades, driven in particular by the energy transition. The principal elements of the North Sea's economic value are as follows.

Maritime traffic. The Dutch seaports are major hubs in the global maritime trade network. The shipping routes on the North Sea are among the busiest in the world: approximately 250,000 vessels navigate the Dutch part of the North Sea annually, of which 50,000 call at a Dutch port.[8] The role of digital arteries is also growing. The North Sea hosts numerous data cables connecting countries and continents, and the existing network is set to expand further over the coming decade.

Offshore wind. The most consequential is the North Sea's steady development as a maritime energy park. Offshore electricity production will grow substantially in the coming decades. This development strengthens the strategic autonomy of the Netherlands and Europe by reducing dependence on fossil fuels and enhancing energy security. For 2040, the target is between 30 and 40 GW – sufficient to generate electricity for all households in the Netherlands.[9] The coalition agreement of the Jetten government states: "To ensure clean energy from domestic sources, we will continue to invest in offshore wind through Contracts for Difference for 40 GW."[10]

Sand extraction. Sand extraction in the North Sea is substantial and structural: approximately 25–30 million m³ per year.[11] It serves coastal defence as well as construction- and infrastructure-related land raising and reclamation. With a quarter of the Netherlands lying below sea level, the continuous maintenance of around 250 kilometres of coastline and a total of roughly 3,500 kilometres of primary flood defences, protecting against the sea, rivers, and lakes, is essential to our physical security.[12] Recent insights have highlighted the limitations of traditional beach nourishment, as more frequent storms may reduce its effectiveness and require larger volumes – volumes that may, moreover, be insufficient available in the North Sea. The principal environmental pressures from sand extraction are physical seabed disturbance, habitat disruption, turbidity plumes, and longer-lasting or potentially permanent morphological changes.

Raw materials. The North Sea is an important source of raw materials and food:

- The volume and significance of offshore gas and oil extraction is declining, but will persist for at least the next five to ten years. The coalition agreement states: "[...] we will continue to extract gas from the North Sea."[13]
- Dutch bottom-trawl fisheries — with their devastating impact on seabed habitats and associated disruption of food webs and nutrient cycles, the ecological bête noire of North

---

7 *Programma Noordzee 2022-2027*, p.23.

8 Inrichting Noordzee – De Koninlijke Vereniging van Nederlandse Reders. These figures concern AIS-visible shipping traffic and primarily relate to route-bound maritime shipping.

9 Ministry of Climate and Green Growth, *Windenergie Infrastructuurplan Noordzee*, 2025

10 *Aan de slag. Bouwen aan een beter Nederland. Coalitieakkoord 2026-2030*, 2026, p.24

11 RWS, *Overzicht activiteiten en berekening hydrografische verstoring*, 2024

12 Veiligheid primaire waterkeringen, 2001-2023 | Compendium voor de Leefomgeving

13 *Aan de slag. Bouwen aan een beter Nederland. Coalitieakkoord 2026-2030*, 2026, p.24

Sea use — have declined by approximately 70% since 2000 (with a further 5% decrease in 2024 relative to 2023).[14] The most plausible outlook for the next five to ten years is a continued shift away from trawl nets, more area closures, nature restoration measures, and further spatial pressure from large-scale wind energy.

- Aquaculture (mariculture) is currently very limited but may expand; the future outlook, however, remains incomplete.

Carbon Capture and Storage (CCS). The capture and storage of CO_2 is an important component of the energy transition and necessary to meet climate targets. Two projects currently under development, Porthos and Aramis, are intended to store CO_2 from industries in the Port of Rotterdam in depleted gas fields beneath the North Sea. Porthos is expected to become operational from 2026 and Aramis from 2028/2029.[15] The coalition agreement states: "The storage of CO_2 (CCS) in the North Sea will also be necessary, and the government will therefore invest in it through its participations in CO_2 storage and CCU."[16]

Offshore hydrogen production. The development of offshore electrolysis capacity – the process that splits water into oxygen and hydrogen – has been scaled back by the previous cabinet. Due to higher costs and lower demand, the target of 3–4 GW of electrolysis capacity by 2030 has been pushed back to 2035.[17] The concept of hydrogen production near offshore wind farms, using existing natural gas pipelines to bring hydrogen ashore, nonetheless remains valid, with large-scale offshore hydrogen production being a possibility from the late 2030s onwards. The current government confirmed this direction: "We will continue to pursue the production of green gas and green hydrogen. We will invest in green hydrogen production and delivery."[18]

2.3. Security of the North Sea

Infrastructure protection. The North Sea is increasingly important to our economy, but also structurally more vulnerable. Accidents and deliberate sabotage or espionage pose real threats to our maritime trade routes, offshore energy supply, and global digital connectivity, and thereby to the continuity of our society. The acts of sabotage targeting the Nord Stream pipelines and various communications and electricity cables in the seas around Northwest Europe have made maritime security a defining theme in the development of the North Sea. The recent developments surrounding efforts to counter the Russian shadow fleet further underscore the urgency. Maritime security requires real-time integration of sensor data, patrol reports, and intelligence into an up-to-date maritime situational awareness on the one hand, and 24/7 response capacity on the other.

Following a Parliamentary motion of November 2021,[19] a government-wide Strategy for the Protection of North Sea Infrastructure and an accompanying action plan were developed.[20] In 2023, the Programme for the Protection of North Sea Infrastructure

14 Inzet visserijtechnieken Nederlandse kottersector, 2024 | Compendium voor de Leefomgeving

15 Porthos and Aramis are the biggest CCS-projects in the Netherlands

16 *Aan de slag. Bouwen aan een beter Nederland. Coalitieakkoord 2026-2030*, 2026, p.24

17 Ministry of Climate and Green Growth, Klimaat- en Energienota 2025, p.43 resp. p.8.

18 *Aan de slag. Bouwen aan een beter Nederland. Coalitieakkoord 2026-2030*, 2026, p.24

19 Parliamentary document (Kamerstuk) 35925-X, nr. 91 | Overheid.nl > Officiële bekendmakingen. The motion was partly based on the issues raised in the HCSS report *The High Value of The North Sea*, 2021

20 Actieplan Strategie ter bescherming Noordzee Infrastructuur | Rapport | Rijksoverheid.nl

(*Programma Bescherming Noordzee Infrastructuur*; PBNI) was launched.[21] Under the coordination of the Dutch Ministry of Infrastructure and Water Management, a number of ministries collaborate within PBNI alongside private parties to improve detection capabilities, enhance resilience, promote international cooperation, and better align the division of responsibilities. The Ministries of Defence and of Infrastructure and Water Management in particular are investing in personnel and resources for maritime security.

The Coast Guard operates as a cooperative network organisation with six commissioning ministries and eight executive services operating jointly under the Coast Guard flag.[22] For its operational tasks, the Coast Guard has only limited resources of its own, relying primarily on the assets and personnel of its partner organisations. In addition to its traditional tasks of assistance, service provision, and enforcement, the Coast Guard was assigned the maritime security task from 2020 onwards. The core Coast Guard organisation itself (apart from the contributions of the cooperating services) has nearly doubled in recent years to approximately 120 staff and is also gaining access to additional assets.

Figure 4. Coast Guard patrol vessel Barend Biesheuvel, focused primarily on fisheries control (source: Kustwacht.nl)

[21] Programma Bescherming Noordzee Infrastructuur - Noordzeeloket

[22] The ministries are: Defence (management); Infrastructure and Water Management (coordination); Justice and Security; Finance; Agriculture; Food Security and Nature; and Economic Affairs and Climate Policy. The executive agencies are: Customs, Royal Netherlands Marechaussee, Police, Fiscal Information and Investigation Service (FIOD), Rijkswaterstaat, Netherlands Food and Consumer Product Safety Authority (NVWA), Human Environment and Transport Inspectorate (ILT), and the State Supervision of Mines (SodM).

Defence is becoming increasingly active on the North Sea. Traditionally, Defence has supported the Coast Guard with vessels, aerial platforms, and personnel for maritime security tasks. Support to the civil authorities is being extended, while at the same time Defence's own role in protection of the Netherlands against state-level threats is being given more substance.[23] This is connected to the fact that security risks on and around the North Sea are increasingly state-based and hybrid in nature: espionage, sabotage of critical offshore infrastructure, next to military pressure and escalation risks in the North Sea region. Such risks and threats require core military capabilities including maritime situational awareness, intelligence gathering, and armed response options – capabilities in which Defence is making considerable investments in the coming years.

Specifically for maritime security, the government has reserved a contribution of €146 million for 2026–2037 from the Ministry of Infrastructure and Water Management; in addition, the Coast Guard has been strengthened by €44 million in recent years, while Defence applies an investment bandwidth of €50–250 million for additional radar capacity on the North Sea. Despite these recent investments, it can be concluded on the basis of various sources that insufficient resources are available for adequate 24/7 navigational safety and emergency response, oversight and enforcement, and maritime security in the Dutch EEZ, while the governance arrangements for North Sea security are also insufficiently clear and effective.[24] Improvement plans are being developed, though the extent to which these plans will be adequately funded and will translate into effective governance models remains to be seen.

Infrastructure operators. Where government actors safeguard and enforce maritime security, the (private) managers and operators of wind farms, platforms, cables, and other North Sea infrastructure make this practically feasible and manageable. Their role is threefold:

1. Prevention: they must design and operate their infrastructure safely, traditionally in terms of safety but increasingly also in terms of security (security-by-design).
2. Operational management and monitoring: they submit plans, maintain safety provisions, and monitor infrastructure using radar, cameras, and drones, among other means, to prevent accidents or illegal activity, in coordination with nautical management authorities and the Coast Guard.
3. Incident response: they report dangerous situations or violations of security zones and are engaged by the Coast Guard in response to threats and incidents in their vicinity.

It should be noted that the security orientation of operators is locally focused on the operational safety and security of their own infrastructure. This differs markedly from the maritime security role of parties such as Defence and the Coast Guard, which is directed at the totality of activities and infrastructure on the North Sea, both within the Dutch EEZ and in an international context. The two perspectives complement one another.

Industrial policy. Finally, it is worth noting that the Dutch government pursues an active industrial policy in which economic strengthening is directly linked to national security interests

[23] Defensie krijgt grotere rol bij bescherming infrastructuur Noordzee | News report | Defensie.nl

[24] See Parliamentary document (Kamerstuk) 33450, nr. 118 | Overheid.nl > Officiële bekendmakingen, which reports an imbalance between tasks and resources of the Coast Guard; Parliamentary questions (Kamervragen; Appendix) 2023-2024, nr. 2399 | Overheid.nl > Officiële bekendmakingen, which raises the issue of the limited available capacity for enforcing the sanctions against Russia; The Dutch Safety Board (OVV) report *Hulpverlening Fremantle Highway* (2025), which shows that the maritime security and incident response structure is still not sufficiently in order; and the ABD Topconsult report *Advies voor de governance van maritime security op de Noordzee* (2025), which discusses bottlenecks in the governance regarding the protection of critical North Sea infrastructure.

in the North Sea. The Defence Industry Strategy and the Sector Agenda for the Maritime Manufacturing Industry describe the strategic role of the maritime sector that justifies government intervention in the form of industrial policy.[25]

The security agenda for the North Sea is elaborated further in Appendix A.

2.4. Ecology of the North Sea

Three distinguished layers. The North Sea holds great ecological value for the Netherlands as a breeding environment and migration route for fish, and as a provider of ecosystem services including food supply, water purification, nutrient cycling, coastal protection, and carbon storage in seabeds and food webs. The totality of life in the North Sea ecosystem – the ecological term is biota – is distributed across three layers, each representing a different part of biodiversity and each affected differently by human activities:

1. Above the sea: foraging habitat for seabirds and migration route for migratory birds and several bat species. This layer is important for migration, rest, and foraging, and interacts with wind farms, shipping, and other human activities at sea.
2. The water column: where plankton develops as the basis of the marine food web, with an important role for fish larvae and migratory fish. This layer interacts with shipping, fisheries, wind farms, and discharges.
3. On and in the seabed: habitat for species in and on the sediment, important for nutrient dynamics, sediment structure, and food availability. This layer is affected by fisheries, sand extraction, and seabed disturbance. It should be noted that the placement of structures (such as wind turbine foundations) in the water column gives rise to new hard-substrate communities that would normally inhabit the seabed.

Ecosystem under pressure. Historically, large-scale degradation of the marine ecology began with the growth of fish catches from the late medieval period onwards. In the twentieth century, the effects intensified through the industrialisation of fisheries, pollution, and eutrophication — the process by which water bodies become excessively enriched with nutrients such as nitrogen compounds and phosphate. Multiple stressors interact cumulatively: climate change (warming and acidification), seabed disturbance and bycatch, chemical substances, plastic and microplastics, underwater noise, invasive species, and spatial pressure from sand extraction and offshore infrastructure. This combination affects species populations and degrades habitat quality.

Fisheries in particular have historically caused considerable ecological damage. The intensification of fishing has led to a decline in fish biomass, large-scale sediment disturbance, the loss of ecosystem engineers, and the simplification of habitat structure on and in the seabed.[26] Regulation and technical innovations have locally reduced these pressures, but the historical effects continue to weigh heavily on the currently worrying ecological condition and diminished resilience of the system.[27]

---

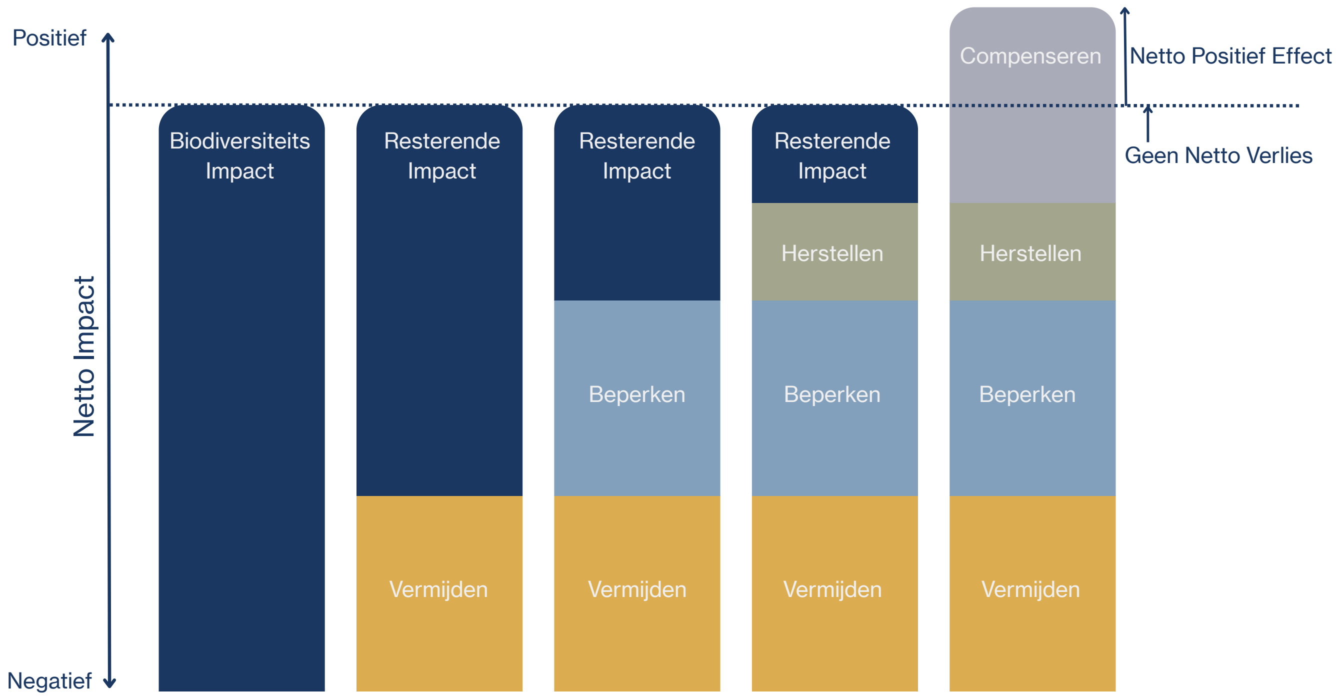
25 *Defensie Strategie voor Industrie en Innovatie 2025-2029, 2025; No Guts, no Hollands glorie! Sectoragenda Maritieme Maakindustrie*, 2023

26 Netherlands Environmental Planning Agency (*Planbureau voor de Leefomgeving*), *Natuurkwaliteit en biodiversiteit van de Nederlandse zoute wateren*, 2010.

27 Aandeel grote vissen in de Noordzee, 1983-2017 | Compendium voor de Leefomgeving

Mitigation strategies. While the marine environment might be best served by curtailing human activities on and around the North Sea, in many cases it is an illusion to think this will be achievable. Where (additional) activities cannot be avoided, other strategies must be employed. First, limiting the ecological damage caused by those activities. Second, remedying the damage inflicted, whether on a one-off basis or through an ongoing restoration programme. Third, compensating for ecological damage by creating alternative natural values. In combination, these strategies can produce a net positive effect — meaning not merely ecological compensation for the activity in question, but also the restoration of an already impoverished system or the reintroduction of lost species. Figure 5 illustrates this.

Figure 5. Different strategies for limiting or compensating ecological damage



As an example: the construction of wind farms inevitably causes ecological disruption, but at the same time creates opportunities to apply the three strategies outlined above in a targeted manner:

1. Through the choice of location, timing, and technique, damage can be minimised, for instance by avoiding ecologically sensitive areas, using noise-reducing foundation techniques, and scheduling works outside vulnerable breeding periods.
2. Temporary disturbances can be followed by targeted restoration, such as encouraging natural recolonisation or the active reintroduction of habitat-structuring species in and around the wind farm.
3. Wind farms can serve as a vehicle for new natural values, for example by excluding bottom-trawl fisheries, applying nature-inclusive design (reef structures, substrate variation), and enhancing habitat functions for particular species.

It should be noted that the current plot decisions for the construction and operation of wind farms already include various measures to limit ecological impact, such as standards for noise levels and nature-inclusive construction.

Long-term contribution to strategic autonomy. An ecologically healthy North Sea can contribute to reducing certain import dependencies and is thus directly connected to economic security in a strategic sense. The greatest and most realistic contribution lies in (1) strengthened protein supply (fish, shellfish, and in part seaweed) and (2) the extraction of marine biobased materials. A caveat regarding the latter is that large-scale extraction faces considerable challenges in terms of scaling, costs, processing technology, and consistent quality. The most plausible role is in strategic niches and as a means of risk diversification.

Historical parallel: from seaweed to gunpowder

During the First World War, the ocean unexpectedly became a strategic arsenal. Before 1914, Germany virtually controlled the entire global trade in potash (potassium salts), a substance essential both for artificial fertiliser and for the production of black gunpowder and other explosives. When Germany imposed an export embargo upon the outbreak of war, the United States, its largest customer, was abruptly cut off from this critical raw material. As an alternative, attention turned to the vast kelp forests along the Californian coast. Giant kelp (Macrocystis) contained high concentrations of potassium salts and proved convertible into potash and acetone through drying, burning, or fermentation. This made it possible to continue the production of gunpowder and cordite. In short order, an entirely new industry emerged which, though temporary, became the largest ever devoted to the processing of seaweed. The Hercules Powder Company in particular constructed enormous processing facilities that harvested, fermented, and chemically separated kelp into potash, acetone, and other substances deployed directly in the war industry. Between 1915 and 1917, 23,000 tonnes of cordite and 2,500 tonnes of acetone were exported to British munitions factories. Marine biomass had thus become an instrument of geopolitical resilience. Although the kelp industry collapsed rapidly after 1918 once German imports became available again, this episode demonstrates that the ocean can function as a source of strategic autonomy in times of crisis.[28]

The ecological agenda for the North Sea is elaborated further in Appendix B.

2.5. **Sub-conclusion**

The three perspectives on the North Sea reveal growing tensions between economic, ecological, and security interests that call for explicit choices. Yet precisely because these interests partly converge — as elaborated in the following chapters — integrated spatial planning offers more than mere compromise: the three perspectives can genuinely reinforce one another.

[28] Peter Neushul, *Seaweed for War: California's World War I Kelp Industry*, 1989

Key actors in North Sea security such as the Coast Guard (as a cooperative framework of six ministries and eight executive services), Rijkswaterstaat (Directorate-General for Public Works and Water Management), and Defence are accustomed to operating in a multi-stakeholder environment in which diverse interests are weighed in operational and administrative decision-making. In the context of this report, this is significant because incorporating ecological considerations to a greater degree than in the past fits naturally into this already established way of working.

Conversely, the ecological agenda also offers entry points for connection with the security agenda. A robust ecological information base partly coincides with the information required for situational awareness around North Sea infrastructure. In addition, ecological and environmental legal frameworks set conditions for spatial planning, use restrictions, monitoring, permitting, oversight, and enforcement. This provides an institutional foundation in which ecological protection and maritime security can reinforce one another, without their respective policy objectives needing to converge.

3. Four task areas with synergy potential

This chapter discusses four task areas in which security and ecological objectives on the North Sea can reinforce one another: monitoring, situational awareness, protection, and enforcement.[29] It should be noted that these task areas form part of an interconnected chain and in practice overlap considerably. Measures frequently serve multiple task areas simultaneously: a patrolling vessel for instance, contributes to monitoring, helps build situational awareness using the data gathered, and can intervene in the event of incidents. Sections 3.2 through 3.5 elaborate the synergy potential for each task area, forming the basis for Chapter 4 (concrete opportunities). First, however, Section 3.1 addresses the geographic overlap between the security and ecological agendas.

3.1. Overlap in geographic interest

Both security and ecology are relevant at the scale of the North Sea as a whole and require coordination between North Sea countries and within the EU. At the same time, risks and restoration potential concentrate locally in hotspots where functions and vulnerabilities converge.

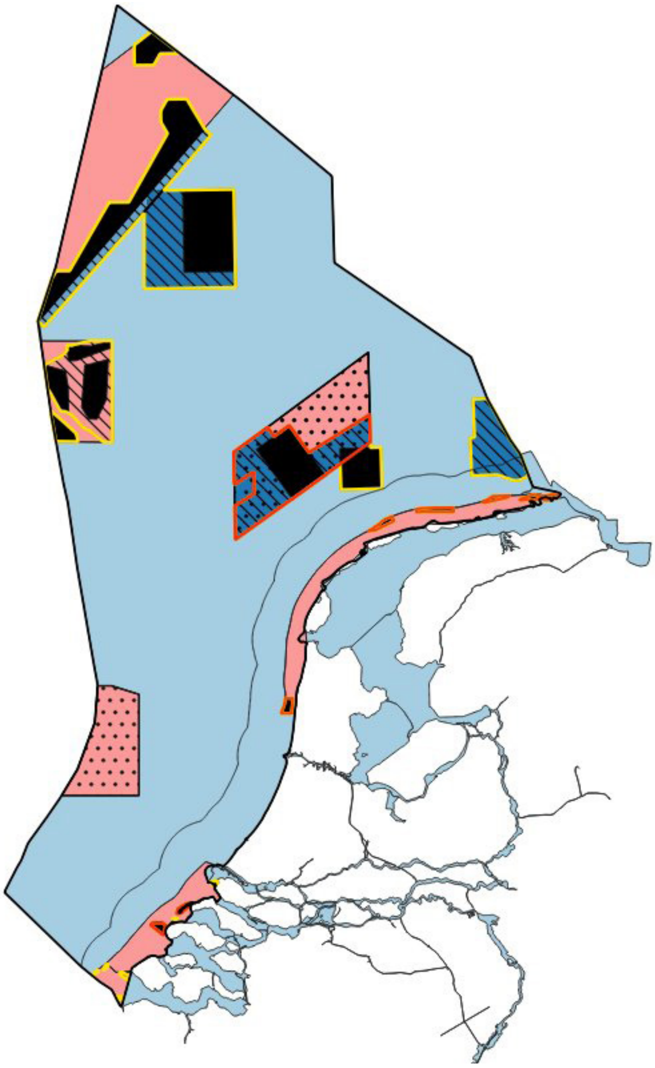
Ecological hotspots include, among others, zones with fisheries restrictions; see Figure 6. Legend:

- Salmon pink = Natura 2000 area.
- Dark blue = MSFD area (Marine Strategy Framework Directive).
- Black = closed to bottom-trawl fisheries.
- Diagonal hatching = to be closed (possibly by end of 2026) to bottom-trawl fisheries.
- Dots = to be closed (possibly by end of 2026) to fixed-net fisheries.
- Red outline Frisian Front = to become (possibly by end of 2026) a no-fishery zone.
- Red outline Frisian Front = to become (possibly by end of 2026) a no-fishery zone.
- Yellow outline = possible areas for extending the no-fishery zone with additional measures for water-column fisheries.

Security hotspots primarily concern areas with important nodes in offshore infrastructure. These are often also ecologically relevant in that they: (1) Restrict use (transit, anchoring, and fisheries), which can support ecological recovery; (2) add hard substrate, such as rock dumping around cables, which can facilitate species settlement and habitat formation; (3) link mitigation and compensatory nature measures to permitting requirements for the construction and use of infrastructure.

[29] This classification aligns with common security models in which detection, interpretation, response, and protection are distinguished as separate functions.

Figure 6. Various closed areas (source: Stichting de Noordzee)



Hotspots with combined security and ecological importance include:

- Cable corridors and cable crossings. Important telecommunications and electricity cables connect the Netherlands with the United Kingdom, Norway, and other North Sea countries. Cable crossings, where cables are locally buried at shallower depths, are vulnerable points for accidental damage and deliberate disruption. Restrictions on anchoring and fisheries, for example, reduce the risks of damage and sabotage while simultaneously creating opportunities for targeted nature development.
- Transformer platforms. These platforms form nodes for the transport of electricity from wind farms to shore; their sabotage has a significant impact on the stability of the national electricity grid. Safety zones apply around these platforms, enabling enforcement and the restriction of certain activities. In addition to existing 700 MW platforms, TenneT is developing 2 GW platforms for further rollout from 2029, which would more than double the current number of seven platforms in the Dutch EEZ.
- Oil and gas platforms and pipelines. The Dutch sector contains approximately 185 oil and gas platforms, of which around 67 are decommissioned or abandoned/dismantled

(reference year 2021).[30] An extensive pipeline network connects these platforms to the coast. In addition, there is the bidirectional BBL gas pipeline (Balgzand-Bacton Line) between the Netherlands and the UK, and several gas pipelines from Norway run through the Dutch EEZ to final destinations in Germany, Belgium, and France.

- Wind farms. The offshore wind roadmap provides for approximately 21 GW of installed capacity by 2032; see Figure 7. This would require approximately 1,700 wind turbines (670 installed as of 2025), leading to a further spatial concentration of infrastructure and zones with use restrictions.

Figure 7. Route map off-shore wind until 2032[31]

[30] Nexstep, *Re-use & Decommissioning report 2022*, 2022

[31] Ministry of Infrastructure and Water Management, *Beleidsadvies scheepvaartveiligheid windparken op zee*, 2025, p.6.

3.2. **Monitoring**

Definition. Monitoring is the regular or continuous collection and analysis of data on the condition of and activities in the North Sea, above, on, and below the water. Sources include radar, sonar/hydrophones, AIS, camera and satellite imagery, open sources, and intelligence. By comparison with a baseline picture — see Situational awareness, section 3.3 — anomalous patterns can be detected.

Possible overlap and synergy in the requirements that ecologists and security actors place on monitoring in order to map the condition of and activity on the North Sea:

- Data**.** Both domains require information on physical conditions (such as currents, wave action, visibility, temperature, and noise levels), although the relevance of specific parameters differs.[32] Much of this information is provided by the Hydrographic Service (see text box). Both are interested in human activities, but with different emphasis: ecologists primarily in relation to pressure factors such as seabed disturbance and disruption, and security actors primarily in relation to anomalous behaviour and risks to critical infrastructure. Ecologists additionally require data on biodiversity and habitat conditions; security actors have a partial interest in these as well, partly on account of environmental regulations.
- Resolution. In broad terms, both sides require high spatial and temporal resolution, particularly around hotspots.
- Continuity. Both domains require continuous or high-frequency observation. For ecology, time series are necessary to detect trends and long-term changes. Security actors place emphasis on (near) real-time situational monitoring, with the accumulation of time series serving as the basis for pattern recognition and anomaly detection. Compared to ecological applications, security requirements more frequently include the additional need to zoom in rapidly in the event of possible incidents, for example, through higher sampling rates and the targeted deployment of mobile sensors.

32 From a security perspective, measurements are currently mainly taken above, on, or just below the water surface, while for ecology measurements in the water column and at the seabed are also relevant. With an increasing threat of (unmanned) underwater platforms, underwater measurements are also becoming more important from a security perspective.

The **Hydrographic Service** of the Royal Netherlands Navy has as its primary task the mapping of the seabed and the production of nautical charts and publications for safe navigation.[33] Specifically for military purposes, the Service provides information for mine countermeasures, submarine operations, and amphibious operations. The Service conducts structural measurements in Dutch waters (and ad hoc beyond them), collecting the following data:

- Water properties: temperature, salinity, currents, and tidal movements.
- Magnetic measurements, important for compass navigation and the detection of objects such as shipwrecks or munitions.
- Gravity measurements providing information on density variations in the subsurface.
- Geodetic data for accurate positioning and reference points at sea.
- Obstacles and hazards: wrecks, pipelines, cables, reefs, and other navigational hazards.
- Coastlines and harbours: detailed information on coastal contours and harbour areas.

It should be noted that some data are measured but not retained (for extended periods), and that in particular in recent times there has been critical scrutiny of whether measurements are actually being used. Detailed current measurements, for instance, were discontinued in 2024.

Beyond their incorporation into nautical charts, source data have traditionally in principle been shared on request. A shift is now visible, as part of this information is increasingly regarded as sensitive in the current climate. This may result in restrictions both on the data shared and on the recipients. Data is also made available at lower resolution to prevent the precise localisation of, for example, cables and pipelines.

There is some overlap with the programme for Monitoring the Hydraulic State of the Country, in which Rijkswaterstaat collects, among other things, morphological information in the sea access channels and within the 12-nautical-mile zone.[34] The Hydrographic Service and Rijkswaterstaat collaborate closely within the Netherlands Hydrographic Institute (NHI), jointly developing national standards for hydrographic surveys. Both also provide access to marine data through the Marine Information House (see below), with data remaining as far as possible with the original data holder.

Platforms for information sharing. An essential precondition for creating greater synergy between ecology and security is the sharing of data and information. Various existing initiatives and platforms can be utilised for this purpose and potentially be expanded; see Table 1.

33 Dienst der Hydrografie | Koninklijke Marine | Defensie.nl

34 Monitoring | Waterinfo Extra

Table 1. Initiatives and platforms for information sharing about the North Sea

Initiative / platform	Description
Noordzeeloket[35]	A public platform providing information on the various functions and uses of the North Sea, including cables and pipelines, wind energy, and data collection.
Data Rijkswaterstaat[36]	A public meta-platform providing an overview of the data collected by Rijkswaterstaat on (among other things) the North Sea, as well as the various websites and viewers through which this data can be accessed.
Information Provision (IV) at Sea[37]	A Rijkswaterstaat programme that develops facilities to meet the growing information and communication needs on the North Sea.
Marine Information House (IHM)[38]	A platform that makes marine data, information, and research findings on the North Sea accessible. The IHM collects and shares information from various ministries, including Infrastructure and Water Management (Rijkswaterstaat), LVVN, and Defence (Hydrographic Service).
Maritime Information Provision Service Point (MIVSP)[39]	A platform managed by Rijkswaterstaat that enables different parties to make observations and share data reliably, such as wind speed, wave height, water temperature, currents, bird and bat routes, and vessel movements in and around wind farms. MIVSP installs nautical radars, wave height meters, wind and temperature gauges, bird radars, and bat detectors on wind farm grid connection platforms. TenneT provides the platforms and fibre-optic connections; Rijkswaterstaat handles installation, management, and maintenance.
Digital Ecological Monitoring (DEM)[40]	A project focused on monitoring the ecological carrying capacity of the North Sea, housed within the MIVSP. Both form part of the IVopZee programme.

These sharing initiatives reveal the absence of a single organisation with clear data responsibility that serves as a gateway or hub for finding and sharing all relevant data from the public, public-private, and private parties involved, more easily and effectively. Such an organisation would also need to understand the different classification levels, be able to create and maintain them, and share data with particular parties in full, partially, or not at all, according to agreed arrangements. It would further need to be capable of identifying connections between data and projects and making these visible in a consolidated overview.

Dual-use sensors. Sensors at sea are costly and maintenance-intensive. The North Sea places high demands on equipment due to weather, wave action, and a corrosive, saline environment. Underwater sensors are additionally affected by biofouling, which impairs their functioning and limits their lifespan. Sensors therefore require regular maintenance, cleaning, and replacement. Some sensors can be mounted on existing infrastructure, though it has in practice proved difficult to install underwater sensors on, for example, wind turbine foundations. Other applications require purpose-built platforms such as buoys or drones. By sharing the costs of sensor and platform development, deployment, and maintenance, coverage can be increased within an unchanged budget.

Preconditions. Combined civil-military data utilisation requires explicit agreements on access and classification, responsibilities and financing, data quality, metadata, and auditability. Appropriate levels of abstraction (aggregated and/or anonymised) are necessary, as are cybersecurity-by-design and agreements on supply chain risks.

35 Home | Noordzeeloket
36 Home | Data Rijkswaterstaat
37 Rijkswaterstaat en de digitalisering van de Noordzee | Digitale Noordzee
38 Home | Informatiehuis Marien
39 Maritiem Informatievoorziening Servicepunt | Digitale Noordzee
40 Project Digitalisering Ecologische Monitoring (DEM) | Digitale Noordzee

3.3. Situational Awareness

Definition. Situational awareness is the integration of sources into a current and, where possible, predictive picture of the operational environment. Situational awareness addresses both the current state of affairs and pattern formation over longer periods. This supports (1) forecasting (what is probable) and (2) scenario exploration (what is possible) for changes that occur autonomously (for example as a result of climate change) or that stem from human action. In this way, situational awareness merges into model development and use.

Possible overlap and synergy. Ecology uses measurements primarily for trend and scenario models; security primarily for (near) real-time situational monitoring. At the same time, both domains have a need to automate anomaly detection to a considerable degree. This requires pattern development and reference frameworks. The Royal Netherlands Navy applies pattern recognition in, among other things, the detection and classification of submarines and sea mines, often in a platform- or sensor-specific context. For area-wide modelling, ecologists are more advanced. It may be possible to repurpose or couple ecological models as early warning instruments for security purposes. More generally, knowledge sharing on, for example, the methodological use of AI in pattern recognition appears feasible.

Nodes for situational awareness. Existing and planned nodes for maritime situational awareness primarily serve maritime security but are simultaneously relevant for the oversight and enforcement of ecological regulations; see Table 2. One example where both perspectives converge: the Dutch government has highlighted the security- and environment-related risks posed by vessels of the Russian shadow fleet and the importance of stricter control over maritime activities that circumvent sanctions.[41]

Table 2. Operational centres for situational awareness and coordination of maritime security activities on the North Sea

Operational centre	Description
Coastguard Centre (KWC) / Maritime Information Hub Netherlands (MIK-NL)[42]	The KWC has for decades been the central hub for shipping safety, SAR, environment, fisheries monitoring and enforcement. The MIK-NL, part of the KWC, uses various sources to collect information, such as databases, radar systems and observations by Coastguard vessels; receives information from port authorities, traffic centres, meteorological services and other maritime and coastguard organisations in the Netherlands and abroad; and combines this with information from the Police, Customs, FIOD, NVWA, Rijkswaterstaat, Navy and Marechaussee. Note that the MIK as an information hub is currently staffed only during office hours, while the Coastguard's operational control room operates 24/7.
Maritime Operations Centre Admiral BENELUX (MOC ABNL)[43]	The entire Command & Control chain for the deployment of naval units, including deployment of the navy in the North Sea, comes together in the MOC ABNL. The Ministry of Defence performs this task in *addition to* the civil situational picture, because civil structures are insufficiently equipped for military threat analysis. Security and mandate limit information sharing, because military data sometimes have higher classification levels than civil data. The MOC ABNL is co-located with the KWC.
Programme for the Protection of North Sea Infrastructure (PBNI) / National Maritime Security Centre (NMSC)[44]	The PBNI programme focuses on the security of infrastructure in the North Sea and works together with various ministries and sector stakeholders. The intention is that the temporary PBNI organisation will be replaced from 2026 onwards by a permanent structure, the National Maritime Security Centre, in order to bring together the initiatives in the field of information collection and situational awareness for maritime security.

41 Nederland gaat schaduwvloot harder aanpakken | News report | Rijksoverheid

42 Kustwachtcentrum - Kustwacht Nederland

43 The MOC ABNL was until recently known as the Maritime Headquarters (MHK). See Logboek | 10 | Alle Hens.

44 ABD, Advies voor de governance van maritime security op de Noordzee, 2025.

NMSC: quo vadis? Whereas various structures for maritime security function at the tactical-operational level, there is (as of yet) no authority at the administrative level where matters converge. To fill this gap, the envisaged National Maritime Security Centre (NMSC) is intended to convert the temporary PBNI programme into a permanent structure. According to advice by ABDTopConsult, the NMSC should bring together the initiatives in the field of information collection and situational awareness for maritime security, while also housing an analytical function for the interpretation of incidents or threats and a Command and Control function for the assignment of cases to the appropriate competent authority in order to organise the correct response.[45] The envisaged operationalisation of the NMSC has, however, been delayed by a lack of clarity regarding administrative embedding and financing. In 2026, work is still being carried out through a temporary working organisation for the NMSC.

3.4. **Protection**

Definition. Protection in security terms encompasses the surveillance and securing of critical assets and nodes, including patrols, access regimes, risk analysis, and protection zones. Nature protection focuses on the preservation of ecosystems, species, and habitats through marine protected areas, sustainable fisheries, the reduction of pollution, and the protection of specific animals.

Possible overlap and synergy. Nature development around critical offshore infrastructure can contribute to maritime security by restricting, marking, or regulating access to specific sea areas. Unlike the relatively recent developments surrounding the protection of offshore infrastructure, the protection of nature has been enshrined in environmental legislation for many years. A large part of this environmental legislation was consolidated in 2017 into the Nature Protection Act.

In physical terms, the barrier effect is generally limited: structures such as oyster reefs or forms of mariculture (for example within wind farms) restrict access only to a modest degree for a wilful violator. Breaching them can, however, serve as a clear signal of dangerous or malicious behaviour. This already points to a second role. Under the North Sea Habitat Policy, areas in which ecological values are demonstrably recovering, such as oyster beds, can be granted an additional protection status. In such cases, legal protection applies: not so much because access becomes impossible, but because a violation can more directly be established and enforced as unlawful conduct (it should be noted, however, that such a framework does not currently exist).

[45] ABD, Advies voor de governance van maritime security op de Noordzee, 2025.

Restricted areas refer to sea areas with restrictions on transit, anchoring and/or fisheries. Several types exist, with varying objectives and legal bases:

- Natura 2000 areas: designated on the basis of European directives for the protection of species and habitats; depending on the protection status and the agreements made, these may entail restrictions on fisheries, seabed-disturbing activities, and anchoring.
- Marine Protected Areas: areas established for the protection of marine biodiversity, with varying levels of protection (ranging from specific regulation to the prohibition of activities).
- Shipping lanes and traffic separation schemes: zones with navigational rules to promote the safety and efficiency of maritime traffic.
- Anchoring prohibition areas: established to prevent damage to the seabed and/or subsea infrastructure.
- Fisheries restriction zones: areas with restrictions or prohibitions on certain forms of fishing, aimed at the conservation of fish stocks and ecosystem functions (see Figure 6).

The designation of such areas is generally carried out by national government authorities, where applicable in cooperation with international organisations. In the Netherlands, management and enforcement lie to a significant degree with Rijkswaterstaat. Decision-making can be complex and typically involves scientific substantiation, consultation, and international coordination, particularly beyond the territorial sea.

Subsea cables as an entry point. In addition to wind farms, the combination of security and nature opportunities is also present in subsea infrastructure. TenneT is a central actor here, given its scale, technical role, and management of the offshore grid that it constructs and operates.[46] Two clear entry points present themselves:

- Around transformer stations, a safety zone of 500 metres has been established on the basis of UNCLOS.[47] A general administrative order (*besluit van algemene strekking,* BAS), adopted by the Ministry of Infrastructure and Water Management (implemented through Rijkswaterstaat), determines which activities are permitted within this zone. In practice, a prohibition on presence applies, with the exception of maintenance and supervision. It is conceivable that nature development could be used to make physical access to the zone more difficult.[48] The current legal room for manoeuvre is, however, limited, as structures must generally be directly connected to the platform. From an ecological standpoint, moreover, the number of locations involved is limited and the surface areas relatively small, although localised emanation effects are possible.
- Cable crossings are vulnerable points because cables lie at shallower depths. Whereas electricity cables are as a rule buried,[49] at crossing zones they are covered with boulders

---

46 Net op zee | Noordzeeloket

47 Under Article 60, paragraph 4, of the United Nations Convention on the Law of the Sea (UNCLOS), it is stipulated that within the safety zone, appropriate measures may be taken to ensure the safety of both navigation and the installation, up to a maximum of 500 metres from the outer edge.

48 A ring of reefs around a transformer platform could perhaps prevent accidents such as that involving the Juliette D in 2022. The Juliette D drifted without steerage in the Hollandse Kust Zuid wind farm and collided with the foundation of a wind turbine yet to be constructed; see: Schade aan windpark Hollandse Kust Zuid na aanvaring door vrachtschip Julietta D - Vattenfall NL.

49 In principle, cables that have been laid are not subsequently excavated ("bury and forget")

and stones. This hard substrate attracts marine life. In an ongoing pilot, TenneT is investigating with partners whether the seeding of oysters can both increase the stability of the cable covering (through the biological anchoring of stone packages) and enhance ecological values.[50] Nature development can thus provide additional protection, provided it is combined with restrictions on seabed-disturbing activities and anchoring (which is currently mostly not the case). As multiple areas of meaningful surface area are involved, the ecological gains can also be substantial.

Issues in creating restricted areas. The establishment of restricted areas in wind farms or around cable corridors or crossings, serving the dual purpose of security and nature restoration, raises several questions:

- Scale and effectiveness. The area must be sufficiently large to generate ecological effect at the scale of the North Sea. The potential gains may be greater when measures are directed at areas that do not yet have protected status but do possess ecological potential. This implies, however, additional legal and administrative procedures.
- Ecological trade-offs. Measures may have positive effects for one natural value and negative effects for another. Hard substrates can support oyster recovery but may also facilitate the spread of invasive species. Fisheries restrictions may lead to increased fishing pressure in other areas. A prior SWOT analysis is therefore necessary to assess effects, risks, and mitigation options in a systematic manner.
- Enforcement. Fragmented, localised measures make oversight more complex. A large, clearly delineated area (such as a wind farm) can be monitored more easily than multiple small locations.

Figure 8. Underwater life (Photo credits Dutch Maritime Productions)

[50] TenneT brengt samen met partners op grote schaal oesterriffen terug naar zee

Nature development in military exercise areas. The designation of sea areas for military purposes means that other human activities are restricted, which benefits marine ecology. The flipside is that the military activities themselves generate ecological pressure. Exercises can lead to disturbance of marine fauna through underwater noise and vibrations. Furthermore, live-fire exercises result in ammunition residue (as hard substrate) accumulating on the seabed. Ecological research has not demonstrated that this leads to environmental damage – it may even contribute (to a limited degree) to local species settlement.[51]

The net effect of a military exercise area on nature can be positive. This gives rise to a dilemma. Successful nature development may result in an area falling (further) under nature protection regimes, with additional restrictions on military use. For Defence, this is an undesirable outcome, as it may jeopardise the continuity and flexibility of training opportunities.

3.5. **Enforcement**

Definition. Enforcement encompasses physical presence for prevention and deterrence, surveillance and detection, and rapid response to incidents. The Coast Guard coordinates civil deployment; the Royal Netherlands Navy and other services provide operational contributions. Patrol activity using surface and airborne platforms (increasingly unmanned) is an important activity in this context. Recent measures include the intensification of patrols, the modernisation of Coast Guard aircraft, and the expansion of unmanned assets. In addition, Defence is procuring two new patrol vessels; these ships have a role across all four task areas elaborated here.

Possible overlap and synergy. With cooperation under the heading of monitoring and situational awareness as a necessary foundation, an integrated approach to oversight and enforcement is most promising through:

1. Joint patrols in combined hotspots with shared sensors.
2. Pre-exercised multidisciplinary scenarios in which ecological and security incidents coincide (for example an oil leak near a wind farm, or damage to a cable in or near a protected nature area). Such exercises would cover which organisation takes operational lead for which incident type, how escalation proceeds, and how ecological and security expertise is brought to bear in decision-making.
3. Permitting conditions for activities on the North Sea (such as dredging, cable and pipeline works, and the construction and maintenance of wind farms) incorporating both security and ecological requirements, including monitoring and reporting obligations. It should be noted that the ecological frameworks largely already exist and may thus serve as a stepping stone for security conditions.
4. Unambiguous reporting routes and communication to users (fisheries, shipping, the offshore sector, and contractors). This can be linked to practical guidance including reporting criteria, exclusion zones, and appropriate conduct upon observation.

---

[51] Militair gebruik | Noordzeeloket

3.6. **Sub-conclusion**

Security and ecology in the North Sea converge in multiple ways: in shared data requirements (monitoring), in integration and interpretation (situational awareness), in spatial regulation and protection (protection), and in oversight and response (enforcement). Synergy is most promising in hotspots where critical infrastructure and ecological recovery potentially coincide. Data sharing, governance, and enforceability must be explicitly arranged.

The following chapter elaborates concrete opportunities along these lines.

4. Concrete opportunities

Taking the information from the preceding chapters as a point of departure: how can the security agenda and the ecological agenda for the North Sea be better aligned? This chapter elaborates a number of concrete opportunities for synergy, drawing gratefully on a workshop held on 10 February 2026 in the context of this report, attended by a mixed group of participants from the ecological and security domains (see Appendix C).

Synergy in monitoring and situational awareness is most promising where (1) data requirements overlap; (2) sensors and platforms are scarce and costly; and/or (3) analytical products are usable in both domains. The core lies in connecting sensor sharing, data integration, and analysis into coherent situational awareness: a shareable maritime picture for a broad range of users with, where necessary, a restricted layer for sensitive applications. Synergy in protection and enforcement lies primarily in coupling spatial regulation with physical presence. Where critical infrastructure and ecological recovery potentially coincide, measures relating to access, oversight, and permitting conditions can yield a double return. Table 3 sets out the synergy opportunities elaborated in this chapter.

Table 3. Concrete synergy chances

Opportunity	Objective (security + ecology)
Dual- and multiple-use sensors	Efficient use of scarce platforms and higher detection and monitoring density
Layered situational picture	One shareable picture for regular users, with a restricted layer for sensitive applications
Pattern development and anomaly detection	(Semi-)automatic detection of anomalies in hotspots (pressure peaks, suspicious behaviour)
Scenario analysis, stress tests, and incident response	Testing robustness under cumulative pressure, climate change, and threat, and preparation for (hybrid) incidents
Spatial protection around infrastructure	Combining restricted areas and nature-inclusive measures for recovery potential and integrity protection
Integrated patrols and targeted enforcement	Joint prioritisation and more efficient deployment of assets in combined hotspots

4.1. Dual-use sensors: from exception to standard

Dual-use increasingly becoming the norm. The distinction between sensors designed primarily for military or security applications and those designed for civilian purposes (including ecological monitoring) has narrowed considerably in recent years. Defence too, with the exception of a number of specialist systems, largely procures off the shelf, with limited modifications where necessary. This lowers the barriers to joint procurement, joint testing programmes, and shared management of sensors and platforms (above, on, and below water) that can be deployed in both domains. Convergence is also visible on the supply side: companies with originally ecological solutions are now active in the security market as well, sometimes even placing greater emphasis on it given the growth opportunities available. Examples include the Dutch company Lobster Robotics and the French company Arkeocean, both offering autonomous underwater platforms and sensors.

Tagging of marine animals. One possible dual-use application is the use of tagged marine mammals and large fish. This is already done for ecological purposes and may also be relevant for security actors ('an underwater watchdog', so to speak). Programmes to this effect are reported to have existed for decades in the United States and Russia; the Royal Netherlands Navy is said to have a latent interest in the concept.[52]

A relevant example is the way in which TenneT monitors subsea infrastructure using a mix of continuous and periodic surveillance. This approach illustrates the building blocks available for broader, dual-use deployment around critical infrastructure:

- Continuous monitoring via fibre-optic connections running parallel to the electricity cables, for example for temperature signalling along the cable. TenneT has concluded an agreement with Prysmian for this purpose.[53]
- Periodic visual inspections and targeted interventions, including through Remotely Operated Vehicles (ROVs) and other underwater assets operated by N-Sea.
- Geophysical surveys (bathymetry/topography and detection of objects or changes in the seabed profile) as the basis for risk assessment and prioritisation.[54]

For ecological applications, the same sensor chain can offer additional value, for example for the structural measurement of nature development, hydrographic parameters, and pressure factors around infrastructure zones. The synergy is greatest when ecological measurement packages that 'piggyback' on existing infrastructure are designed to meet the same requirements for robustness, maintenance, and data quality as the security-oriented sensors.

52 Inside the Navy's Marine Mammal Program; Russia deploys trained dolphins at Black Sea naval base, satellite image show | Russia | The Guardian

53 Leveringszekerheid in Noordzee: TenneT sluit raamovereenkomst met Prysmian en N-Sea voor service en onderhoud van offshore kabelsystemen; TenneT Opts For LIOS Export Cable Monitoring Kit | Offshore Wind; Nieuwe onderzeese COBRA-kabel is meer voor stroom dan voor internet

54 Tennet Launches EUR 3 Million Offshore Cable Survey Tender | Offshore Wind

Figure 9. Remotely operated underwater drone from Lobster Robotics

Something similar applies to wind farms. Their fixed position and scale make them well suited as permanent observation networks. The radars and cameras already present are deployed primarily for tracking bird and bat migration and for reducing collision risks, but can in principle also detect low-flying drones and other anomalous aerial activity.[55] In the future, unmanned platforms will regularly be used for underwater inspections that can simultaneously serve a security and ecological purpose. For actual dual-use deployment, additional investments are required in sensors as well as in the analytical chain (data fusion, classification, follow-up). This raises two central questions: how are costs distributed between public and private parties, and at which point in the chain does handover take place for (further) analysis, including clear organisational and legal safeguards? The answers are highly context dependent.

The assumed efficiency gains of shared sensors must be tested in practice: which specifications are compatible, and which concessions are acceptable to different users? Broadening participation and use cases within existing innovation initiatives such as the Seabed Security Experimentation Centre (SeaSEC; see text box) offers entry points for this purpose.

[55] In countries such as Poland, offshore wind turbines are explicitly regarded as fixed platforms for multi-use sensors. Cameras and radars installed for ecological purposes are also used there for the observation of drones and other aerial objects. This makes wind farms part of a broader surveillance architecture, creating a direct operational interface between civilian ecological management and defence-oriented monitoring. See: Europe's wind farm army | Euractiv

The Seabed Security Experimentation Centre (SeaSEC) was established in December 2023 by six Northern European countries, all members of the Northern Naval Capability Cooperation (NNCC).[56] SeaSEC aims to accelerate technology development and cooperation towards working solutions for the security of critical subsea infrastructure in the North and Baltic Seas. To this end, SeaSEC has access to a 10×10 nautical mile test area in the North Sea for the realistic testing of unmanned and autonomous systems. Areas of focus include the detection and identification of underwater threats, protection of subsea infrastructure, real-time monitoring and data fusion, and the interoperability of civilian and military assets. Participants in the projects include the navies of the NNCC member states, civilian companies, research institutions, and infrastructure owners.

SeaSEC organises, among other things, the SeaSEC Challenge Week, bringing together civilian companies, research institutions, and navies to test technologies collaboratively. In 2025, for example, three challenges were central:

- Sea What's There. Detection and tracking of autonomis underwater vehicles in real time; testing of acoustic sonar and detection systems.
- No Pipe to Lose. Detection and classification of suspicious objects on or near pipelines; testing of sonar, Autonomous Underwater Vehicles (AUVs), Uncrewed Surface Vehicles (USVs), and sensor integration.[57]
- Fishy Finds. Detection of anomalies on the seabed, such as signs of sabotage, disturbance, or manipulation around critical infrastructure.

A practical route for pilot projects is to connect with such existing initiatives for joint experiments in realistic test environments. This allows technical and procedural interoperability to be demonstrated before large-scale rollout takes place. As a first step, select one wind farm zone as a pilot location, map the minimum requirements for measurement performance and data access per user group, and establish a management regime, role-based access, and agreements on cost distribution and analytical responsibility.

4.2. Layered situational awareness for ecology and infrastructure protection

Shared situational awareness begins with data sharing but requires much more. It calls for a joint information chain: a data catalogue with clear metadata, shared measurement and quality protocols, and a platform for data integration and product development. In substantive terms, the added value lies in combining (1) physical parameters; (2) human use; (3) ecological status and pressure; and (4) infrastructure vulnerability, so that both ecological and security analysis can draw on the same reference framework.

56 Home - SeaSEC

57 For different types of autonomous and unmanned maritime platforms, see: UUV, ROV, AUV & USV – Differences and Use Cases

In the ecological domain, data are currently dispersed across multiple sources – see Table 1 for the various national platforms for information sharing and note that international datasets are also important. The Marine Information House (*Informatiehuis Marien*), for instance, provides access to information and research data on the North Sea from various ministries; ICES collects and manages data on fish and fisheries; KNMI manages data on weather and climate; and the Sir Alister Hardy Foundation for Ocean Science collects data on phyto- and zooplankton. These institutions can also make their own data available to the security chain (for example through MIK-NL) and act as intermediaries for unlocking relevant information held elsewhere.[58] In addition, for measurements yet to be carried out, they can assist security partners in applying existing measurement protocols, ensuring that new data are comparable with the large-scale and long-running datasets already available.

Wind farm operators and grid operators form a functional link between ecological observation and security-related situational awareness. Wind turbines and transformer platforms offer fixed platforms with power and data connections on which sensors can be mounted for both ecological monitoring and maritime and aerial security. Moreover, the new generation of wind farms will make greater use of underwater drones for subsea inspection. At the same time, a distinction will persist between the locally oriented security focus of operators and the broader national maritime picture; agreements on which data become available, when, and to whom are therefore crucial.[59]

Privacy legislation and classification requirements are frequently cited in practice as barriers to data sharing. In many cases, however, these frameworks function primarily as governance and accountability structures: with sound agreements in place, substantial data sharing is possible, provided that objectives are clearly defined and appropriate safeguards are established.

The General Data Protection Regulation (GDPR) applies where personal data are involved, for example when AIS data is traceable to individual skippers, camera footage in which individuals are identifiable, or reporting data that contain contact details.

The obstacle is often not a categorical prohibition, but rather (1) legal uncertainty regarding the classification of data; (2) the complexity of joint controllership; (3) the risk of liability in the event of errors; and (4) organisational reluctance on compliance grounds. With sound agreements, much is possible: data minimisation, clear purpose limitation, agreements on (joint) controllership, and a data protection impact assessment (as anchored in Article 35 of the GDPR) for structural large-scale monitoring.

58 Aggregated information on, for example, (developments in) water temperature, water quality, and species richness is already shared at symposia and similar events that are often also attended by security partner. However, this can be done more structurally.

59 In Belgium, the sharing of relevant data with Defence and the coastguard is explicitly a requirement, with wind farms being considered fixed sensor platforms that contribute to both ecological monitoring and maritime and air safety. See Europe's wind farm army | Euractiv

For military classification, the challenge is that integrated products tend to be classified more quickly, since datasets can directly or indirectly reveal sources, methods, vulnerabilities, and response procedures. This can be (partially) circumvented by applying multiple levels of abstraction at which sensitive detail is no longer visible at higher abstraction levels, by organising shareable core findings separately from source- and method-sensitive details ("tear lines"), and by explicitly designing technical separation and controlled partial environments.

Several practical implications follow from this. First, it is important that ecological data requests are concretely linked to an explicit purpose and a limited set of parameters. Second, it helps when ecological parties not only articulate a need but also contribute to thinking about how it can be met at an appropriately secure level of abstraction. Conversely, ecological research institutes can be more transparent about which data they hold and under what conditions these are usable for security purposes.

A first step in shaping a pilot project could be the definition of a minimal set of core layers (ecological status/pressure; infrastructure vulnerability; maritime and aerial situational awareness) and their implementation in a delineated sub-area, including agreements about data standards, access levels, and incident workflow (reporting-interpretation-follow-up).

4.3. **Pattern development and anomaly detection in combined hotspots**

The integration of monitoring and situational awareness enables joint pattern recognition and (semi-)automated anomaly detection in areas where security and ecological interests converge, such as wind farms, cable corridors and crossings, and Natura 2000 areas. For security actors, this concerns the early detection of anomalous vessel behaviour and unauthorised activities near critical infrastructure. For ecological parties, it concerns the recognition of pressure peaks or anomalous ecological signals, for example sudden turbidity, noise loading, disturbance patterns, or changes in habitat conditions.

A joint approach requires shared historical datasets, a common label set, and periodic validation through targeted observations. The outcome can be a set of explainable alerts (with clarity on the degree of anomaly, probability assessment, and contextual information) that is usable for both ecological analysis and operational follow-up. The relevant alerts will partly differ between domains, and where they overlap, different tolerance thresholds may apply. The modelling and decision-making process must therefore make domain-specific settings and responsibilities explicit. Where the classification of sources or methods is a concern, different levels of abstraction for the alerts can be applied.

A realistic first step within 12 to 18 months is a pilot in one combined hotspot area, in which ecological and security data are brought together under controlled access for pattern analysis, with pre-established follow-up procedures for alerts and verification.

4.4. Scenario analysis, stress tests and multidisciplinary incident response

Beyond real-time situational awareness, shared data infrastructure offers opportunities for scenario analysis and stress-testing over the medium and long term, precisely because the North Sea is simultaneously experiencing an increase in offshore infrastructure, an intensification of use, and climate-driven change. Ecological models support trend and cumulative impact analysis, while security actors use scenarios to anticipate threats, vulnerabilities, and capacity requirements.

Concretely, this can be structured through shared databases (with or without primary data responsibility resting with the original data holder), version control of datasets and model runs, and a set of shared scenarios for the period 2030 to 2050. Outputs can be made accessible through a dashboard that visualises (1) ecological pressure and status; (2) infrastructure exposure and vulnerability; and (3) disturbance and incident pathways in an integrated manner. This supports policy choices around spatial zoning, permitting conditions, and enforcement priorities, as well as operational planning in terms of capacity, response times, and monitoring priorities.

The same foundation also supports multidisciplinary incident response when ecological and security incidents coincide (for example an oil leak near a wind farm or cable damage in a restricted area). This requires pre-exercised scenarios with explicit role allocation and escalation procedures; a standardised classification model (environmental, infrastructure, or hybrid incident) linked to response times and information requirements; and upstream steering through permits and tenders (see text box). Monitoring intensity can be differentiated according to ecological seasons as well as threat levels. Finally, an unambiguous reporting route to the competent authorities strengthens the chain from detection to follow-up.

> **Permit conditions** for activities on the North Sea (such as cable and pipeline works and the construction and maintenance of wind farms) can systematically incorporate both security and ecological requirements, including monitoring and reporting obligations. Tenders for wind farms should harmonise requirements for operational safety, security, and nature conservation or development. This prevents the emergence of disparate systems that obstruct the reuse (dual- or multiple-use) of sensors and information.

As a pilot, a limited stress test can be carried out for one wind farm, in which climate scenarios, cumulative pressure in relation to ecological carrying capacity, and infrastructure vulnerability are modelled in an integrated manner. The results then serve as the basis for scaling up to North Sea-wide stress tests and periodic updates.

4.5. **Spatial protection around infrastructure**

The establishment or tightening of restricted areas (see text box p24) can both reduce ecological pressure and diminish the vulnerability of infrastructure. Examples include zones around cable crossings, export cable corridors, and wind farms. When such restrictions are motivated on ecological grounds, this can also reduce the likelihood of accidental damage or deliberate disruption, provided that enforceability and communication to users are clearly arranged.

Environment-inclusive measures around offshore infrastructure can provide additional contributions by regulating access, marking use, and making violations more readily demonstrable. The physical barrier effect is generally limited, but damage or disruption can serve as an early signal of unwanted behaviour, while an additional protected status can strengthen legal enforceability. Design choices must explicitly weigh how habitat measures relate to access, inspectability, and repairability of infrastructure.

Key considerations are (1) scale and coherence for ecological effect at North Sea level; (2) ecological trade-offs (such as stepping-stone effects of hard substrate for invasive species); and (3) consistency of regimes (differences between parks or countries complicate compliance and enforcement). This argues for a recognisable standard set of rules (distance requirements, access windows, conditions such as AIS use) with transparent exception procedures, as well as standardised design principles and monitoring requirements that make effects on ecology and infrastructure risks demonstrably visible.

A possible first step: select one combined hotspot, take stock of existing access / fisheries / anchoring regimes, and develop one integrated zoning proposal that incorporates restrictions on human activities beneficial to both nature development and the security of the area. The combined requirement must receive an adequate legal translation, in which enforceability is of great importance (see section 4.6).

4.6. **Integral patrol and targeted enforcement**

Combined hotspots call for the integrated deployment of assets and expertise. Joint patrols by the Coast Guard, Royal Netherlands Navy, and other services may use shared sensor and monitoring packages that detects both environmental pressure (such as illegal fishing and discharges) and suspicious or dangerous activities around infrastructure. The operational gain lies in the ability to prioritise oversight based on shared awareness and to respond more swiftly to incidents.

A first step is to select one or two priority sub-areas (for example a wind farm zone with nearby cable crossings) and to establish observation protocols, models for the validation of (possible) incidents, and the chain for follow-up and evidence gathering.

4.7. **Sub-conclusion**

The concrete opportunities in this chapter show that synergy between security and ecology arises primarily where the same sensor platforms, the same information chain, and/or the same enforcement assets can serve multiple objectives. In monitoring and situational awareness, the core lies in shared data products, pattern development, and (where relevant) scenario analysis, structured with governance-by-design (privacy, classification, and cyber-security as design variables). In protection and enforcement, the core lies in spatial regulation, nature-inclusive reinforcement around infrastructure, and the integrated execution of over-sight, enforcement, and incident response.

The most important precondition is the institutional and technical arrangement of information shareability: clarity on who may access which data, at what level of abstraction, with what responsibilities, and with what follow-up. When these preconditions are made explicit, a realistic route emerges toward pilots within 12 to 18 months and scaling within five to at most ten years.

5. Conclusions and recommendations

This research shows that gains can be made for both the ecological and the security agenda for the North Sea through a joint approach. This focuses on two areas: more shared or collaborative monitoring and situational awareness on the one hand, and strengthened integrated execution of oversight, enforcement, and incident response on the other.

Shared information chain as a foundation. The basis for (greater) synergy between maritime security, marine ecological research, and nature management of the North Sea is the establishment of an information chain that serves all parties involved. Within such a chain, the data and analyses provided by different parties must lead to layered situational awareness, then to robust interpretation (pattern development, significance, status and trends, and scenarios), and finally to consistent follow-up (enforcement, incident response, nature management, and the public sharing of new ecological insights). The most critical design variables are:

- Data: which parameters, at what scale and resolution are needed or desirable.
- Shareability: who receives which information, at what level of abstraction, with what safeguards, and with what obligations for follow-up. In principle, a great deal of data is already available but is difficult to find, cannot be shared, or lacks the mandate and/or budget to be made ready for sharing.
- Interpretation: by whom are which data interpreted, and is consensus required for interpretation?

Our conclusions regarding the concrete opportunities are as follows:

1. Dual-use sensors on offshore infrastructure objects or on mobile platforms offer demonstrable opportunities, but the returns only materialise when the analytical chain, cost distribution, and responsibilities are also explicitly arranged.
2. Layered situational awareness requires harmonisation of metadata, measurement and quality protocols, and access levels; privacy and classification function in this context primarily as a governance question, not as a categorical barrier.
3. Joint pattern development and anomaly detection are a logical follow-on from shared situational awareness, but require shared label sets, validation models, and pre-established follow-up procedures to become operationally usable. A point of attention is the need for more intensive measurements during challenging conditions or low-frequency events such as storms.
4. Scenario analysis and integrated stress tests (2030–2050) connect directly to incident response: the same data infrastructure supports both policy-oriented robustness analysis and operational preparation for incidents.
5. Restricted areas can serve three objectives: improvement of nature quality, ecological research into processes under relatively undisturbed conditions, and protection of infrastructure. The precondition is that protection regimes are consistent, enforceable, and explicitly monitored.

6. Ultimately, oversight and enforcement are crucial to success: without integrated patrols, unambiguous reporting routes, robust chains of evidence and follow-up, protective measures remain too non-committal, and the associated monitoring and analyses therefore of limited value. The bottom line is that the enforcement task must be strengthened, both in terms of governance and in terms of available resources. An ongoing commission from the Coast Guard cooperative framework to examine the organisation and governance of the Coast Guard should provide handles for this.[60]

The recommendations in Table 4 focus on measures that can simultaneously reduce ecological pressure, mitigate integrity risks around infrastructure, and strengthen the evidentiary position for enforcement. Pilot projects to demonstrate feasibility and practical dual value are a first step.

Table 4. Recommendations from this report

Priority	Recommendation (action-oriented pilot project)	Primary responsible actors	Effort
High	Establish one shared information base: a data catalogue with core layers, measurement / quality protocols, role-based access, and a fixed incident workflow (reporting-interpretation-follow-up)	Coast Guard Centre (*Kustwachtcentrum*)/ MIK, Defence, Rijkswaterstaat, LVNL, knowledge institutes, infrastructure owners, environment managers (government; *Rijk*)	High
High	Launch one hotspot pilot (wind farm zone with cable crossings) for dual-use monitoring and data fusion; establish the research question and objective, and formalise management, cost distribution, and analytical responsibility prior to rollout	Infrastructure owners and wind farm managers, Coast Guard, Rijkswaterstaat and affiliated ministries, knowledge institutes	Medium
High	Develop a standardised incident classification model (environmental/infrastructure/hybrid) with escalation pathways, response times, and information requirements; exercise this in a multidisciplinary (scenario-based) exercise	Coast Guard, Defence, Rijkswaterstaat, competent authorities and inspection services	Medium
Medium	Operationalise joint pattern development and anomaly detection in at least two hotspots, with a label set, validation plan, and formally documented follow-up procedures (including evidentiary logic)	Defence, Coast Guard, Rijkswaterstaat, knowledge institutes, infrastructure owners	High
Medium	Formulate requirements for safety, security, and nature in an integrated manner in permits and tenders, with requirements for the reuse of sensors and data where appropriate	Rijkswaterstaat and affiliated ministries, contracting parties	Medium
Medium	Design one integrated zoning and management regime in a hotspot: restricted areas combined with nature-inclusive measures and monitoring, with enforceable rules and transparent exceptions	Rijkswaterstaat, competent authorities, user representation, enforcement services	High
Low/ medium	Conduct an integrated stress test (2030–2050) and organise the necessary infrastructure for this purpose: a data room, fixed scenario set, periodic updates, and reporting that is usable both for policy and operational purposes	Strategic coordination (e.g. NMSC/ PBNI), Coast Guard, Defence, knowledge institutes	High

Clarity in ecological needs. The recommendations in Table 4 address primarily the chain and governance arrangements. For practical implementation, an explicit sharpening of requirements on the ecological side is also necessary. Security partners, in particular Defence, the Coast Guard, and infrastructure operators, are in principle willing to contribute, but expect a concrete, verifiable question and/or contribution from ecologically motivated parties. It should be borne in mind that the pressure toward data restriction is more likely to increase than

[60] Beantwoording vragen over bericht 'Nederlandse kustwacht machteloos bij spionage en sabotage op Noordzee door personeelsgebrek' | Kamerstuk | Rijksoverheid

decrease: structural data sharing, including as a basis for oversight and enforcement, therefore requires sharp articulation of needs and appropriate levels of abstraction. The following are concrete steps for ecological parties to make initiatives for information exchange, management, and application more practically feasible.

1. Prioritise knowledge needs. Ecological knowledge institutions and managers should specify which questions are most relevant and urgent, what is already known or currently being researched, and what the most relevant and urgent knowledge gaps are that can be addressed within the collaborative framework. This allows them to clearly specify what types of data are needed (parameters, field measurements, maps), at what scale, and at what spatial and temporal resolution.
2. Map existing information exchange and lessons learned. On the basis of the knowledge needs identified above, establish which ecological parties currently receive which information (data, analyses, and reports) from Defence, Rijkswaterstaat, or other intermediaries. Document in doing so: purpose limitation, level of abstraction, turnaround time, restrictions (classification and GDPR), and contact points. Draw lessons from working practices (such as fixed interfaces, tear lines, and aggregated products) and translate these into a scalable way of working.
3. Reduce fragmentation through recognisable interfaces. Both the demand and supply sides are fragmented. Create therefore one coordinated point of demand articulation (for example a steering group or desk with a mandate to prioritise) and one recognisable routing mechanism on the supply side (Defence, Rijkswaterstaat, and the Coast Guard), so that requests are handled consistently and duplication is kept to a minimum.
4. Prioritise the identified information needs by value and feasibility. Order desired information products along two axes: (1) added value for the ecological agenda; and (2) feasibility (availability, costs, processing, legal preconditions, and classification). Share this prioritisation with the supply side and jointly identify low-hanging fruit (high in both value and feasibility), including a list of initial products for a pilot period.
5. Place dual-use on the agenda as a development track. Enter into dialogue with Defence and other actors with a security interest in the North Sea on dual-use capabilities in sensors, platforms, and analysis (research, applications, and products), and not only on 'data delivery'. This enables a shared investment logic and connects to innovation trajectories that regularly originate from the ecological side and draw on funds for nature management and scientific research.
6. Translate requests into concrete specifications; design for shareability. Develop requests further into concrete specifications (parameters, area, resolution, time window, intended product, minimum quality, planning, own contribution, and ship time). Test these early with Defence and chain partners, and where necessary request aggregated outputs or tear lines rather than source- or method-sensitive detail data. This increases deliverability and makes structural embedding more realistic than generic requests for more information.

Appendix A. **Security Agenda for the North Sea**

A.1 The broad security challenge for the North Sea

Integrated approach. As a maritime nation with an EEZ of 58,500 km², one and a half times the land area of the Netherlands, what happens in, on, and above the North Sea is crucial to national security and prosperity. In recent years, the North Sea has accordingly been identified in various government-wide strategies as a strategic space in which vital economic, ecological, and security interests converge. With the launch of the Programme for the Protection of North Sea Infrastructure (*Programma Bescherming Noordzee Infrastructuur*, PBNI) in 2023, a government-wide, integrated approach was introduced for the first time. This approach marks a shift from sectoral protection to a systemic challenge in which physical, digital, and administrative resilience converge.

Protection of vital functions at sea. The protection of vital functions at sea concerns the unimpeded continuation of our overseas trade, offshore energy production, communication via subsea cable networks, extraction of raw materials, and food supply (fisheries, and possibly mariculture). It is crucial to prevent disruptions or to remedy them swiftly. Whether involving accidents, disasters, or deliberate disruptions, the Netherlands must be capable, to the greatest extent possible, of acting as first responder.[61] Governance is anchored in interdepartmental cooperation under the coordination of the Ministry of Infrastructure and Water Management. Operational execution lies with the Netherlands Coast Guard.

A.2 Military maritime security

Geopolitical turbulence. Russia's invasion of Ukraine has fundamentally altered the geopolitical reality in Europe. German Chancellor Friedrich Merz, referring to the Russian threat, stated: "... we are not at war, but we are no longer living in peace."[62] In this 'grey zone', the protection of vital functions at sea in peacetime and military maritime security in crisis and wartime increasingly merge into one another. This recognition has led, among other things, to Defence recently being assigned a permanent task to develop its own situational awareness within the Dutch EEZ. When a threat materialises, the armed forces have a prominent role in denying an adversary access to Dutch waters, ensuring freedom of access for friendly forces, and protecting critical infrastructure.

61 *No guts, no Hollands glorie! Sectoragenda Maritieme Maakindustrie*, 2023, p.25.

62 Europe 'no longer at peace' with Russia, says Germany's Merz | Reuters

At the same time, the scope of Defence's tasks and responsibilities for the surveillance and security of the North Sea is shifting at the administrative level. Defence's role in peacetime is in support of the civil authorities, forming part of the third core task of the defence organisation. However, because a 'grey zone' exists between peace and war, the distinction between the core tasks is becoming blurred. Maritime security in the form of escorting Russian vessels on the North Sea and countering the Russian shadow fleet represents a combination of core task 3 and core task 1, territorial defence and deterrence. This is the reason why the cabinet decided in 2023 to assign Defence the permanent task of mapping potential threats in the vicinity of the Dutch part of the North Sea.[63]

New assets. Defence is in the process of acquiring new assets to strengthen situational awareness and reconnaissance – in military jargon also referred to as Intelligence, Surveillance and Reconnaissance (ISR) – for the North Sea; see Table 5.

Table 5. Defence investments in situational awareness and presence on the North Sea

Project	Objective	Bandwidth[64]
Acquisition of ISR capacity	Sensors and satellite data for maritime situational awareness	€50–250 million
Development of operational satellite capacity	Investment in (military) satellite capacity to enable more autonomous planning and use of intelligence collection	€50–250 million
Procurement of two multifunctional vessels	Operationally ready from 2027, for evidence gathering and observation on the North Sea	€250 million – €1 billion[65]
Lease of surveillance ship	Temporary solution prior to the delivery of new vessels	Approx. €20 million
Procurement and maintenance of radars on the North Sea	Additional radar systems for detection of smaller surface and aerial targets; maintenance contract financed by Defence	€50–250 million
Expansion and reinforcement of MQ-9 capacity	Four additional MQ-9 aircraft, plus expansion with additional sensors including maritime radars	€250 million – €1 billion
Procurement of MQ-9 armament	Acquisition of munitions and integration for armed deployment (in due course)	€50–250 million
Further development and expansion of NH90	Further development and modifications within the NH90 programme and procurement of three additional (maritime) NH90s	€1,624 million[66]
Replacement of mine countermeasures capacity (MCM)	Realisation of binational mine countermeasures capacity including a toolbox of unmanned systems, among which 10 helicopter drones Skeldar V-200	€1,144 million[67]
Procurement of 12 ship-based UAVs	Procurement of 4 V-BATs and modification of 4 vessels for deployment from 2026	<€50 million

These capacities are as follows:

- Sensor and radar systems on offshore platforms and wind turbines at sea. Defence is also investing in the acquisition and use of satellite data, with a view to eventually operating its own satellites.[68]

63 Defensie krijgt grotere rol bij bescherming infrastructuur Noordzee | Defensie.nl

64 See among other sources the *Defence Projects Overview*, May 2025. For most (new) projects, a bandwidth is indicated because negotiations on the procurement are still ongoing, or because the precise amount is (commercially) confidential

65 Investments including risk provisions and operating costs to end of service life.

66 This is the broader NH90 project budget, not exclusively the three additional aircraft.

67 This is the total MCM project budget, with the toolbox of unmanned systems constituting only a part thereof.

68 Defensie koopt middelen en materieel om Noordzee te beschermen | News report | Rijksoverheid.nl

- The fleet will be expanded in 2027 with two new multifunctional support vessels equipped with sensors and underwater equipment, tasked with patrolling the North Sea and investigating and responding to suspicious activities, including vessels sailing without AIS.[69] Until that time, a vessel with a civilian crew from the company Fugro is being chartered for the patrol task on the North Sea, supplemented where necessary by naval personnel.[70]
- Three additional maritime NH90 helicopters are being procured.[71] Four additional aircraft have been ordered of the MQ-9 Medium Altitude Long Endurance Unmanned Aerial System (MALE UAS)[72], which entered service in 2022 and is well suited for extended monitoring over the North Sea.[73] The observation capacity of the MQ-9 is being substantially expanded,[74] and the aircraft will eventually be armed.[75]
- Explicit attention is being given to the procurement of maritime unmanned systems for ISR above, on, and below the water.[76] From a Multirole Support Ship (MSS), for example, multiple aerial, surface, and underwater drones can be launched and coordinated as a system-of-systems; in Defence's vision, this process is largely automated with the assistance of AI.[77] First steps have already been taken. Defence is procuring twelve unmanned aircraft that are to be deployable from four vessels from 2026 onwards for intelligence gathering and security tasks at sea.[78] As part of the new mine countermeasures capacity (MCM), ten helicopter drones are being acquired, to be deployed for situational awareness (scanning the operational area), communications relay, and support for operations involving other unmanned systems.[79] Work is also underway on a permanent drone test area in the North Sea.[80]

A.3 Maritime military exercise areas

Defence conducts exercises on the North Sea. During exercises, currently approximately 40 days per year, the maritime exercise areas are closed to all forms of shipping.[81] It is prohibited to place objects such as wind turbines in these areas. When an exercise area forms part of a Natura 2000 area, Defence takes mitigating measures. An example is the prohibition on the use of pyrotechnic devices in the vicinity of rest areas.

Possible expansions. Currently, just over 7% of the Dutch part of the North Sea is available for live-fire exercises, flying exercises, and mine clearance exercises. Defence has a need to expand the maritime exercise areas.[82]

---

69 Nieuwe vaartuigen met wapens en apparatuur bieden betere bescherming | News report | Defensie.nl

70 Nieuw patrouillevaartuig marine gelijk in actie tijdens de NAVO-top | New report | Defensie.nl

71 Defence Projects Overview, 2025

72 Defensie verkoopt versneld F-35's en MQ-9 Reapers | News report | Defensie.nl

73 The MQ-9 was deployed during the NATO summit in June 2025, for example; see: Gezamenlijke inspanning voor veiligheid op de Noordzee tijdens NAVO-top - Kustwacht Nederland.

74 Parliamentary letter (*Kamerbrief*) on the project 'MQ-9 SIGINT/ESM capacity', 2023. This concerns new sensor pods, including a Maritime Surveillance Radar pod and a SIGINT/ESM pod.

75 Defensie schaft munitie voor MQ-9 Reaper aan | News report | Defensie.nl

76 Marine presenteert toekomstvisie op gebied van drones | News report | Defensie.nl

77 Sommige schepen over 10 jaar mogelijk zelfvarend | ALLE HENS 16-07-2025 | Specials

78 Met V-BAT beschikken schepen in 2026 over noodzakelijke drone | 05 | Materieelgezien

79 Splinternieuwe helikopterdrone voor mijnenbestrijding | MATERIEELGEZIEN 20-05-2025 | Specials

80 Permanent drone-testgebied boven Noordzee in zicht | News report | Defensie.nl

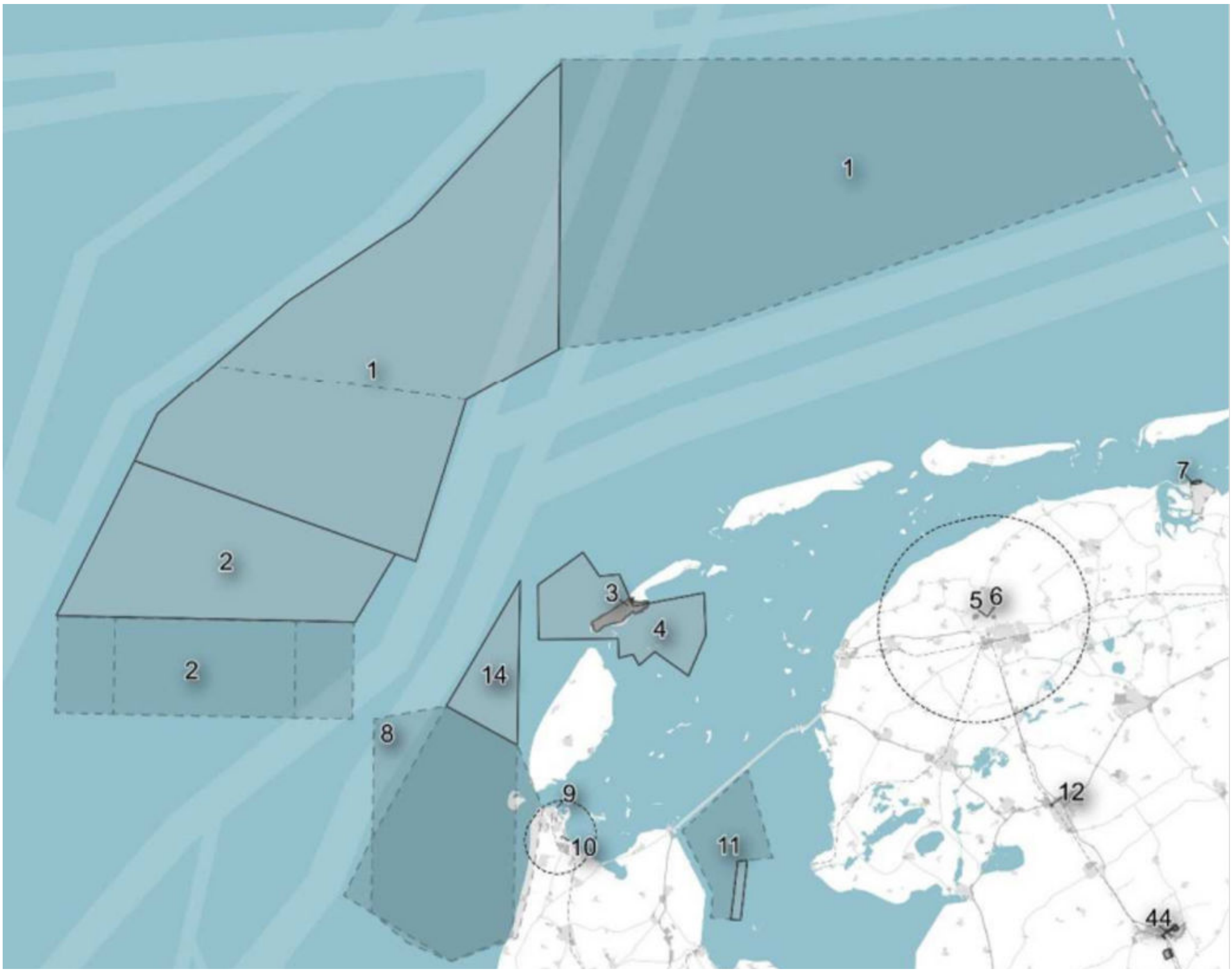
81 It should be notes that due to current low frequency of exercises (and thus of the associated prohibition on, for example, fisheries), there will be little to no ecological recovery.

82 Ontwerp Nationaal Programma Ruimte voor Defensie, 3 april 2025, p.47 et seq.

The existing military exercise areas on the North Sea and possible expansions are as follows; see Figure 10:

1. EHD 42 (area 1), currently 3,060 km². Used for aircraft live-fire exercises against aerial targets and for Royal Netherlands Navy exercises. This area is to be expanded, with a preference for expansion of EHD 42 in a south-westerly direction.
2. EHD 41 (area 2), currently 406 km². Defence requires expansion of this exercise area for larger and more versatile exercises, including drones with corridors on, in, and above the water to, from, and within EHD 41. Expansion of EHD 41 in a northerly direction is preferred.
3. EHR 8 (area 8), 837 km². Used for live-fire exercises and exercises with manned and unmanned vessels. Defence wishes to be able to sail unmanned vessels from the port of Den Helder to EHR 8, which requires regulatory adjustments. Expansion of EHR 8 and corridors does not form part of the preferred package.

Figure 10. Existing maritime military exercise areas (darker, hatched borders) and possible expansions (lighter, solid borders)[83]



[83] Source: *Ontwerp Nationaal Programma Ruimte voor Defensie*, 3 april 2025, p45.

Appendix B. Ecological agenda for the North Sea

B.1 Strengthening the North Sea Ecosystem

The ecological agenda is directed at the conservation, restoration, and strengthening of the North Sea ecosystem. The objective is to maintain and, where possible, restore and strengthen sustainable populations and their biotic communities on the seabed, in the water column, and in the above-water zone. This must be achieved in conjunction with human use of the North Sea, which may potentially be restricted on a per-activity and per-area basis, but is in totality expected to increase rather than decrease.

Concretisation along two questions. To translate this generic objective into scientifically grounded nature conservation and restoration, two (clusters of) questions are crucial:

1. What are (or are considered by those involved to be) the greatest threats to North Sea biodiversity in the broad sense; and how does this vary in space and time (considering, for example, possible northward shifts in species distribution due to global warming)?
2. Where do the best opportunities lie for adapting human activities to promote nature conservation and restoration; what are the preconditions for this; and specifically in the context of this report: how can these opportunities best be realised by connecting to the security agenda for the North Sea?

Information needs. To answer these questions adequately, the determining parameters for nature conservation and restoration must be known with sufficient resolution in time and space, for the entire North Sea and in particular with regard to existing and potential ecological hotspots (locations with high potential for nature restoration). The current monitoring network is often too coarse to map, for example, the local influence of human pressures (including nature management measures) with sufficient precision. Furthermore, the importance of extreme events (heatwaves, storms, strong river discharge) for ecology is increasingly recognised, but measurements during such events are scarce. In addition to a well-functioning monitoring network, the storage of and access to data must be provided for on a structural basis.

The data form the basis for the analyses needed to answer the questions above. Following the two questions set out above, there are two main analytical directions:

1. Describing the current status of natural values in space and time, including trends particularly in relation to human activities. This concerns both realised and potential natural values. The latter – what the ecological condition could be on the basis of the prevailing conditions – requires advanced analyses of monitoring data, combined with other information such as depth maps and satellite imagery.
2. Modelling long-term developments with and without human interventions, including measures for nature management. Such scenarios are often calculated using models, with monitoring data and outputs from other models (such as climate models) serving as input. The choice of models to be used depends on the question being addressed; there is no one-size-fits-all model.

B.2 Legislation and Regulation

The ecological agenda for the North Sea is strongly shaped by (the manner and degree of implementation of) international and European policy and agreements that must be implemented within the Dutch context, as well as specifically national policy. Table 6 sets out the most important documents and instruments.

Table 6. Important policy documents and agreements that determine the ecological agenda of the North Sea

Level	Instrument / document	Substantive role
EU law	Marine Strategy Framework Directive (2008)	Framework for the assessment, objectives, monitoring, and measures for achieving good environmental status of marine waters.
EU law	Habitats Directive (1992) and Birds Directive (2009)	Basis for Natura 2000, conservation objectives, appropriate assessment, and species and habitat protection.
EU law	Nature Restoration Regulation (2024)	Binding restoration targets for marine and coastal habitats; implementation through national frameworks currently in preparation.
International	OSPAR Convention and OSPAR North-East Atlantic Environment Strategy (ospar.org)	Regional agreements on the protection of the north-east Atlantic marine environment; programmes for biodiversity, ecosystem health, and monitoring.
National — strategy	National Water Programme 2022–2027	Main lines of national water policy; integral framework for national waters, including the North Sea.
National — North Sea	North Sea Agreement (2020)	Multi-stakeholder agreement with arrangements up to 2030 on food (fisheries), nature, and energy, with a long-term vision for offshore wind. Although not formal legislation, the agreement has considerable influence on ecological and spatial policy choices for the North Sea.
National — North Sea	North Sea Programme 2022–2027 (maritime spatial plan)	Policy framework for spatial use, nature, energy, fisheries, and sand extraction; implementation within the National Water Programme.
National — implementation of EU obligations	Environment and Planning Act, Decree on Environmental Quality, and Nature Supplementary Act/Decree	National legal anchoring of the Habitats Directive, Birds Directive, Marine Strategy Framework Directive, and other obligations; assessment and protection framework.
National — elaboration North Sea	Marine Strategy Netherlands (parts 1–3)	Dutch elaboration of the Marine Strategy Framework Directive: assessment and GES (part 1), monitoring (part 2), measures (part 3).
Natura 2000 — area level	Management plans for marine Natura 2000 areas (including North Sea Coastal Zone, Vlakte van de Raan, Dogger Bank)	Area-specific conservation objectives, measures, and regulation of activities.

Regulations in wind farms for transit. Wind farms can be important for marine nature development. North Sea countries apply different rules for transit through wind farms:

- **Netherlands.**[84] Limited access varying by park. In parks including Egmond aan Zee and Prinses Amalia, transit has been permitted since 2018 for vessels up to 24 metres under strict conditions (including AIS; no anchoring or seabed contact). Distances: approximately 50 metres around turbines and generally 500 metres around (transformer) stations. New parks include designated transit passages (generally for vessels up to 46 metres). Gemini and Luchterduinen: closed for transit.
- **Belgium.** No transit through wind farms; minimum distance of 500 metres from the outer boundary of the wind farm area.
- **United Kingdom.** Navigation generally permitted; 50-metre (advisory) safety distance around turbines; 500-metre safety zones may apply temporarily during construction or major maintenance.
- **France.** The French policy starting point is cohabitation of uses: navigation and fishing are permitted to the extent that navigational safety allows. Precise rules are park-specific.
- **Germany.** Transit through virtually all offshore wind farms is prohibited.
- **Denmark.** Transit permitted in some parks for vessels up to 24 metres; conditions and zones are park- and project-specific (including restrictions near turbines and cables; no anchoring).

Regulations in wind farms for fisheries. Different rules also apply for fisheries.

- **Netherlands.**[85] Bottom-trawl fisheries prohibited; passive gear permitted only to a limited extent and often subject to permit or authorisation requirements.
- **Belgium.** Fisheries entirely prohibited.
- **United Kingdom.** No uniform national prohibition; access and restrictions are park- and activity-specific (safety and cable risks; in practice contested).
- **France.** In some parks, co-existence with (certain forms of) trawl fisheries is accommodated; implementation remains dependent on permits and location.
- **Germany.** Closed zones: no fisheries permitted.
- **Denmark.** Bottom-trawl fisheries generally prohibited in wind farms and along (export) cable corridors; passive gear may in some cases be permitted under strict, park-specific conditions.

In summary, for transit and fisheries, the United Kingdom and France are broadly the most accommodating (relatively open, particularly once operational); Belgium and Germany are the most restrictive (largely closed for transit and fisheries); and the Netherlands and Denmark follow a middle course (selective access under strict conditions, varying by park).

84 Doorvaart en medegebruik | Noordzeeloket and Veilig varen rond windparken op zee | Varen doe je Samen!

85 Doorvaart en medegebruik | Noordzeeloket and Doorvaart en visserij windparken - Vissersbond

B.3 **Monitoring and analysis**

The information needs for the ecological agenda for the North Sea can be organised along three main axes, each of which can in turn be divided into subcategories.

1. The physical characteristics of and environment in the North Sea:

    a. On and above the water: including temperature, wind (direction, speed, turbulence), pollution, and disturbance (including noise, light, infrastructure, and movement).
    b. Water column: including temperature, currents, turbulence (storms, stratification, wake effects), depth, salinity, nutrients, toxic substances, pH, oxygen, and disturbance (including noise).
    c. c. Seabed: including depth, sediment composition, currents, turbulence (storms, stratification, wake effects), salinity, nutrients, toxic substances, and disturbance (including noise and seabed disturbance).

2. Biota: food availability, shelter, attachment surface, and ecosystem engineers.[86] This can in turn be subdivided according to the three layers above. An alternative classification follows the food chain: (a) producers (such as plankton, algae, and seagrasses); (b) primary consumers (such as zooplankton, mussels, oysters, and certain worms); (c) higher consumers (such as shellfish, fish, marine mammals, and seabirds); and (d) decomposers and detritivores (such as bacteria, fungi, and certain worms and crustaceans).

3. The (partly interacting) dynamic processes caused by human intervention that affect the layered North Sea ecosystem:[87]

    a. Climate change. The axis of climate-related changes encompasses physical, chemical, and biogeographical changes that shift the baseline conditions of the entire North Sea ecosystem.
    b. Human activities at sea. Encompasses spatial interventions, seabed disturbance, pollution, noise, and disruption that directly affect habitats and species communities, as well as nature management.
    c. Influence from the coast. The connection between land and sea via rivers, morphological processes, and coast-related activities. This strongly determines the quality of the coastal zone as a crucial link in the North Sea ecosystem, but also has a broader influence on the North Sea.

The tables below set out these complex processes, their effects, and the possible ecological measures at a high level.

---

86 'Ecosystem engineers' refers to species that modify their habitat passively or actively, both for themselves and for other species.

87 This connects to the way in which existing frameworks such as the Marine Strategy Framework Directive, Natura 2000, the North Sea Programme, and the National Water Programme group pressure factors and measures (for example: climate, use functions, land-based sources). Like any classification, this one too has its limitations. Several processes are difficult to assign uniquely to a single category. Climate change also affects river discharge and coastal morphology; the energy transition at sea simultaneously constitutes climate mitigation and sea use. Furthermore, this classification focuses on physical and biological processes. Institutional and socioeconomic factors such as governance, economic dynamics, technological innovation, and societal preferences are implicitly assumed but not explicitly structured. Finally, this tripartite division says little about spatial scale and time horizon. Climate change operates slowly but irreversibly; human activities can be acute and locally intense; and coastal processes are season- or weather-driven. Making scale and time explicit for each axis sharpens the precision of the information requirements.

Table 7. Summary processes, effects and measures of climate change

Activities and pressure factors	Main effects (layers)	Some possible ecological measures
Physical changes (temperature, stratification, currents, sea level, wave climate)	Above water: shift in foraging areas and timing of food peak. Water column: changes in plankton production and phenology. Seabed: changes in growth and survival.	Protection of core habitats; reduction of other stressors; climate-robust spatial planning; long-term monitoring; adaptive management.
Chemical changes (acidification, oxygen regime, nutrient loading and ratios, anthropogenic toxic substances)	Water column: changes in plankton composition and oxygen conditions. Seabed: effects on calcifiers and bioturbation, with knock-on effects on the food web.	Expansion of protected areas; restoration of shellfish beds and reef structures; coupling with CO_2 mitigation under ecological conditions.
Biogeographical and phenological shifts (species distribution, timing of blooming and migration, emergence of opportunistic or invasive species)	Above water: shifts in migration and breeding patterns. Water column: redistribution of fish species. Seabed: adjustment of community structure.	Facilitating ecological networks; nature-based solutions; adaptive objectives and management.

Table 8. Summary processes, effects and measures of human activity at sea

Activities and pressure factors	Main effects (layers)	Some possible ecological measures
Spatial and physical interventions (wind farms, platforms, cables and pipelines, sand extraction, nourishment)	Above water: barrier and collision effects. Water column: local disturbance and noise. Seabed: habitat loss and introduction of hard substrate.	Spatial zoning; cumulative impact assessment; nature-inclusive design of offshore infrastructure (reef and shelter structures, substrate variation).
Seabed disturbance and exploitation (fisheries, mineral extraction)	Water column: changes in trophic ratios. Seabed: loss of structure and biodiversity.	Area closures; restrictions on fishing gear; restrictions on mining; nature-inclusive construction; ecosystem-based fisheries management.
Pollution, noise, and light	Above water: disturbance of bird and bat behaviour. Water column: effects on plankton and larvae. Seabed: accumulation of contaminants.	Source reduction of emissions; noise and light mitigation; mandatory ecological monitoring framework.

Table 9. Summary activities and pressure factors, effects and measurements of coastal influence

Activities and pressure factors	Main effects (layers)	Some possible ecological measures
Riverine and estuarine influences (nutrient and contaminant loading, sediment supply, freshwater discharge)	Above water: changes in quality of foraging areas. Water column: eutrophication and salinity gradients, with knock-on effects on the open North Sea.	Source reduction on land; catchment-based approach; improvement of water and sediment quality; integration of river, coastal, and North Sea policy.
Coastal morphological processes and coastal defence (beach nourishment, dike reinforcement, changes to wave and current regime)	Water column: changes in stratification and plankton blooms. Seabed: changes in sediment structure and habitats.	Nature-inclusive coastal safety; restoration of transitional areas (mudflats, salt marshes, tidal flats, dunes); protection of coastal habitats.
Human activities in the coastal zone (ports, industry, recreation, coastal fisheries)	Above water: disturbance of resting and breeding sites. Water column: barrier formation, e.g. for migratory fish. Seabed: habitat shifts in shallow zones.	Spatial coastal planning; regulation of use; monitoring of coast-sea coupling.

B.4 **Monitoring and enforcement**

Ecologists generally give priority, in terms of monitoring and enforcement in the North Sea, to activities that (1) are spatially widespread and (2) exert direct pressure, particularly on seabed habitats and protected species:

- Bottom trawling fisheries, as this emerges as one of the most significant pressure factors. The emphasis is on compliance with area closures/conditions in ecologically sensitive seabed habitats and protected zones.
- Bycatch and disturbance of protected species (in particular marine mammals and seabirds) caused by fisheries and intensive activity. Monitoring then focuses on bycatch reporting, compliance with mitigation measures, and high-risk areas.
- Underwater noise (pile-driving for wind farms, shipping, seismic surveys and clearance of explosives), as this is a demonstrably relevant exposure pathway for marine mammals. Permit conditions are often linked to noise standards.
- Marine litter (loss of fishing gear, waste from shipping and coastal sources). Priority is given to prevention, reporting and take-back systems, and compliance with waste-chain agreements, in view of the persistent scale and diffuse origin of the problem.
- Pollution and incidents (oil/chemical discharges, chronic emissions).
- Local cumulative effects around offshore infrastructure (wind farms, cables/pipelines, platforms), where analyses indicate that effects may be relatively small at the North Sea scale but locally significant. Monitoring then focuses on compliance with construction/maintenance conditions and local ecological monitoring.

Appendix C. **Workshop participants**

Name	Position	Organisation
Frank Bekkers	Programme Director	HCSS
Bas Binnerts	Senior Consultant Acoustic Signatures & Noise Control	TNO
Kees Borst	Senior advisor Offshore Expertise Centre	Rijkswaterstaat
Casper Bosschaart	Lead advisor seabed security	TNO
Joris Diehl	Service delivery manager eco-sensors	Rijkswaterstaat
Roos van Dorp	Environment advisor	Ministry of Defence
Luca van Duren	Marine ecologist	Deltares
Alexander Ebbing	Blue economy innovation manager	CampusatSea
NN	Analyst department Strategy and Advice	Ministry of Defence
Floris van Hest	Director	Gieskes-Strijbis Fund
NN	Sustainability Coordinator	Ministry of Defence
Edith Kuijper	Coordinating Senior Policy Advisor	PBNI
Bastiaan Malta	Coordinating Policy Officer in Maritime Security	Ministry of Infrastructure and Water Management
Eline van Onselen	Project leader and marine ecologist	Stichting de Noordzee
Rob Oudelaar	Senior Advisor North Sea digitalisation	Rijkswaterstaat
Katja Philippart	Director	Waddenacademie
Gerjan Piet	Marine ecologist	Wageningen University
Sandra Reynaers	Senior Policy Adviser in Living Environment	Ministry of Defence
Inger-Marie Smid	Sustainability Advisor	Ministry of Defence
Pieter-Jan Vandoren	Strategic Analyst	HCSS
Marcel van Veldhuisen	Offshore Crossings and Nature Inclusive Design	TenneT
Berend Jan Zonneveld	Leader Operations Management Offshore	TenneT

The Hague Centre
for Strategic Studies

HCSS
Lange Voorhout 1
2514 EA The Hague

Follow us on social media:
@hcssnl

The Hague Centre for Strategic Studies
Email: info@hcss.nl
Website: www.hcss.nl