

Work Package 2: Evaluation of Enablers

How-to Natura 2000



May 2025

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Introduction: Why is N2000 an issue with implementing NbS?

Natura 2000 is a European wide ecological network of protected areas aiming at conserving biodiversity. It is based on the Habitats Directive (Council Directive 92/43/EEC) and the Birds Directive (Directive 2009/147/EC). The aim is to achieve "favourable conservation status of natural habitats and species of wild fauna and flora of community interest" (FFH Directive) and to restore and conserve habitats (Birds Directive). In order to avoid negative influence on the protected habitats and species, the impacts of planned projects and plans are analysed in a Habitats Directive Assessment taking also into account cumulative impacts of other projects and plans (Art. 6(3)). In exceptional cases, where overriding public interest prevails, projects can be carried out despite the negative effects on the protected habitats and species, provided that the coherence of Natura 2000 is ensured (Art. 6 (4)) (=Coherence measures).

The implementation of nature-based measures has the potential to align the objectives of nature conservation and coastal flooding and erosion risk management (IUCN 2020). According to the Nature Restoration Law (NRL) which was passed by the EU in 2024, nature-based solutions (NbS) are solutions that are inspired and supported by nature, that are cost-effective, and that simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. Nature-based solutions need to therefore benefit biodiversity and support the delivery of a range of ecosystem services.

The Natura 2000 could provide opportunities or limitations for the implementation of NBS in protected sites. Generally, Natura 2000 acts as a driver in the NBS implementation if these measures aim for nature conservation, development, restoration and maintenance (de Luca et al., 2021). Another opportunity is that the alignment of N2000 with other EU policies (Water framework directive, Green Deal or Horizon Europe research policy) provides NBS implementation access to finance (Ryfisch et al., 2023). Moreover, if a project needs an environmental permit to be implemented in N2000, it requires a public support and a long term interest from the public (Terlouw, 2023). However, NBS implementation also encounters certain limitations in Nature 2000 sites. First, the implementation of NBS mainly happens to areas part of the Bird habitat directive (BHD). This means that only a small set of (vertebrates) habitats have a priority for NBS implementation. An unclear or a lacking business plan might limit as well the implementation of NBS in N2000 site. And lastly, the role of local authorities in the selection of NBS in Nature 2000 sites still to research (Ryfisch et al., 2023).

Integrating Natura 2000 objectives into the planning phase of coastal protection measures can facilitate the authorisation process and accelerate the granting of permission, as evidenced by projects such as the Marconi project near Delfzijl (Leuven et al. 2021). However, this requires a comprehensive understanding of ecosystems and their conservation status, the effectiveness of nature-based elements in coastal protection as well as of the governmental structures and laws (van der Meulen et al. 2023). It needs extensive accompanying and impact monitoring to increase system understanding. But, no distinction is often made in the impact assessment between hard coastal protection measures and NbS. As NbS sometimes require more space, this means that hard structures are still being prioritized in some places. In addition, the transposition of EU directives into national law leads to different challenges in the planning and approval process for nature-based coastal protection elements in different countries.

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Border issues

Opermanis et al. (2013): "The lack of coherence of a network of protected areas across administrative borders may occur as different bodies are responsible for nature conservation on either side which may lead to a lack of unified approaches in site selection".

Borders are present in a variety of forms, where differences in legislation and organizations responsible for maintaining the natural environment can have a significant influence on Natura 2000 areas (Opermanis et al., 2013). One of the main objectives for the Natura 2000 network is a good ecological coherence, something that might be hindered by borders.

A distinction needs to be made between internal and external borders, as borders within countries can impact Natura 2000 management, however, this distinction is different compared to the external border differences. Connectivity can be measured on a variety of parameters, such as distance between bordering sites, dispersal of species across the borders and travel time between bordering sites.

External and internal

Different reasons can be found for connectivity issues. Natural factors, such as geographical features, i.e. land management impacting habitats on each site, or different habitats due to other actions. Some

Natura 2000 sites are rather small, reducing the likelihood that specific species will be present in both the areas, as they are often designated for a specific species (Kruk et al., 2010).

External

Knowledge and information sharing is also hampered by border issues. Borders lead to different languages, databases and methods of measuring and managing N2000 areas. Collaboration needs to be fostered to ensure that national borders don't lead to fragmentation of N2000 areas. The Common Wadden Sea Secretariat was established to address this issue, among others. The trilateral approach aims to improve exchange and interaction across the borders of the Netherlands, Germany and Denmark to work on common goals for the wadden sea area.

Internal

Internal borders lead to differences in management and possible fragmentation of N2000 areas. In the Netherlands for instance, provinces are responsible for managing N2000, where some areas cross borders of multiple provinces. However, Rijkswaterstaat (executive agency of the Ministry of Infrastructure and Water management) is also responsible for a lot of N2000 areas. Management plans for N2000 areas are drafted by the Ministry of Economic affairs, after which those responsible for management are given a lot of freedom how to work with the management plan (Bij12, 2023). This leads to differences in working methods, hindering the collaboration when borders are present within the nation.

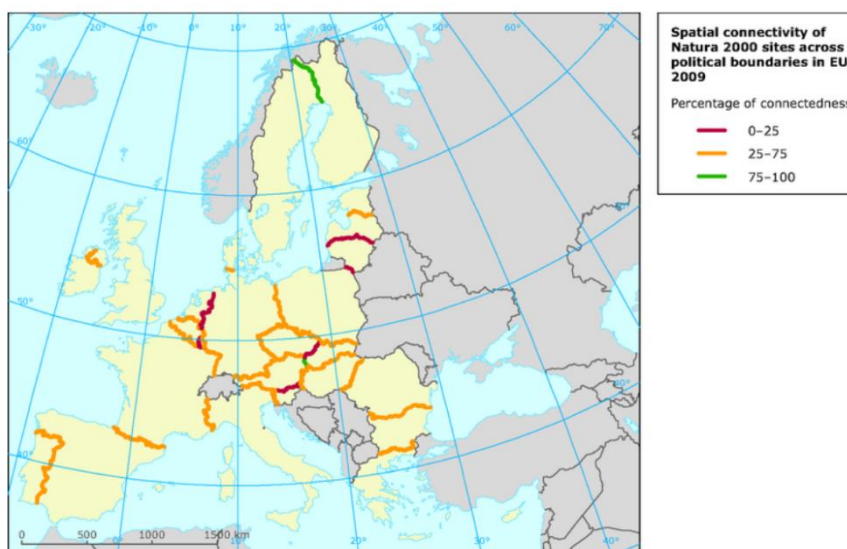


Figure 1: Connectivity between external borders within the EU regarding Natura 2000 areas (European Environment Agency, 2012)

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Responsibilities for Natura 2000 areas

Effective management of Natura 2000 areas in the European North Sea region is crucial given the pressing environmental threats such as flooding, erosion, and rising sea levels, which are not directly addressed by the European Environment Agency (EEA). Clearly defined responsibilities among stakeholders are essential to effectively combat these challenges and ensure the protection of these valuable habitats. Nature-based Solutions (NbS) offer promising strategies to mitigate these threats, enhancing resilience and supporting conservation goals. This chapter explores the key responsibilities for managing Natura 2000 sites in Denmark, the Netherlands and Germany.

Figure 1 gives an overview about the authorities and responsibilities in the different countries. The following subchapters go into more detail on the responsibilities.

Denmark Municipalities of Esbjerg, Fanø, Vardø, Tønder Danish National Park Wadden Sea Nature Agency* Environmental Protection Agency* Coastal Authority* The Agency for Culture and Palaces The main tasks of the Agencies and Authority part of the Ministry of Environment concern: nature protection; monitoring and recovery; implementation of Natura 2000. The Municipalities contribute with implementation of Natura 2000, are responsible for the environmental impact reports and initiatives for restoration. The National Park runs projects for nature conservation, communication, education, and awareness, and contributes to sustainable tourism initiatives. The Agency for Culture and Palaces, part of the Ministry of Culture Denmark, represents the State Party to the World Heritage Convention. *part of Ministry of Environment of Denmark.	Lower Saxony National Park Authority* (NLPV) Ministry for Environment, Energy, Building and Climate Protection of Lower Saxony Wardening NGOs contracted by the National Park Authority The Lower Saxon National Park Authority as site manager is responsible for monitoring, scientific studies, and research coordination; surveillance and wardening; communication, information and education; maintenance, development and restoration; species protection; exceptions and exemptions; fines; acts as stakeholder in planning and permission procedures; coordinates the UNESCO Biosphere Reserve. * competent authority, subordinate to the Ministry for Environment, Energy, Building and Climate Protection of Lower Saxony.
Schleswig-Holstein National Park Authority* Ministry for Energy Transition, Climate Protection, Environment and Nature of Schleswig-Holstein (MEKUN) Wardening NGOs contracted by the National Park Authority The Schleswig-Holstein National Park Authority as site manager is responsible for monitoring, coordination of scientific studies and applied research, management activities, species protection, exceptions and exemptions from the National Park Act, fines. It acts as stakeholder in planning and permission procedures, surveillance and wardening, communication, information and education, coordination of the UNESCO Biosphere Reserve and networks. * part of the State Agency for Coastal Defence, National Park and Marine Conservation Schleswig-Holstein as a subordinate authority of the MEKUN.	The Netherlands Rijkswaterstaat, Natuurmonumenten, Staatsbosbeheer, Ministry of Agriculture, Nature and Food Quality, the three provinces (Groningen, Friesland, and Noord Holland), Landschap Noord-Holland, Groninger Landschap, It Fryske Gea and private owners (each with their own management plans for the areas that they support in the Wadden Sea). The Ministry of Defence is also (partly) a manager of areas within the Wadden Sea Region. The municipalities have a management responsibility regarding destination plans and building permits. The Wadden Sea Management Authority is working on integral site management of the Wadden Sea. The main tasks of the site managers concern: physical site management; nature recovery; permitting procedures; monitoring; surveillance and enforcement; hospitality; practical research.
Hamburg National Park Authority* Free and Hanseatic City of Hamburg, Ministry of Environment, Climate, Energy and Agriculture Department of Nature Conservation (BUKEA). Wardening NGOs contracted by the National Park Authority The Hamburg National Park Authority as site manager is responsible for the protection of nature, environmental observation, and research, as well as environmental education and promoting the experience of nature in the National Park. * part of the Hamburg Ministry of Environment	Table 2. Composition of site managers in the three Wadden Sea countries. In Germany, site management is organised at federal state level: Schleswig-Holstein, Hamburg, and Lower Saxony.

Figure 1 Overview by Common Wadden Sea Secretariat (2023) of Natura 2000 site management responsibilities in Denmark, the Netherlands and the German federal states located at the sea

Denmark

The EU's Natura 2000 directives require member states to safeguard and restore key habitats and species, with Denmark implementing these obligations through systematic Natura 2000 planning over six-year periods. In Denmark, 8% of the marine areas and 18% of the land are designated as Natura 2000 areas, totaling 252 sites, including 10 in the Wadden Sea region. These areas are based on detailed baseline analyses, which inform planning and are discussed with various stakeholders

including government authorities, regional bodies, municipal authorities, national park boards, associations, organizations, and landowners.

At the national level, broad discussions shape the Natura 2000 plans, while the Danish Environmental Protection Agency handles regional baseline analyses and plan proposals. In the aquatic zones, efforts align with river basin plans aimed at enhancing water quality and ecological conditions, which benefits Natura 2000 areas like the Wadden Sea's rare houting.

The Natura 2000 planning process involves five key components for each site: the Natura 2000 plan, a consultation report, a summary statement, a strategic environmental assessment, and a revised baseline analysis. The Natura 2000 plan outlines conservation objectives and intervention measures based on the baseline data and monitoring results. The consultation report captures public feedback, while the summary statement addresses the environmental impact and integrates stakeholder opinions. The strategic environmental assessment follows statutory requirements, and the baseline analysis details habitat mapping, condition assessments, and threat evaluations.

Once finalized, these plans are binding for municipal councils and other authorities, which then develop specific municipal action plans to ensure effective implementation of Natura 2000 directives.

An ongoing obstacle is the unclear administration of N2000 in assessing the impact of coastal protection in at least 2 important topics: Is the impact assessment based on the lifetime of the coastal protection or based on the impact at the time of construction. And comparing the gross and net impacts, including considering impacts that would have occurred without the construction of the project.

The Netherlands

In the Netherlands, the Natura 2000 network consists of 162 areas. Information about the criteria selection and each area can be found on a [digital map](#). The N2000 areas are managed by the Provinces and in the case of national waters, they are managed by the Rijkswaterstaat. For each Natura 2000 area, the provinces or Rijkswaterstaat draws a management plan. This states what needs to be done to achieve the nature objectives for that area and who will do that. Management plans are drawn up in close consultation with owners, users, interest groups and other involved authorities, such as municipalities, water boards and provinces. A management plan is valid for six years. Currently, the Rijkswaterstaat is busy updating the management plans (Rijkswaterstaat 2025).

- Natura 2000 management plan:
https://open.rijkswaterstaat.nl/publish/pages/74045/natura_2000-beheerplan_waddenzee_2016-2022.pdf
 - Targets are at page 48. If you look at table 3.3. for example and last line. You can read there that the state of conservation is positive, the relative contribution to Wadden Sea is triple positive, the trend is positive, target for full population is maintaining the size, target of the quality of population is maintaining quality and target for population is increase.
- Natura 2000 management plan coastal areas (includes North Sea side of the islands)
- N2000 land. Is best to be found by pressing on the smaller items on the ARCGIS website and via the taps. They have for example separate N2000 plans for the dunes on the islands.

Germany

The total of 5.200 Natura 2000 areas[1] cover 15,5% of Germany's terrestrial land and around 45% of the marine area[2] (in three biogeographical regions: Alpine, Continental and Atlantic, which includes the waters of both North and Baltic Sea).

Areas under the Habitat Directive				
Federal state	Count	Hectare (terrestrial)	Hectare (marine)	Hectare (in total)
Lower-Saxony	385	325.204	284.829	610.032
Hamburg	16	6.034	13.450	19.484
Schleswig-Holstein	271	113.765	579.551	693.315
GERMANY (incl. EEZ)	4.544	3.327.708	2.123.789	5.451.497

Areas under the Birds Directive				
Federal state	Count	Hectare (terrestrial)	Hectare (marine)	Hectare (in total)
Lower-Saxony	71	339.265	347.763	687.028
Hamburg	8	3.087	13.450	16.537
Schleswig-Holstein	46	105.606	747.828	853.434
GERMANY (incl. EEZ)	742	4.028.503	1.971.825	6.000.328

In case of Germany, these regulations are part of the Federal Nature Conservation Act. Due to the federal structure in Germany, the federal states have the option of making additional state-specific regulations with certain federal laws (see the following overview) while adhering to the federal provisions.

Implementation in national law	Federal Nature Conservation Act (Bundesnaturschutzgesetz, BNatSchG)
Implementation in state law (Ländergesetze)	State Nature Conservation Act (Landesnaturschutzgesetz); National Park Acts (SH, HH, LS) LS / HH: specific conservation objectives are included in the National Park Acts, SH: Specific conservation objectives for each Natura 2000 site (SAC and SPA) published separately by the Ministry for the Environment ^[3]
Management plan	Management plan for each site except for the National Parks (Trilateral Wadden Sea Plan)

In the German Wadden Sea, which is protected under the Habitats Directive (HD) and Birds Directive (BD), the Trilateral Wadden Sea Plan (WSP) and the Site-specific Integrated Management Plan (SIMP) together serve as the Natura 2000 management framework. While the WSP and SIMP are legally non-binding, they guide conservation efforts across national borders. On the national level, management and protection responsibilities are structured around key regulations and institutions. In Germany, the national park authorities are responsible for implementing management measures. For example, in Lower Saxony, they develop site-specific management plans to address their respective areas of responsibility. The recent management plan is available under: <https://www.nationalpark-wattenmeer.de/wp-content/uploads/2022/01/1-Management-FFH-001-Textteil.pdf>

Under Article 6(3) of the HD, transposed into German law (§ 34 BNatSchG), any project or activity that could significantly impact a Natura 2000 site must undergo an appropriate assessment to ensure it does not harm the site's conservation objectives. This regulation prohibits any actions that could negatively affect the conservation values of the site, requiring thorough assessment before project approval or implementation.

Species protection is mandated by Articles 12-16 of the HD and Articles 5-9 of the BD, also implemented in federal law (§ 44 BNatSchG). This law prohibits the harassment of particularly protected and strictly protected species. Specifically, it is forbidden to significantly disturb these species during critical life stages, such as breeding or migration, if such disturbances could deteriorate the conservation status of the local populations.

Every six years, Germany must report on the status of the Natura 2000 network components to the European Commission, as stipulated by Article 17 of the HD. The Federal Agency for Nature Conservation (BfN) is responsible for compiling this national report, using data collected from federal states and nationwide surveys of habitats and species.

The management and monitoring of Natura 2000 areas within the Wadden Sea fall under the National Park Authorities. These authorities oversee compliance with both the HD and BD, as well as additional EU directives like the Marine Strategy Framework Directive (MSFD). They are also responsible for advising on the assessment process for projects near or within Natura 2000 sites and ensuring that natural processes are minimally disturbed. Restoration or improvement plans for habitats or species are considered only when necessary to meet EU directive obligations.

Overall, the responsibilities for Natura 2000 management in the German Wadden Sea are distributed among various legal frameworks and administrative bodies. This organisation intends to ensure comprehensive protection and adherence to conservation objectives, but leads in reality often to the contrary. The distribution to various administrative bodies normally does not ensure but hamper comprehensive management.

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Working with many legislations and restrictions

Managing Natura 2000 sites in coastal areas involves navigating a complex landscape of regulations, including Natura 2000 directives, national nature legislation, flood management directives, UNESCO World Heritage requirements, national cultural heritage laws, and spatial planning regulations. These diverse frameworks can sometimes create conflicting demands, making it challenging to find optimal solutions for both nature conservation and flood risk management. Effective long-term maintenance requires a nuanced approach that balances these various restrictions while addressing both ecological and hydrological needs.

One potential solution is to shift from a purely conservation-focused approach to an ecosystem-based approach. This involves considering the broader ecological context and integrating conservation efforts with flood risk reduction measures. Expanding the scope of protected areas or adopting a geographical approach that targets key species and ecosystems could also enhance effectiveness. Additionally, addressing the balance between abiotic interventions (such as flood defenses) and ecosystem recovery processes is crucial for sustainable maintenance. However, the question remains as to how these changes can be implemented in detail, and who will initiate and carry out this process in the regarding countries of the European north sea region.

For example Sand nourishment projects for coastal protection often face a mismatch between technical maintenance needs and ecological recovery. While technical requirements may call for frequent interventions to prevent erosion, the environment may require a longer recovery time to restore its natural balance. This discrepancy can hinder ecosystem recovery, affecting habitats and biodiversity. Balancing both timelines is essential for effective coastal protection and environmental health.

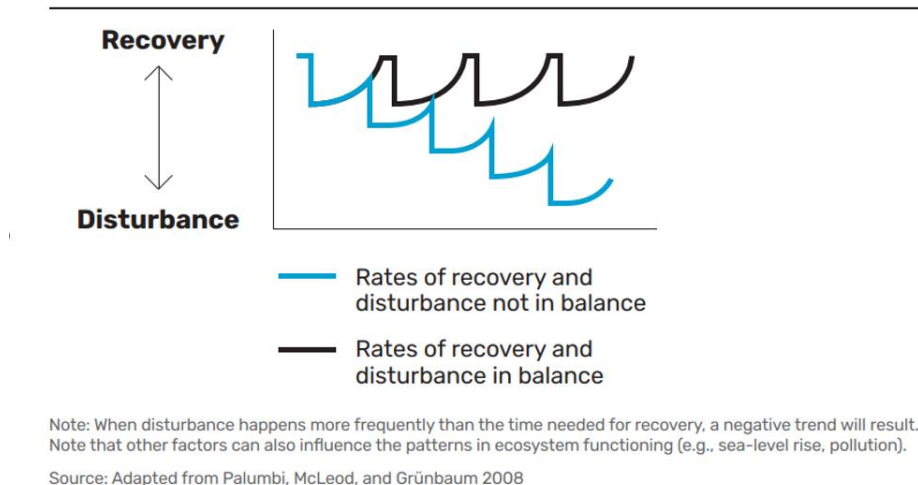


Figure 2 Schematic illustration of the recovery dynamic of an ecosystem when disturbance and recovery are in balance or not

Monitoring and adaptive management strategies can help navigate these complexities, ensuring that maintenance practices align with both ecological and regulatory requirements. By exploring these possibilities and fostering collaboration among stakeholders, it is possible to reconcile competing demands and improve outcomes for Natura 2000 sites in coastal areas.

Natura 2000 cycle of implementation: pinpoint where challenges occur

With the Natura 2000 cycle of implementation (based on the paper of Frantzeskaki et al. 2020) we aim to identify the phases in which obstacles for implementation of NbS in Natura 2000 areas occur in the different countries of the MANABAS Partnership. With this empirical analysis we want to point out and describe challenges due to knowledge gaps, skill, partnership or legislation needs.

Together we identified 13 steps needed to implement NbS in Natura 2000 areas in the European North Sea region (Table 1). Most needs and gaps occur in step 9, *Monitoring and evaluation for new NbS*, and 11, *Maintenance of existing NbS*. Most often named obstacles are knowledge needs (K), followed by partnership needs (P), skill needs (S) and legislations (L).

Table 1 Natura 2000 cycle of implementation. 13 steps to successfully implement NbS in the North Sea region. The MANABAS partners empirically marked different needs to the equivalent steps that occur in their organisations: Knowledge needs = K, Skill needs = S, Partnership needs = P, Legislation needs = L

	Natura2000 implementation cycle	RWS (NL)	HHNK (NL)	HZ pilot (B/NL)	NLWKN (D)	LKN.SH (D)	DCA (DK)
1	Identify problem/opportunity			K			K, S
2	Identify N2000 management responsibilities			K, P			
3	Involvement (all stakeholders, ecologists, nature conservation authorities (!) etc.)	S, K, P, L			(K)	P	K, S, P
4	Select NBS			K	K, S, P	K, S, P	K, S
5	Design implementation processes			S, K, P, L	K, S	S, P, L	K, S
6	Implement NBS			S, K, P, L	K	L	K, S
7	Engagement and communication	K, P	P, S	K	P		
8	Monitoring and evaluation for new NbS	K		S, K, P, L	K, S	K, P	K, S, P
9	Transfer and upscale			K, S		K	K, S, P
10	Monitoring existing NBS on flora and fauna, climate change, recreation	P	P	S, K, P, L	K	P	K, S, P
11	Maintenance of existing NBS	p	P, L	S, K, P, L	K	K, P	
12	Adaptation maintenance		P, K, L		K, S, P	K, P	
13	AI for monitoring, adaptation of monitoring		P, S, K			K, S	

The German partners NLWKN and LKN.SH seem to have similar obstacles according to the steps they occur in and the corresponding needs and gaps. Knowledge and partnership needs are more important

than legislation or skill needs corresponding to the selection, monitoring, maintenance and adaptation of NbS. In the design and implementation process legislations and some practice of the permitting authorities are main barriers. Instead of recognizing NbS as positive contributions to nature, they are often viewed as negative impacts due to their primary objectives, such as coastal defense. Likewise, the Dutch pilots show more knowledge and partnership needs. Compared to the German pilots, more skills and legislation support are needed for NbS implementation in the Netherlands. And lastly, the pilot in Denmark shows that NbS implementation require knowledge, skills and partnerships.

In conclusion, the analysis of the Natura 2000 implementation cycle reveals that the most significant obstacles to NbS in the European North Sea region are found in the phases of design the implementation process and Monitoring and Evaluation and Maintenance. The common challenges across different countries primarily involve knowledge gaps and partnership needs, while skill and legislative requirements are less frequently cited, but for individual organizations in some steps of enormous significance. Addressing these diverse needs is crucial for the effective implementation of NbS in Natura 2000 areas.

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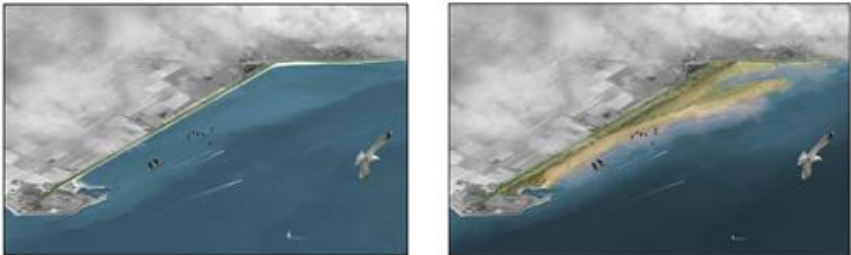
Niki Frantzeskaki, Paula Vandergert, Stuart Connop, Karlijn Schipper, Iwona Zwierzchowska, Marcus Collier, Marleen Lodder (2020): *Examining the policy needs for implementing nature-based solutions in cities: Findings from city-wide transdisciplinary experiences in Glasgow (UK), Genk (Belgium) and Poznań (Poland)*, Land Use Policy, Volume 96, 104688, ISSN 0264-8377, <https://doi.org/10.1016/j.landusepol.2020.104688>.

Examples of implementing NbS in Natura 2000 areas

This chapter presents practical examples from the MANABAS COAST project partners, highlighting how coastal protection measures have been applied in various Natura 2000 areas. Through these cases of conventional and NbS coastal protection projects, we want to show different approaches and possible solutions for specific and real situations. Also which role played stakeholder collaboration and involvement, ecological restoration and coastal flood protection.

Prins Hendrik Zanddijk, NL

Location	53.02884222204324, 4.822747698979858 Texel, the Netherlands
Summary of the project/ the measure in a few sentences	Following a national assessment of primary flood defenses mandated by the Dutch flood defense law, the dike along the Wadden Sea on the Dutch island of Texel was deemed insufficient on several safety aspects. For the 3.2 km stretch between the Wadden Sea and the Prins Hendrikpolder, the municipality of Texel and regional water authority (Hoogheemraadschap Hollands Noorderkwartier – HHNK) proposed to investigate alternatives for seaward reinforcement with the aims to prevent inland intervention, keep options open for future enhancements, and seize opportunities for nature, landscape, and recreation. The sandy solution and artificial dune and nature reserve project that followed is titled the Prins Hendrik Zanddijk (sand dune) (PHZD).
Was the NbS assessment in comparison with alternative hard, “traditional” structures?	Taking into account the coastal morphological context, several alternative designs were developed: an island and a beach-hook, as well as more traditional landwards dike reinforcements. The designs have been evaluated based on costs, required initial volumes of sand, monitoring needs, maintenance requirements (i.e., volume, frequency), nature disruptions due to maintenance, likelihood of obtaining permits, nature management, natural values, and feasibly realizable natural habitats. The dune with beach-hook was selected for implementation.
Was the impact in your N2000 area calculated net or gross? E.g. are natural trends integrated into assessment of a NbS? (net) Or was taken into account what would have happened without the NbS measure? (net)	The impact was assessed taking into account the whole system, so also outside the project plan area. Possible developments were evaluated for this whole system, indirectly taking into account a net calculation. For the smaller project area studies where focused on possible and probable developments including the proposed coastal reinforcement project.
How long did you calculate impact? For construction time or over a certain measure-lifetime?	The effects and impacts were calculated for the 50 years design period.
How often do you map nature types? (developments and shifting/ changing distribution)	Breeding birds are yearly monitored. Water birds 5 times per year (this includes availability of resting areas during high-tide in the Wadden Sea). Vegetation yearly in cooperation with Floron (NGO)
What does the measure add to mainstreaming NbS? (which elements can contribute to mainstreaming)	Taking into account a larger perspective, namely the larger habitat area, rather than the smaller project area provides possibilities. An (system) ecologist in the lead makes discussions with nature organisations easier, as they speak the same language. Also, during the

	design period, the ecologist in the lead will make sure natural sound alternatives will be developed.
What role plays maintenance?	A significant role. The system might erode, we therefore designed a robust system so disturbance due to maintenance can be limited (not prevented). Maintenance is planned on a monitoring procedure which provides ample learning as well.
How were Natura 2000 management plans and goals integrated in the NbS project planning?	Regarding the latter, the sandy solution of the PHZD provides a redistribution and transformation of habitats within the 200 ha of the project area. Permanently submerged sandbanks reduced in area, whereas silt- and sandbars, marches, silt grass- and cord grasslands, embryonic, white, and calcareous grey dunes, and shell-beaches all gain surface and quality. By doing so, it gives impetus to natural values which the current situation or the traditional solution would have missed, such as ecological coherence, natural features, and contribution and conservation of biodiversity with positive impacts for fish species, seals, and birds which are key to the Natura 2000 objectives for the Wadden Sea region. As such, the Natura 2000 context of the Wadden Sea acted as enabler for the nature-based solution for improvements to coastal flood defense, as the Natura 2000 status obligates projects to improve the quality of the natural habitat and prevent its disturbance. In the design objectives where set for each newly developed habitat type at the project site (Figure 2). Figure 3 and 4 show the developed habitats in and the bird species found at the site. This video provides an aerial overview of the projectsite and insights provided by close stakeholders (Nature and Regional Water agency). Automatic subtitles are available: https://youtu.be/jNGx6zI8iPg?si=I5nRS2qx3x9SJzU
Which stakeholders were involved and how?	The social system and stakeholder engagement were key to the habitat development of the PHZD project. A local frontrunner with affinity to ecology and gravity in terms of knowledge and relation to the island community played a major part in the intensive stakeholder process. Sufficient time was secured to have actors (e.g., nearby residents and farmers, representatives of nature organizations, recreationists, parties responsible for management of the Wadden Sea (Rijkswaterstaat) and flood defense (HHNK), specialists and enthusiasts on local flora and fauna heard in one-on-one and round table sessions. Ultimately, additional rounds of concession-conversations were scheduled to secure no objections would be made. Close relations with the island community proved to be valuable during constructions, as nuisance from unexpected drifting sand could easily be compensated with collective cleaning of windows and cars while dog walkers e.g. contributed to temporarily keep out breeding birds.
Pictures	 <i>Figure 1 Artist impression of NbS flood protection project PHZD (source projectplan, EDM70-19/17-004.091)</i>

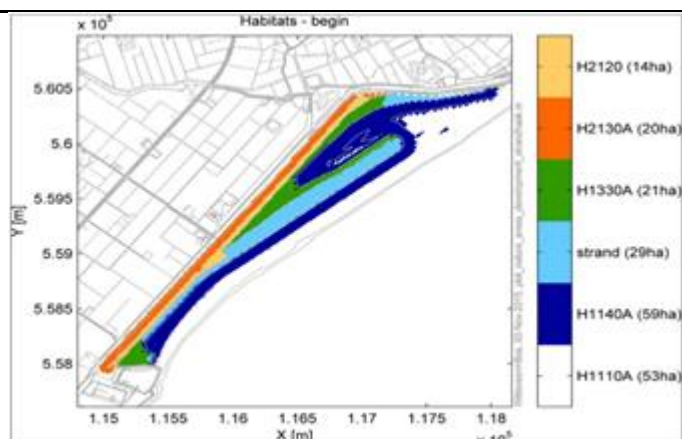


Figure 2 design of N2000 habitats including projected acreage (source projectplan, EDM70-19/17-004.091)



Figure 3 the PHDZ site with the beach, spit and dune system (photo June 2022, Q.Lodder)



Figure 4 Public information on birds found on the PHDZ (photo June 2024, Q.Lodder)

Westerschelde, NL/BE

Location	51.40335561070883, 3.7018944417730397 The Netherlands and Belgium
Summary of the project/ the	Within the Zuidwestelijke Delta, the Western Scheldt estuarine environment is in danger of disappearing and the land areas surrounding Western Scheldt

measure in a few sentences	are also at risk of flooding. It is one of the two estuaries in the Netherlands and is an intertidal area with mud flats and salt marshes of great value for nature. The Western Schelt estuary is part of the Natura 2000 network. The tidal nature, which is rare in Europe, also provides natural protection against floods. In 2005, the Province of Zeeland (The Netherlands) together with the Flemish government (Belgium) signed a Treaty to give more space to the Scheldt estuary through depoldering. Three depoldered sites are studied in this pilot project: Hedwige polder, Perkpolder and Zwin.
Was the NbS assessment in comparison with alternative hard, "traditional" structures?	The aim of the projects in the three sites was to increase the ecological value of the Western Schelte estuary. The flood safety was part of the aim in the Hedwige on the Belgian site. Further research is still needed to find out the contribution of Perkpolder tidal area to the Natura 2000 goals.
Was the impact in your N2000 area calculated net or gross? E.g. are natural trends integrated into assessment of a NbS? (net) Or was taken into account what would have happende without the NbS measure? (net)	I dont have the information about this.
How long did you calculate impact? For construction time or over a certain measure-lifetime?	I dont have the information about this.
How often do you map nature types? (delevopements and shifting/ changing distribution)	I do not have this information. Long term (ecological) monitoring takes places in the three sites: Hedwige (2022-2037), Zwin (2024-2034) and Perkpolder (2020-2030).
What does the measure add to mainstreaming NbS? (which elements can contribute to mainstreaming)	The ecological monitoring shows an increase in vegetation, benthic specific and birds in Hedwige and Zwin. Hedwige has become part of the Grenspark Groot Zaaflingen across the border with Belgium and the Netherlands. In Perkpolder, there is an increase in benthic species but no changes yet in vegetation. The ultimate goal of monitoring is to develop knwoledge on how to manage the nature in the depoldered area. For example, the Zeeuws Landschap wants to update their nature management plans in the Zwin. In addition, the knowledge is also valuable to develop a story about the benefits of depoldering to gain social acceptance.
What role plays maintainance?	The maintenance is important to avoid erosion and salinisation of the area.

How were Natura 2000 management plans and goals integrated in the NbS project planning?	The activities performed in these areas follow the Natura 2000 goals. They developed the Nature package Western Schelt to carry out projects nature restoration projects. Some of these projects are called managed realignments and they extend the tidal nature. For example, the Hedwige-Prosperpolder (300 ha) and Zwin (120ha) are located across the Dutch-Belgian border. And Perkpolder (75ha) is located in the Netherlands (Province of Zeeland, 2023). Since 2005, the Hedwige-Prosperpolder and the Zwin extension are part of the Natura 2000 network (ANB, 2024). In the Belgian site, the objective was two fold: nature
Which stakeholders were involved and how?	In the Hedwige and Zwin sites there are Dutch and Flemish stakeholders involved. Dutch stakeholders are: Province of Zeeland, Ministry of Agriculture fisheries, food security and nature, Dutch ministry of foreign affairs, Rijkswaterstaat, Waterboard, local municipalities, Zeeuwss Landschap, residents. In the Flemish site: the Province of West Flanders, Flemish waterways, Agency of nature and forest (ANB), Agency of coastal protection (MDK). The Flemish Netherlands Scheldte Commission (VNSC) as international stakeholder. in the Hedwige, the project managers are: the Province of Zeeland in the Dutch site and the Agency of nature and forest is the Dutch site. In the Zwin, the project managers are MDK in collaboration with ANB. In the Perkpolder, the project manager is Rijkswaterstaat.
Pictures	

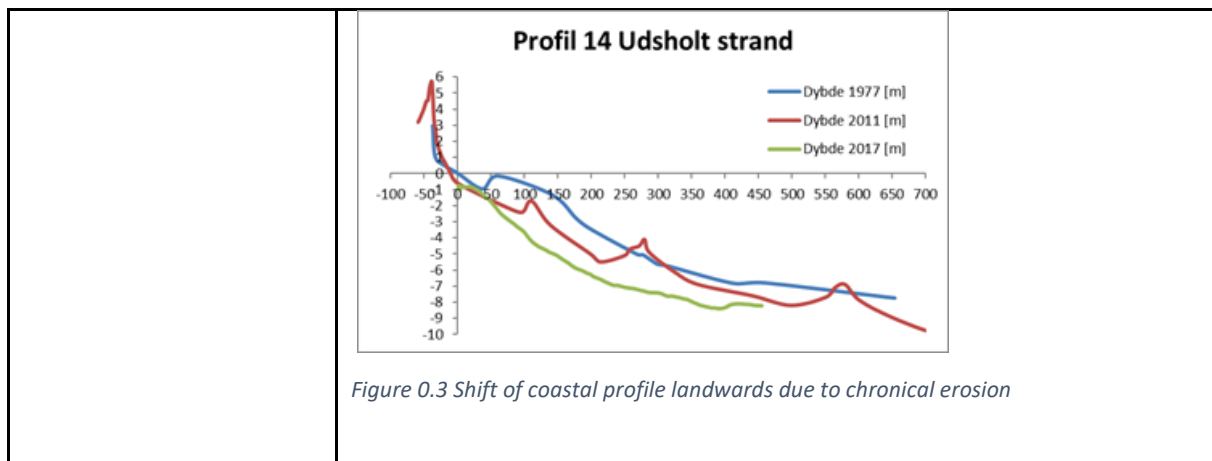
Hundested to Helsingør, DK

Sand nourishment on a dynamic coast

Location	56.03129325216142, 12.593681714997917 Hundested to Helsingør, Denmark
Summary of the project/ the measure in a few sentences	The north coast of Zealand in Denmark, the coast is eroding from Hundested to Helsingør, Figure 0.1. 25 km of the coast marine nature types has been appointed as a Natura 2000 area from the coastline to deeper water, see Figure 0.2. There are two marine N2000 areas Reef(1170) and sandbank(1110). The areas close to the coast the sea bed is varying from being sand or gravel/stone. An analysis of annual

	orthophotos shows a huge variability in the location and areas of the nature type Reef and Sand bank. This is caused by three factors: Seasonal variations, chronical erosion and the stop of sediment supplement supply from coastal cliffs. The seasonal variation between summer and winter coastal profile causes a shift from finer to coarser sediment at the coastline and vice versa in the nearshore. This process is not accounted for in the Danish management of the Habitats directive. Chronical erosion causes the coastal profile to shift landwards, see Figure 0.3, which also shifts the position of nature types. This process will further be increased by rising sea level, which causes the wave dominated coastal profile to move landwards. This process is not accounted for in the Danish management of the Habitats directive. Stop of sediment supply to the wave driven sediment transport from erosion of the coastal cliffs has caused a steepening of the coastal profile, hence a coarsening of the sediment. This process is not accounted for in the Danish management of the Habitats directive.
Was the NbS assessment in comparison with alternative hard, "traditional" structures?	Yes since there is already a lot of traditional passive coastal protection like rock revetments, shoreparallel breakwaters and groins. The assessment has shown that sand nourishment must be undertaken to compensate for erosion and restore the beaches and nearshore partly sandy sea bed.
Was the impact in your N2000 area calculated net or gross? E.g. are natural trends integrated into assessment of a NbS? (net) Or was taken into account what would have happened without the NbS measure? (net)	Gross, and the assessment was only done for the initial nourishment and not the maintenance. This led to misinterpretation of the impact of the NBS.
How long did you calculate impact? For construction time or over a certain measure-lifetime?	Only at impact i.e. few months
How often do you map nature types? (developments and shifting/ changing distribution)	The aim in the N2000 plan is to keep the area of Reef and Sandbank at a fixed size and space, even though it is constantly shifting in the wave impacted area as described above. There is an option every 6 years to adjust the two marine habitats.
What does the measure add to mainstreaming NbS? (which elements can contribute to mainstreaming)	That it has been realized that sand nourishment provides multifunctions that are needed on an erosional coast.
What role plays maintenance?	It is the most important issues, since it is vital to acknowledge that maintenance on erosional coast is regular supply of sediments.
How were Natura 2000 management plans and	During the last 100 years landowners have built passive coastal protection to combat erosion in the presence of shoreparallel

goals integrated in the NbS project planning?	breakwaters, groins and revetments. The erosion continued and now the present coastal protection is at risk of collapsing the following years. Therefore the 3 municipalities has decided that they will support the landowners in counteracting the erosion by an initial beach nourishment at 8 stretches. The beach nourishment will result in a coast closer to a natural coast. The natural dynamics and erosion management will be done by frequent beach nourishments. The sand from the beach nourishment will cover areas of Reef just seawards of the coastline, hence increasing the area of Sandbank. The nature type are not prioritized Despite that fact the environment authority has required compensation for the loss of Reef. This will be done by using more gravel and rocks in the beach nourishment. The result is beach and nearshore that consists of coarser sediment that is natural. The effect is a fixation of an biology that lives in coarse sediment, and what is unnatural for the coast.
Which stakeholders were involved and how?	Landowners, municipalities, environment authority
Pictures	 <i>Figure 0.1 Location of the coastal stretch from Hundested to Helsingør in DK</i>  <i>Figure 0.2 Appointed Nature type Reef (blue) and sandbank (yellow)</i>



Enø flood protection, DK

Location	55.168697100845996, 11.668643341191283 Enø, Denmark
Summary of the project/ the measure in a few sentences	Enø is a low lying area and prone to flooding because the storm surges can reach up to 2 meters. The area is a small island where many holiday houses have been built as can be seen on Figure 0.1. A large part of the seaward area of the houses and infrastructure has been designated as a Natura 2000 area, as shown for a section of the coast in Figure 0.2 and Figure 0.3.
Was the NbS assessment in comparison with alternative hard, "traditional" structures?	Yes. Hard structures were preferred to NbS.
Was the impact in your N2000 area calculated net or gross? E.g. are natural trends integrated into assessment of a NbS? (net) Or was taken into account what would have happened without the NbS measure? (net)	The landowners wanted to reduce the risk of flooding by implementing a flood protection scheme. In the procedure of designing the flood protection it was realized that it was not possible to install a nature-based flood protection as a landscape or a dike, due to the fact that a small part of the Natura 2000 would be impacted. Based on the experience from another project on Zealand it was therefore decided to install a vertical timber wall instead, see Figure 0.4 and Figure 0.5. At another site at Næsby strand the installed solution is a steel sheet pile, see Figure 0.6. But these hard structures function as an ecological barrier and interruption and may therefore not align with the local Natura 2000 management plans.
How long did you calculate impact? For construction time or over a certain measure-lifetime?	

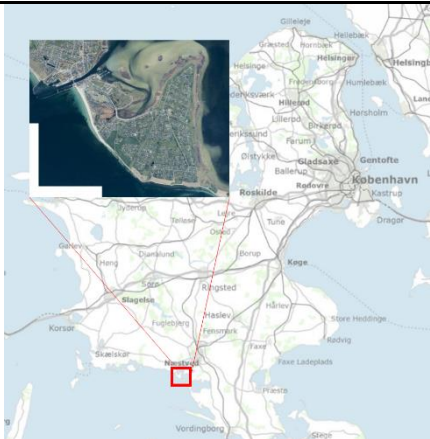
How often do you map nature types? (developments and shifting/ changing distribution)	There is a option every 6 years to adjust the appointed habitats.
What does the measure add to mainstreaming Nbs? (which elements can contribute to mainstreaming)	Part of the project is a green dike that is an example on how a traditional NBS can be used as flood protection. Another part of the coastal protection consists of a sand nourishment, which is an excellent example on how a NBS can create a multifunction on a very attractive beach
What role plays maintainance?	The hard structures of a timber wall and a steel sheet pile don't need frequent maintainance.
How were Natura 2000 management plans and goals integrated in the Nbs project planning?	It was avoided to impact Natura 2000 by using non-Nbs like concrete walls. These structures don't impact the Natura 2000 sites, but function as an ecological barrier. The questions remains open, if the timber wall and steel sheet piles align with the local Natura 2000 management plan.
Which stakeholders were involved and how?	
Pictures	 Figure 0.1 Location of Enø in Zealand, Denmark



Figure 0.2 Location of roads and houses close to nature.

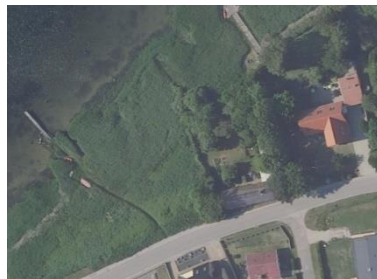


Figure 0.3 Location of Nature 2000 area



Figure 0.4 Installed vertical wood wall next to the N2000 area at Enø



Figure 0.5 Vertical wooden wall seen from the air at Enø



Figure 0.6 Installed sheet pile flood protection at Næsby strand

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Eiderdamm Nord, DE

Location	54.28338184818764, 8.839324965231249 Eider-estuary, Germany
Summary of the project/ the measure in a few sentences	As a consequence of the severe storm surge in 1962 the Eider-estuary was closed in the late 60ies with a 5 km long dike and a storm-surge barrier inbetween. Through lack of clay in the area, the dike was covered with asphalt. 50 years later, the asphalt-revetment has severe damages and has to be reinforced. A landward reinforcement isn't possible due to a high frequented street and a nature reserve directly adjacent to the dike. Directly seawards the dike the Wadden Sea with weak subsoils begins. Therefore a dike construction was developed which stays in the existing dike dimension but with a higher safety standard in relation to wave-overtopping. Due to roughness elements on the seaward dike slope the wave run up was reduced substantial. By using a concrete revetment a high durable surface with low maintenance is build. With an Nature 2000 area seawards and landwards the dike inbetween is an important breeding ground for a lot of sea-birds. During construction it is ensured that there are enough quiet zones on the dike where birds have the possibility to breed. The new concrete revetment improves the breeding ground quality due to its surface character.
Was the NbS assessment in comparison with alternative hard, "traditional" structures?	A hard structure with the same dimensions as the previous structure was preferred to NbS because it needs less space and therefore influences or covers less of the local Natura 2000 area. Furthermore the ground of the measure area is very soft. This circumstance has limited possibilities for alternative hard structures or the installation of wide-ranging NbS. Consideration of whether the asphalt dyke should be converted into a green dyke was rejected due to the impossibility of maintenance. Due to the poor location, there are currently no available shepherds in the area and the use of the dyke for grazing cannot be guaranteed.
Was the impact in your N2000 area calculated net or gross? E.g. are natural trends integrated into assessment of a NbS? (net) Or was taken into account what would have happened without the NbS measure? (net)	The Natura 2000 area was not impacted, because the measure stayed in the same dimensions as before. During reconstruction no new construction roads were needed, existing infrastructure was used. The Eiderdamm was and is an important breeding area for birds, most important for the in Germany endangered ringed plover. During construction works it was aimed to minimize the effect on the breeding birds. The controlled distribution of flotsam, which the birds need for nest building, ensured that birds were able to breed on the dyke despite the construction work. On the new dyke the much coarser surface structure was especially chosen for wave reduction, but also to catch flotsam even better. A positive side effect of the new surface structure is, that visitors and tourists stay at the official bike lane at the top of the dyke and don't disturb the birds.
How long did you calculate impact? For construction time or over a certain measure-lifetime?	As it is a hard structure, one corresponds to another: The impacted area during construction was slightly bigger than the area over the lifetime of the structure.

How often do you map nature types? (delevopements and shifting/ changing distribution)	Breeding birds are monitored every year on and around the dyke. The Natura 2000 area around the dyke is monitored every 6 years.
What does the measure add to mainstreaming Nbs? (which elements can contribute to mainstreaming)	Engeneers worked from the beginning of the project planning together with ecologists and relevant stakeholders of lokal nature conservation associations. This has led to an optimal and amicable solution for the surrounding nature reserves and the habitats at the dyke itself.
What role plays maintanace?	Nature conservation: flotsam organisation during construction or maintenance measures before the start of the breeding season. Problem: Rubbish in the flotsam and in the structure of the dyke surface. Solutions still need to be found in the long term!
How were Natura 2000 management plans and goals integrated in the NbS project planning?	In this case Natura 2000 management plans were not integrated into project planning, because the chosen measure did not interfere with existing Natura 2000 habitats.
Which stakeholders were involved and how?	Lokal nature conservation associations like NABU or the wadden Sea Protection Station were included into the project planning and during construction. There was no public participation, as there are no residents in this area.
Pictures	



Leybucht, DE

Location	The Leybucht (53.516866, 7.077808) is located along the Western mainlandcoast of Lower Saxony in the region of East Frisia. The area is part of the UNESCO World Heritage and situated in the highly protected zone (Ruhezone) of the Lower Saxony Wadden Sea Nationalpark. Following the storm surges of 1374/7 the bay attained its maximum inland extension. Gradually, the process of reclaiming land from the sea led to the outline of the contemporary coastline, a process that ended with the completion of the Störtebecker dyke.
Summary of the project/ the measure in a few sentences	In order to stabilise the foreland, artificial drainage structures were built until the 1980s. Consequently, large areas of the Leybucht are characterised by anthropogenic drainage structures, a lack of dynamic processes and missing connection to the tidal system. This resulted in a medium to poor (C) conservation status for the Atlantic salt marshes and a need for development measures to improve their conservation status. In the course of a dyke strenghtening project to ensure coastal protection, the need for nearby clay as dike construction material was determined. In this context, the opportunity of combining the renaturation of the salt marshes with clay extraction for coastal protection measures was identified. In the Leybucht, the aim was to develop a salt marsh on around 40 ha. To achieve this, the surface was lowered to allow natural, dynamic salt marsh development. In addition, anthropogenic structures, that were no longer needed for coastal protection, were removed and the connection to the natural tidal regime was restored. The removed clay soil could be used for coastal protection measures.
Was the NbS assessment in comparison with alternative hard, "traditional" structures?	Due to the poor state of preservation of the salt marshes, the Leybucht was designated as a search area for site-specific renaturation measures in the foreland management plan. It was stated in the text that the material obtained during the measures could be used for coastal protection purposes. The measure was primarily a renaturation measure and no comparison of alternatives had to be carried out.

Was the impact in your N2000 area calculated net or gross? E.g. are natural trends integrated into assessment of a NbS? (net) Or was taken into account what would have happened without the NbS measure? (net)	/
How long did you calculate impact? For construction time or over a certain measure-lifetime?	The effects of the measure simultaneously represent a renaturation i.e. a nature conservation enhancement of the area.
How often do you map nature types? (developments and shifting/ changing distribution)	- Before measure: Initial state - After completion of the measure: second, fifth and tenth year after project implementation
What does the measure add to mainstreaming NbS? (which elements can contribute to mainstreaming)	The project is accompanied by monitoring, which can show the impacts on the environment. Although the full evaluation of the monitoring is still pending, first results indicate a positive development of the habitat type. The successful implementation of the project can therefore serve as a model for further projects (mainstreaming).
What role plays maintenance?	No maintenance will be carried out.
How were Natura 2000 management plans and goals integrated in the NbS project planning?	The project area is part of N2000 as an FFH site and EU-bird sanctuary. The measure is based on the information in the foreland management plan, which is developed in co-operation with the National Park Authority. The foreland management plans therefore also take into account the management objectives of the N2000 areas. Further, the compatibility of the project with the nature conservation objectives (including Natura2000) was checked as part of the approval process.
Which stakeholders were involved and how?	The basis of the measure is the foreland management plan. It is developed in co-operation of the Coastal Protection Authority and the National Park Administration. Further, the Dyke Authorities, Nature Conservation Authority, Nature Conservation NGOs and the land owners and managers were involved in the planning process.



“Special Area of Conservation” Cap Lévi to Pointe de Saire, FR

Location	49.697051, -1.472880 Cap Lévi to Pointe de Saire, France
Summary of the project/ the measure in a few sentences	The SyMEL (Syndicat Mixte des Espaces Littoraux de la Manche) is a French coastal management authority responsible for overseeing and implementing NbS in the Manche department. Operating under the Conservatoire du Littoral, SyMEL manages approximately 12.276 hectares of coastal land, focusing on preserving and restoring coastal ecosystems to enhance resilience against climate change impacts such as erosion and sea-level rise. SyMEL's initiatives include habitat restoration, dune stabilization, and the promotion of sustainable land-use practices. By integrating ecological considerations into coastal management, SyMEL aims to balance environmental conservation with human activities, ensuring the long-term sustainability of coastal areas in the Manche department.
Was the NbS assessment in comparison with alternative hard, “traditional” structures?	Yes, the SyMEL project includes the assessment of NbS in comparison with traditional, hard coastal protection measures, such as sea walls or dikes. The project's goal is to evaluate how NbS—such as dune and reef restoration, habitat conservation, and the creation of natural buffers—can provide sustainable, cost-effective alternatives to conventional infrastructure.
Was the impact in your N2000 area calculated net or gross? E.g. are natural trends integrated into assessment of a NbS? (net) Or was taken into account what would have happened without the NbS measure? (net)	The SyMEL project in France employs a net impact assessment approach when evaluating the effectiveness of NbS in Natura 2000 areas. By considering what would have happened in the absence of the NbS, the project can isolate the actual benefits and outcomes resulting from the interventions.
How long did you calculate impact? For construction time or over a certain measure-lifetime?	The SyMEL project in France evaluates the impacts of its NbS over the entire expected lifespan of the implemented measures, rather than just focusing on the construction phase.

How often do you map nature types? (developments and shifting/ changing distribution)	habitat mapping in Natura 2000 areas on a regular basis every 6 years.
What does the measure add to mainstreaming NbS? (which elements can contribute to mainstreaming)	By integrating NbS strategies, SyMEL aims to enhance coastal resilience to erosion and flooding, while promoting biodiversity and ecosystem services. The comparison with hard structures focuses on the long-term benefits of NbS, including better ecological outcomes, adaptability to climate change, and reduced maintenance costs. Thus, the project helps to demonstrate that NbS can be effective alternatives to traditional methods, supporting both environmental and coastal protection goals.
What role plays maintenance?	- Regular maintenance, such as invasive species management, Regular planting of native vegetation to stabilize dunes and prevent erosion, monitoring water salinity to maintain habitat quality, periodic replenishment of sand to maintain natural coastal buffers, conducting ecological assessments to inform necessary adjustments in restoration strategies - Local stakeholders are involved in maintaining these areas, fostering shared responsibility and ensuring long-term success with lower costs
How were Natura 2000 management plans and goals integrated in the NbS project planning?	The project aligns its NbS initiatives with the objectives of the Natura 2000 network. The local Natura 2000 goals are incorporated into the planning and monitoring processes of the NbS. Regular monitoring ensures that both coastal protection and ecological restoration goals are being met, with adaptive management in place to adjust strategies as needed. The SyMEL project collaborates closely with relevant authorities responsible for Natura 2000 sites, such as regional environmental agencies and conservation organizations. This collaboration ensures that the implementation of NbS is consistent with Natura 2000 objectives and integrates scientific advice on the best conservation practices.
Which stakeholders were involved and how?	The project actively engages a diverse range of stakeholders, including local communities, environmental organizations, governmental agencies, and coastal landowners. Regular communication through flyers took place to raise awareness about the local habitats and the coast as an ecosystem and with its hazards.

Pictures

Val de Saint-Pierre
Aire d'étude du Document Unique

Site Natura 2000 des "Récifs et marais arrière-littoraux du Cap Lévi à la Pointe-de-Saint-Pierre"
PARTIE MARINE

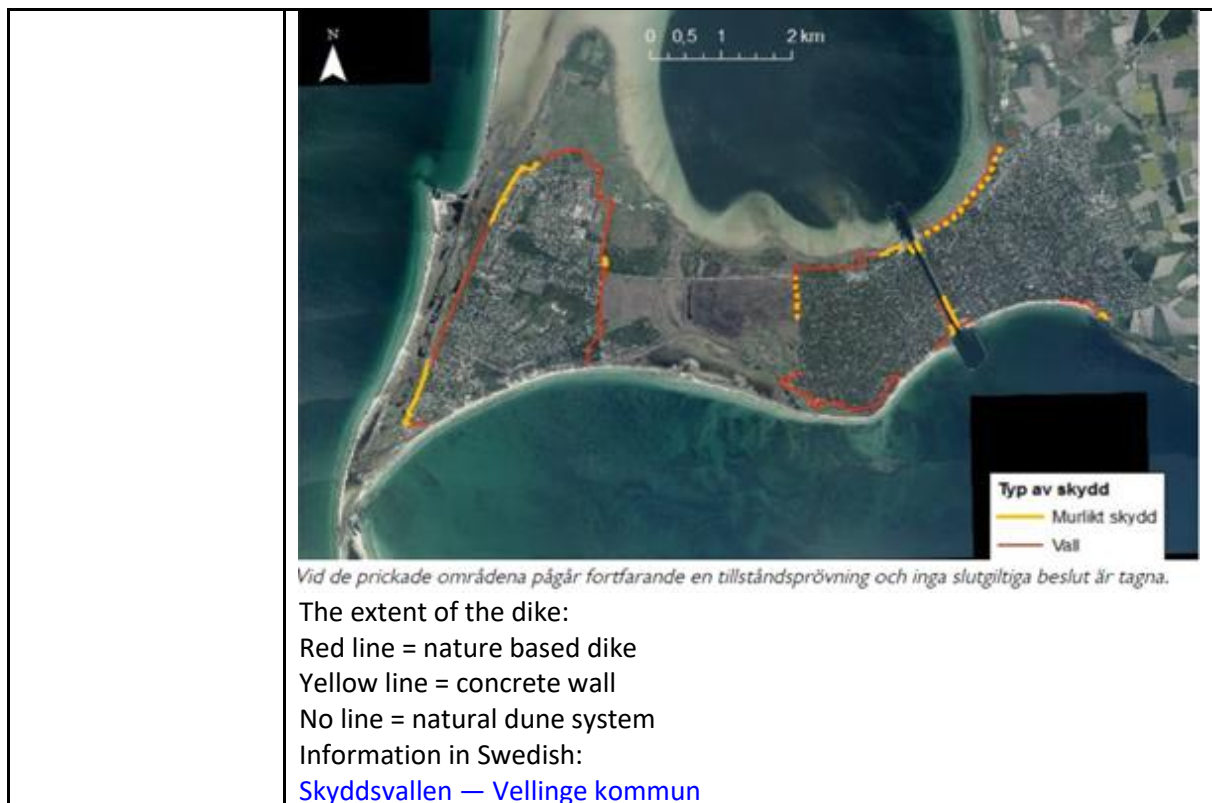
Site du Conservatoire du littoral

Site Natura 2000
Partie terrestre du site Natura 2000
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Périmètre d'intervention
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Limites communales
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Flood defense Falsterboänset, Municipality of Vellinge Sweden, SW	
Location	WGS84 55°25'27.6"N 12°52'43.4"E, Sweden Natura 2000 areas on the Peninsula of Falsterbo. Falsterbohalvön SCI (SE0430095), Falsterbo skjutfält (SE0430111) and SPA area Falsterbo-Foteviken (SE04430002).
Summary of the project/ the measure in a few sentences	The Municipality of Vellinge is constructing a 21 km long flood defense. About three-quarters of the defense consist of a nature-adapted dike for flood protection in Natura 2000 areas. The dike will largely be covered by nature-adapted vegetation to minimize the environmental impact of the embankment. The measure was reviewed in the Land and Environment Court (Mark- och Miljödömsstolen). The Court found the measures covered by the municipality's application permission to erect a flood barrier generally good balanced and acceptably accommodate the many conflicting interests concerned. However, in some respects, the Court assesses that there are possible, alternative locations of flood protection that would be better than

	those for which a permit has been sought. As a consequence the application to install flood protection was rejected for two sub-areas. The permit also involves repairing existing dunes in some places. To minimize negative effects on Natura 2000 areas, conditions were imposed by the Court: Claimed land must be managed by the municipality in such a way that the habitat types there as far as possible, restored and maintained after construction. Land classified as meadows and pastures shall be managed as pasture or mowing where possible. The embankments must be checked regularly and any detections of detected invasive alien species must be combated immediately and effectively without undue delay. Impact on Natura 2000 biotopes was allowed but had to be compensated by new small lakes and wintering sites will be established on the Falsterbo peninsula to improve the conditions for amphibians.
Was the NbS assessment in comparison with alternative hard, "traditional" structures?	An alternative discussed by the Municipality is an outer defense placed closer to the sea to protect more land from flooding. The construction of that alternative is supposed to be the same kind of defense. Negative consequences of an outer defense is that nature values dependent on natural flood dynamic will be destroyed. An outer defense also have to be builded higher compared to the suggested alternative.
Was the impact in your N2000 area calculated net or gross? E.g. are natural trends integrated into assessment of a NbS? (net) Or was taken into account what would have happened without the NbS measure? (net)	The applicant states that: the land claims for the habitat type 2180 "Wooded dunes" make up just cover 10% (23 500 m²) of the area Natura 2000 area and for the habitat type 4030 "Dry heaths" just under 7 % (14000 m²) of the area. The Land and Environmental Court considers that the land claims are of such magnitude, both in the number of hectares and with the percentage that a significant impact on this Natura 2000 area can be predicted. The applicant states that probability that birds would be harmed by the construction work itself is assessed as very low, because birds are mobile. On some routes, noise from the work can disturb especially the breeding. Along such stretches, Vellinge municipality will propose time constraints in the work to minimize the negative impact.
How long did you calculate impact? For construction time or over a certain measure-lifetime?	An EU-funded LIFE project investigates how nature-adapted vegetation affects biodiversity and flood protection. The project goes by the name LIFECAPEable. Vellinge Municipality, together with University of Lund and the Technical University of Delft, the Netherlands, as well as the environmental consultant Ecogain, will test and evaluate the effect of seven different vegetation cover strategies. The nature-adapted vegetation cover will be on top of just under six kilometres of the newly built embankment, a total of 53,000 square metres of new habitat, and 1800 square metres of reinforced sand dunes. The impact of vegetation cover strategies will be evaluated in terms of climate vulnerability, biodiversity and social and economic benefits.
How often do you map nature types? (developments and shifting/ changing distribution)	Habitat types and species within the Natura 2000 areas will be mapped every 6 or 12 years, depending on the habitat type and species. At Falsterbo Bird Station, counting and ringing of migratory birds has been carried out since the late 1940s. Every autumn, more than two million of the approximately five hundred million migratory birds that pass through southern Sweden are counted.

What does the measure add to mainstreaming NbS? (which elements can contribute to mainstreaming)	In its judgment, the Land and Environment Court essentially upheld the Vellinge municipality's application for a permit under the Environmental Code to carry out flood protection. At the same time, the municipality was granted an exemption of the Species Protection Ordinance and a permit of the Environmental Code to establish flood protection within a Natura 2000 area, and exemption pursuant of the Environmental Code to carry out certain measures within nature reserves. The permit was subject to conditions of precautionary measures.
What role plays maintainance?	Grazing or mowing is important for keeping natural values.
How were Natura 2000 management plans and goals integrated in the NbS project planning?	Natura 2000 plans were not integrated in the project planning but the project had to adapt and take account to Natura 2000 regulations and management plans to minimize impact.
Which stakeholders were involved and how?	A lot of stakeholders were involved in the process in the Land and Environmental Court. According to Swedish law the operator needs to consult with the County Administrative Board (CAB), Supervisory authority, the individuals who can be assumed to be particularly affected, other government authorities, municipalities and the public that can be assumed to be affected. The purpose of the consultation is to improve the basis for decisions and to give an opportunity for public control and influence. CAB has a lot of responsibilities. In this case, CAB's role is the supervision of Natura 2000 areas. CAB was one of the interests who appealed against the permit for some of the distance due to risk for impact on habitat of Natura 2000. Other stakeholders who had comments on the application were the golf club and the local society of nature conservation.
Pictures	Prototype dike divided into four sub-areas to enable an evaluation of different vegetation types 



What does Natura 2000 mean for mainstreaming NbS in the North Sea region?

Incorporating NbS into coastal flood protection within the European North Sea region offers a sustainable and environmentally compatible approach to addressing social challenges. Natura 2000, with its focus on protecting specific habitats and species, can harmonize with NbS in coastal flood protection by considering the processes and characteristics of protected areas from the outset of project planning. Success in this integration relies heavily on involving ecologists throughout the project lifecycle, especially in leading communications and ensuring that ecosystem-based rather than species-focused approaches are prioritized. Adapted accompanying and impact monitoring for better system understanding is therefore crucial for wise and longterm measure planning. If future maintenance is part of the measures lifecycle assessment necessary adaptations or maintenance can potentially be performed with a minimal impact.

In Germany, key obstacles include evaluation rules that assess the significance of impacts on protected habitats, leading to a rigid approach by conservation and permitting agencies that often overlooks the benefits of NbS. Instead of recognizing NbS as positive contributions to nature, they are often viewed as negative impacts due to their primary objectives, such as coastal defense.

Designing solutions that address both flood risk reduction and habitat development objectives can expand the range of options available, often leading to more innovative and effective outcomes compared to traditional hard infrastructure. However, for Natura 2000 to fully support NbS in coastal flood protection, it is crucial to recognize the development potential of these solutions and how they can be coherently integrated into existing frameworks. In Denmark, for example, Natura 2000 has sometimes acted as a barrier, partly due to limited understanding of the natural dynamics of coastal ecosystems. Enhancing knowledge and integrating ecological insights will be key to overcoming these

challenges and ensuring that NbS can thrive within the Natura 2000 network, ultimately benefiting both coastal protection and biodiversity.

Open Questions

During the work in our How-to-Group questions which are important to answer for an NbS implementation in Natura 2000 areas arose. Some of these questions can be answered individually for every project. But others remain open and it seems that they only can be answered on a higher level. One of these questions is, how can development potentials of NbS be implemented in an impact assessment? Connected to this question it is key to look at the timespan of the impact assessment and if the impact of NbS to the the Natura 2000 area is calculated net or gross. For instance, is the immediate impact after construction or the impact over a certain lifetime assessed? Or is the NbS impact assessed in comparison with an alternative hard coastal protection structure?

However, it is also crucial to find a way how to deal with static borders in highly dynamic coastal areas and constantly changing environments. Experiences show, that in some places Natura 2000 borders are not adapted to changing habitat expansions. But it is important to find a way, how natural dynamics in landscapes can officially be considered in an EIA.

Another finding is that in some countries the authorities consider a very non-NbS measure, such as a steel sheet pile wall, as an alternative coastal protection solution when assessing the impact on NbS.

In context of climate change monitoring schemes and maintenance strategies should be adapted. But which indicators should be monitored and how maintenance is influencing Natura 2000 lifecycles and the other way around has to be answered for every measure and location individually. Nevertheless, it is important to expand exchange of experiences about these issues.

Questions from our group to continue with in other How-to-Groups are how to deal with national legal challenges and policy questions in the NbS-pilots beyond Natura 2000. And how can the Nature Restoration Law align with national habitat legislations?

Food for thought

The Nature Restoration Law (NRL) presents a unique opportunity to align coastal protection with ecological enhancement, especially within Natura 2000 areas. NbS, such as dune restoration or wetland creation, can contribute significantly to improve biodiversity and achieve restoration targets set by the NRL. When implementing such projects, it could be essential to interpret Natura 2000 regulations with this broader perspective in mind.

According to Article 37 of the NRL, member states may adapt habitats across biogeographical regions, provided that appropriate compensatory measures are taken for any significant deterioration. Importantly, if a restoration project transforms one protected habitat type into another—both covered under the regulation—this change should not be seen as degradation. Instead, it should be understood as a positive step toward ecological resilience.

This approach invites policymakers and project developers to think beyond rigid conservation toward dynamic restoration. By embracing ecological transitions within regulatory frameworks, coastal projects can enhance biodiversity, protect against climate change impacts, and support long-term environmental goals.