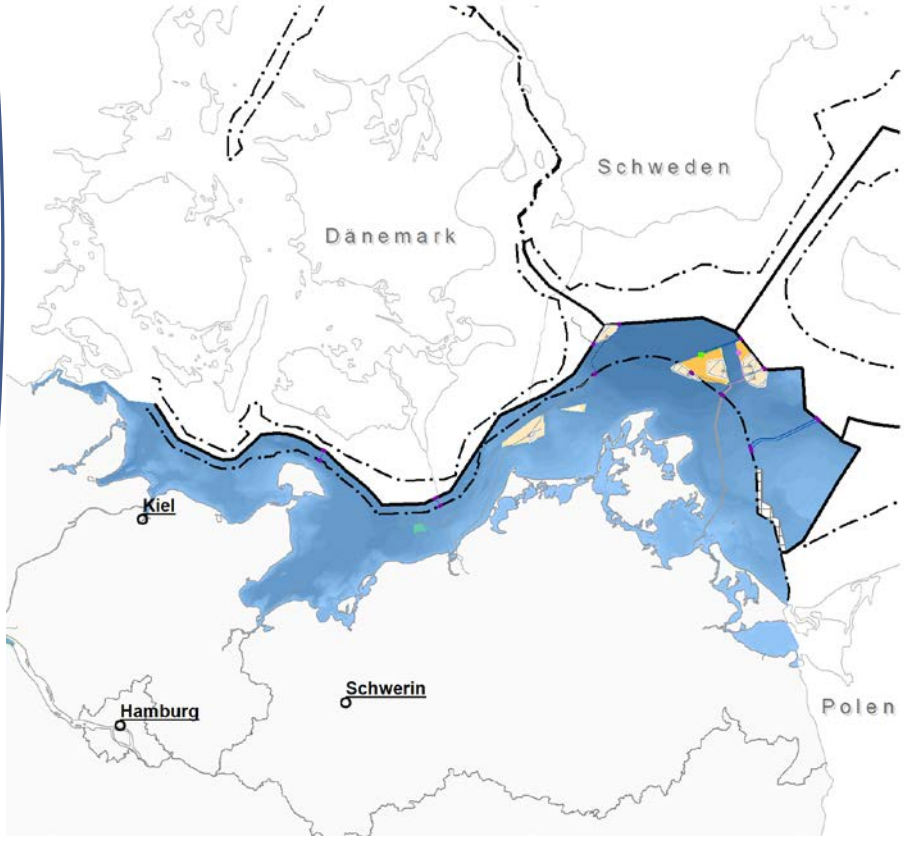
BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

Environmental Report: Baltic Sea Site Development Plan



Hamburg, 7th June 2024

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List of abbreviations

EEZ	Exclusive Economic Zone
BfN	Federal Agency for Nature Conservation
BGBl	Federal Law Gazette
BNatSchG	Act on Nature Conservation and Landscape Management (Federal Nature Conservation Act)
FNA	Bundesnetzagentur (Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway)
BSH	Federal Maritime and Hydrographic Agency
R&D	Research and development
FFH	Flora Fauna Habitat
Habitats Directive	Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive)
HELCOM	Helsinki Convention
ICES	International Council for the Exploration of the Sea
IfAÖ	Institute for Applied Ecosystem Research
IOW	Leibniz Institute for Baltic Sea Research, Warnemünde
IUCN	International Union for Conservation of Nature and Natural Resources (World Conservation Union)
K	Kelvin
OWF	Offshore wind farm
POD	Porpoise Click Detector
PSU	Practical Salinity Units
RL	Red List
ROP 2021	Maritime spatial plan of the EEZ (dated 19 August 2021)
SAMBAH	Static Acoustic Monitoring of the Baltic Sea Harbour Porpoise
SCANS	Small Cetacean Abundance in the North Sea and Adjacent Waters
SEL	Sound exposure level
SPA	Special Protected Area
SPEC	Species of European Conservation Concern (Important species for bird conservation in Europe)
SEA	Strategic environmental assessment
SEA DIRECTIVE	Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the environmental impacts of certain plans and programmes (SEA Directive)
UBA	Umweltbundesamt (Federal Environment Agency)
Environmental Impact Assessment Act	Environmental Impact Assessment Act
EIA	Environmental Impact Assessment
Birds Directive	Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (Birds Directive)
WT	Wind turbine
WindSeeG	Offshore Wind Energy Act (WindSeeG)

[***Preliminary Remark***

The current draft of the Site Development Plan dated 7 June 2024 makes the following spatial designations for the Baltic Sea, which go beyond the designations of Site Development Plan 2023:

- *In addition to an already established interconnector between the NordStream pipelines, routes for two other cross-border subsea cables were included to the north of NordStream (gates OXII- OXIII).*
- *Starting from the converter platform OST-2-4, three routes were included for cross-border subsea cables in the direction of the Danish EEZ (gate O-X).*

All other designations of the Site Development Plan 2023 as well as the associated SEA remain valid. The Strategic Environmental Assessment (SEA) on the current draft of the Site Development Plan is therefore limited to the assessment of additional environmental impacts by the above mentioned new spatial designations for the EEZ of the Baltic Sea in accordance with Section 39, para. 3 sentence 3 of Act on the Assessment of Environmental Impacts [UVPG] or to the required updates or consolidations. In order to mark the paragraphs concerned accordingly and create verifiable transparency, the added or updated text sections are in black font and the unchanged sections of the document that are still valid are in grey font colour.]

1 Introduction

A Strategic Environmental Assessment (SEA) was carried out as part of the revision and update of the Spatial Development Plan. This environmental report documents the result of the SEA for the EEZ of the Baltic Sea.

1.1 Legal basis and tasks of environmental assessment

According to Sections 4 et seq. WindSeeG, the BSH prepares an Spatial Development Plan in agreement with the Federal Network Agency (FNA) and in coordination with the Federal Agency for Nature Conservation (BfN), the Directorate-General for Waterways and Shipping (GDWS) and the coastal states. The Site Development Plan was last updated in 2023.

The new revision of Site Development Plan was introduced on 01 September 2023.

This revision procedure incorporates the amendment procedure for Spatial Development Plan 2020, which was initiated with the announcement of 17 September 2021 (cf the associated BSH announcement of 1 July 2022). The contents of the preliminary assessment of the individual case from the aforementioned procedure are included in the present SEA accordingly (cf Chapter 4.13 of the present environmental report).

When the Spatial Development Plan was in preparation, a detailed environmental assessment was carried out in accordance with the Environmental Impact Assessment Act (UVPG)1, in what is termed the Strategic Environmental Assessment (SEA). The environmental reports were published together with the Spatial Development Plan on 28 June 2019. The implementation of an SEA with the preparation of an environmental report is based on Section 35, para. 1, No. 1 UVPG in conjunction with Appendix 5, No. 1.17 UVPG because site development plans are subject to the SEA obligation within the meaning of Section 5 WindSeeG.

[1] Environmental Impact Assessment Act (UVPG) in the version of the announcement of 18 March 2021 (Federal Law Gazette I p. 540), last amended by Art. 14 AufbauhilfeG 2021 of 10 September 2021 (Federal Law Gazette I p. 4147)

In principle, this also applies if the Spatial Development Plan is updated or amended.

In the context of the revision initiated on 17 December 2021, in order to implement the statutory expansion targets for offshore wind energy, which have been defined since December 2021 by the coalition agreement and subsequently enshrined in the draft bill for the amendment of the WindSeeG (Section 1, para. 2 WindSeeG), areas and sites that go beyond Spatial Development Plan 2020 and were therefore not included in the SEA carried out in previous preparation, update, and revision procedures of the Spatial Development Plan are designated.

Unlike the last revision of the Spatial Development Plan, the completion of the revision procedure for maritime spatial planning means that an up-to-date maritime spatial plan is now available: The maritime spatial plan for the German EEZ of the North Sea and Baltic Sea (ROP)2, which came into force on 1 September 2021. As part of the maritime spatial planning revision procedure, a comprehensive SEA was carried out and an environmental report was prepared for each of the German EEZs in the North Sea and the Baltic Sea.

The revision of the Spatial Development Plan essentially builds on the designations of the maritime spatial planning for offshore wind energy and subsea cables and pipelines and develops them in terms of sectoral planning.

Against this background, the SEA for the revision of the Spatial Development Plan is largely based on the results of the SEA carried out in the maritime spatial planning revision procedure. According to Section 5, para. 3, sentence 5–7 WindSeeG, it must be determined at which stage certain environmental assessments are to be focussed in order to avoid multiple assessments in multi-stage planning and approval processes. The nature and extent of the environmental impacts and technical requirements as well as the content and subject matter of the site development plan shall be taken into account. The environmental assessment shall be limited to additional or other significant impacts on the environment as well as to necessary updates and elaborations.

In accordance with Section 72, para. 1 WindSeeG, the assessment of the environmental impact of offshore wind turbines or installations for other forms of energy generation according to the provisions of the UVPG based on an SEA already carried out according to Sections 5 to 12 WindSeeG for the site development plan or the site investigation shall be limited to additional or other significant impacts on the environment as well as to any necessary updates and elaborations.

Accordingly, the SEA carried out in the procedure for the update and revision of the Spatial Development Plan is to be limited to additional or other significant environmental impacts and to necessary updates and elaborations compared with the SEA for ROP 2021 (in this respect, in accordance with Section 5, para. 3, sentences 5–7 WindSeeG) and compared with more recent results from site investigations or from Spatial Development Plan 2019 or Spatial Development Plan 2020 (in this respect, in accordance with Section 72, para. 1 WindSeeG).

Accordingly, the SEA for the revision of the Spatial Development Plan is also based on the environmental reports for the preparation and revision of the Spatial Development Plan from 2019 and 2020. Insofar as new knowledge on existing designations is available and relevant, this will also be taken into consideration.

[2] Ordinance on Maritime Spatial Planning in the German exclusive economic zone in the North Sea and the Baltic Sea of 19 August 2021, Federal Law Gazette I p. 3886.

In the following, the scope of the assessment is therefore limited to additional or other significant environmental impacts as well as to necessary updates and elaborations.

In accordance with Art. 1 of Directive 2001/42/EC on the assessment of the impacts on the environment of certain plans and programmes on the environment (SEA Directive)[3], the SEA Directive aims to ensure a high level of environmental protection in order to promote sustainable development and to help ensure that environmental considerations are adequately taken into consideration in the preparation and adoption of plans well in advance of actual project planning.

The SEA has the task of identifying the likely significant impacts on the environment of implementing the plan, describing them at an early stage in an environmental report, and assessing them. It serves as an effective environmental precaution according to the applicable laws and is implemented according to consistent principles, and with public participation. In accordance with Section 2, para. 1 UVPG, the following protected assets are to be considered:

- Population & human health, in particular human health
- Fauna, flora, and biodiversity
- Space, soil (sediments), water, air, climate, and seascape
- Cultural heritage and other material assets
- the interactions between the aforementioned protected assets

The main content document of the Strategic Environmental Assessment is this Environmental Report. It identifies, describes, and assesses the likely significant impacts that the implementation of the Spatial Development Plan will have on the environment and possible alternative planning options, taking into consideration the essential purposes of the plan.

As part of the assessment of the impacts on the protected assets within the meaning of Section 2, para. 1 UVPG, the SEA also included the nature conservation law assessments for statutory biotope, site, and species protection, especially according to Section 30, 34, and 44 Federal Nature Conservation Act (BNatSchG)[4]. The special provisions of Section 72, para. 2 WindSeeG (for marine biotopes) and Section 5, para. 3, No. 5 WindSeeG were also taken into consideration.

1.2 Brief description of the content and most important objectives of the Site Development Plan

According to Section 4, para. 1 WindSeeG, the purpose of the Spatial Development Plan is to make offshore grid planning designations for the exclusive economic zone (EEZ) of the Federal Republic of Germany.

Section 4, para. 2 WindSeeG stipulates that for the expansion of offshore wind turbines and the offshore grid connection cables required for this purpose, the Spatial Development Plan shall make designations with the objective of

- achieving the (now increased) expansion targets according to Section 1, para. 2, sentence 1 WindSeeG
- expanding power generation from offshore wind turbines in a spatially ordered and land-saving manner

[3] Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the environmental impacts of certain plans and programmes

(OJ L 197 p. 30).

[4] Nature Conservation and Landscape Management Act (Federal Nature Conservation Act – BNatSchG) dated 29 July 2009 (BGBl. I p. 2542), last amended by Article 1 Act on the Protection of Insect Diversity in Germany and on the Amendment of other regulations dated 18 August 2021 (Federal Law Gazette p. 3908).

- ensuring an orderly and efficient use and utilisation of offshore grid connection cables and planning, constructing, commissioning, and using offshore grid connection cables in synchronisation with the expansion of electricity generation from offshore wind turbines.

According to the legal mandate of Section 5, para. 1 WindSeeG, the Spatial Development Plan contains designations for the period from 2026 for the German EEZ and, subject to the following provisions, for the territorial sea:

1. areas; in the territorial sea, areas may be designated only if the competent country has designated the areas as a possible subject of the Site Development Plan
2. sites in the areas designated according to Number 1; in the territorial sea, sites can be designated only if the competent state has identified the sites as a possible subject of the site development plan
3. the chronological order in which the designated sites are to be put out to tender according to Part 3, Section 2, 4, and 5, including the designation of the respective calendar years, and whether the area is to be centrally pre-screened
4. the calendar years including the quarter in the respective calendar year in which the surcharged offshore wind turbines and the corresponding offshore grid connection cable are to be commissioned on the designated sites as well as the quarters in the respective calendar year in which the cable of the in-farm cabling of the subsidised offshore wind turbines is to be connected to the converter or transformer platform
5. the expected generation capacity of offshore wind turbines to be installed in the designated areas and on the designated sites
6. locations of converter platforms, collector platforms and, where possible, substations
7. routes or route corridors for offshore grid connection cables
8. locations at which the offshore grid connection cables cross the boundary between the exclusive economic zone and the territorial sea
9. corridors for cross-border electricity lines
10. corridors for possible connections between the installations mentioned in points 1, 2, 6, 7, and 9, and
11. Standard technical principles and planning principles

For areas in the German EEZ and in the territorial sea, the Spatial Development Plan may designate available grid connection capacities on existing offshore connection lines or on offshore grid connection cables to be completed in the following years; these may be allocated to pilot offshore wind turbines according to Section 95, para. 2 WindSeeG. The Spatial Development Plan can make spatial legal requirements for the construction of pilot offshore wind turbines in areas and designate the technical conditions of the offshore grid connection cable and the resulting technical requirements for the grid connection of pilot offshore wind turbines.

In accordance with Section 5, para. 2a WindSeeG, the Spatial Development Plan may designate areas for other forms of energy generation outside of areas.

In accordance with Section 3, No. 8 WindSeeG, an area for other forms of energy generation is an area outside of areas on which offshore wind

turbines and installations for other forms of energy generation, each of which is not connected to the grid, can be constructed in spatial coherence and which is subject to the approval procedure according to Section 2 of the Maritime Facilities Act. According to Section 4, para. 3, sentence 1 WindSeeG, the objective of these designations is to enable the practical testing and implementation of innovative concepts for energy generation not connected to the grid in a spatially ordered and spatial resources-saving manner.

In the context of the SEA, a “classic” offshore wind farm is assumed based on the findings to date with regard to electricity generation within the areas for other forms of energy generation. Impacts on the environment going beyond this are highly dependent on the respective type of use and should therefore be comprehensively examined at the approval level. In this respect, the SEA for the areas for other forms of energy generation is carried out in the same way as the assessment of sites for offshore wind energy.

1.3 Relationship with other relevant plans, programmes, and projects

The Spatial Development Plan is related to other plans and programmes within the Exclusive Economic Zone (EEZ) and adjacent areas – in particular in the territorial sea – as well as to plans and projects at upstream and downstream planning and licensing levels. Detailed information can be found in the scope for the current SEA dated 30 June 2022 to which reference is made here.

1.4 Presentation and consideration of the environmental conservation objectives

The update and revision of the Spatial Development Plan and the implementation of the SEA will be carried out taking into consideration the environmental conservation objectives. These provide information on the state of the environment to be aimed for (environmental quality objectives). The environmental conservation objectives can be seen in an overall view of the international, union-based, and national conventions and regulations that deal with marine environmental protection, among other things, and based on which the Federal Republic of Germany has committed itself to certain principles and objectives.

These are explained in detail in the scope for the current SEA. Please refer to the statements in Chapter 3 of the scope of 30 June 2022.

The environmental reports on ROP 2021 contain a description of how compliance with the aforementioned relevant international, EU, and national regulations and recommendations is checked and implemented and which designations are made or which measures are taken. Should there be a need for updating or changes in this respect in the context of the revision of the Spatial Development Plan, a supplementary presentation will be made in this environmental report.

1.5 Methodology of the Strategic Environmental Assessment

When carrying out the Strategic Environmental Assessment, various approaches to the planning status can be considered within the framework of the methodology. This Environmental Report builds on the methodology used in the Strategic Environmental Assessments of Spatial Development Plan 2019 and Spatial Development Plan 2020.

The methodology is based primarily on the designations of the plan to be examined. Within the framework of this SEA, it is determined, described, and evaluated for each of the designations whether the designations have likely significant impacts on the protected assets concerned. According to Section 1, para. 4 UVPG in conjunction with Section 40, para. 3 UVPG, in the environmental report the competent authority

provisionally assesses the environmental impacts of the designations with regard to effective environmental precautions in accordance with applicable laws. According to the special legal benchmark of Section 5, para. 3, sentence 1, No. 2 WindSeeG, the designations may not pose a threat to the marine environment. In addition, the provisions of Section 5, para. 3, sentence 1, No. 5 WindSeeG (protected areas) and Section 72, para. 2 WindSeeG (marine biotopes) must be observed in particular.

The subject of the environmental report corresponds to the designations of the Spatial Development Plan as listed in Section 5, para. 1 and 2a WindSeeG (see 1.2).

The methodology of the Strategic Environmental Assessment is comprehensively explained in the scope for the current SEA. Reference is made at this point to the designated scope of 30 June 2022.

Area of investigation

The SUP area of investigation covers the German EEZ of the Baltic Sea. The adjacent territorial sea and the adjacent areas of the neighbouring states are not directly the subject of this plan; however, they are considered as part of the cumulative and transboundary consideration of this SEA where necessary.

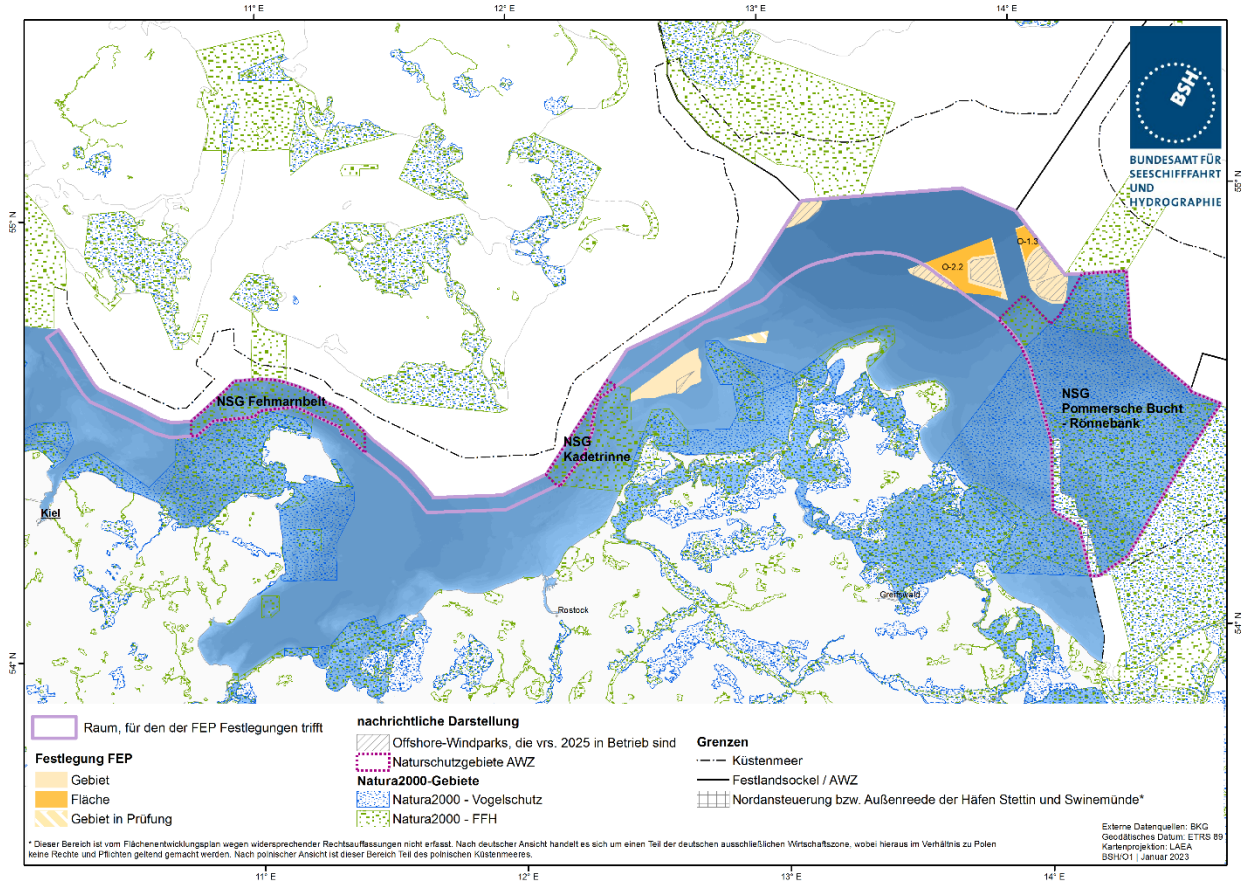

Figure 1: Delimitation of the area of investigation for the SEA of the site development plan – in this case, the EEZ of the Baltic Sea.

Assumptions for the description and assessment of likely significant effects

The description and assessment of likely significant effects of the implementation of the Spatial Development Plan on the marine environment

are carried out separately for areas and sites as well as areas for other forms of energy generation, platforms, and subsea cables in relation to the protected assets and taking into consideration the status assessment described above. For each of these aspects, it is examined individually whether additional or different significant environmental impacts arise compared with the SEA for Spatial Development Plan 2020 or the SEA for ROP 2021 and whether updates and elaborations of the descriptions and assessments are required.

The following table sets out the potential environmental impacts based on essential factors that may be caused by the respective use and which form the basis for the assessment of the expected significant environmental impacts. For the evaluation, effects are differentiated according to whether they are due to construction, deconstruction, or operation or are caused by the turbine itself.

Table 1: Overview of potentially significant impacts if the Spatial Development Plan is implemented.

Use	Effect	Potential impact	Protected assets																
			Benthos	Fish	Seabirds and rest-	Migratory birds	Marine mammals	Bats	Plankton	Biotopes	Biological diversity	Sediments	Spatial resource	Water	Air	Climate	Humans/health	Cultural/material	Scenery
Areas, sites, and location of platforms	Introduction of hard substrate (foundations)	Change of habitats	x	x			x		x	x	x	x							
		Habitat and area loss	x	x			x			x	x	x	x					x	
		Attraction effects, increase in species diversity, change in species composition	x	x	x		x		x		x								
		Change in hydrographic conditions	x	x			x		x					x				x	
	Scouring/sediment relocation	Change of habitats	x	x					x	x		x	x					x	
	Sediment turbulence and turbidity plumes (construction phase)	Adverse effect	x t	x t	x t				x t					x t					
		Physiological effects and deterrence effects		x t			x												
	Resuspension of sediment and sedimentation (construction phase)	Adverse effect	x t	x t					x t					x t					
	Noise emissions during pile driving (construction phase)	Adverse effect/deterrence		x t			x												
		Potential disturbance/damage		x t			x												
	Visual disturbance as a result of construction activity	Local deterrence and barrier effects		x t	x t														
	Obstacle in airspace	Deterrence, habitat loss			x														
		Barrier effect, collision			x	x		x											x
	Light emissions (construction and operation)	Attraction effects, collision			x	x		x											x
	Wind farm-related shipping traffic (maintenance, construction traffic)	Adverse effect/deterrence Collision	x	x	x	x	x	x	x	x	x	x	x t	x	x	x	x	x	
Subsea cables	Cable laying, cable trench, and working strip	Disturbance of near-surface sediments	x							x		x	x					x	
		Adverse effect	x							x									
	Introduction of hard substrate (stone packing)	Change of habitats	x	x					x	x		x						x	
		Habitat and area loss	x	x						x		x	x					x	

Use	Effect	Potential impact	Protected assets																
			Benthos	Fish	Seabirds and rest-	Migratory birds	Marine mammals	Bats	Plankton	Biotopes	Biological diversity	Sediments	Spatial resource	Water	Air	Climate	Humans/health	Cultural/material	Scenery
	Heat emissions	Adverse effects on/displacement of cold-water loving species	x								x	x							
	Magnetic fields	Adverse effect	x																
		Adverse effect on the orientation behaviour of individual migratory species		x															
	Turbidity plumes (construction phase)	Adverse effect	x t	x t	x t				x t					x t					
		Physiological effects and deterrence effects		x t															

[t] temporary effects

Cumulative impacts and interactions between protected assets are also assessed in addition to the effects on the individual protected assets.

Cumulative assessment

According to Article 5, para. 1 SEA Directive, the environmental report also includes an assessment of cumulative impacts. Cumulative impacts arise from the interaction of various independent individual effects which either add up as a result of their interaction (cumulative effects) or reinforce each other and thus generate more than the sum of their individual effects (synergistic effects) (e.g. SCHOMERUS et al., 2006). Both cumulative and synergistic impacts can be caused by both temporal and spatial coincidence of effects. Impacts of the construction phases are mainly of a short-term and temporary nature, whilst installation-related and operation-related impacts can occur permanently. The impact can be intensified by similar uses or different uses with the same effect, thus increasing the impact on one or more protected assets.

The focus of the environmental report on the Spatial Development Plan is on the cumulative consideration of similar uses, namely those for which the Spatial Development Plan makes designations. A cumulative assessment of different uses (i.e. intersectoral) is carried out within the framework of the SEA at the higher level of the ROP for the EEZ.

In order to assess the cumulative impacts, it is necessary to assess the extent to which a significant adverse impact can be attributed to the designations of the plan in interaction. An assessment of the designations is carried out on the basis of the current state of knowledge within the meaning of Article 5, para. 2 SEA Directive. An important basis for assessing the impacts of habitat loss and underwater noise is provided by the position paper on the cumulative assessment of the loss of diver (bird) habitat in the German North Sea (BMU, 2009) as well as the noise protection concept of the BMU (2013).

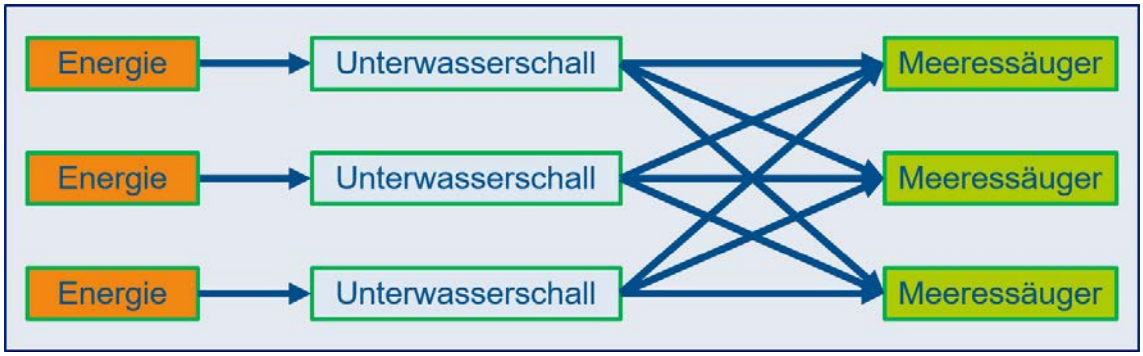

Figure 2: Exemplary cumulative effect of similar uses (effects of energy on underwater sound and marine mammals).

InteractionsIn general, impacts on any one protected asset lead to various consequences and iteractions between the protected assets. The essential interconnection of the biotic protected assets exists via the food chains. Because of the variability of the habitat, interactions can be described only in imprecise terms overall.

Specific assumptions for assessment of likely significant environmental effects (model parameters)

In detail, the analysis and assessment of the respective designations is carried out as follows:

Areas and sites, including the expected generation capacity

With regard to the areas, it is currently assumed that all priority and reservation areas for offshore wind energy in the ROP will be designated in the Spatial Development Plan. If additional designations are made, these shall be included in the scope of the SEA accordingly. Within the areas, the Spatial Development Plan will define sites and for these the expected generation capacity of offshore wind turbines to be installed.

For a consideration of the protected assets in the SEA, certain parameters for the development of the sites are assumed. In detail, these include the number of turbines, output per turbine [MW], hub height [m], height of the lower rotor tip [m], rotor diameter [m], total height [m] of the turbines, diameter of foundation types [m], and diameter of the scour protection [m].

In particular, the following input parameters are taken into consideration in the framework of the SEA:

- Installations already in operation or in the approval procedure (as reference and existing pressure)
- Forecast of certain technical developments and assumptions of ranges for various parameters for the consideration of the designated areas and sites.

Tabelle 2 provides an overview of the parameters to be used in respectiveto their range. In order to depict the range of possible developments, the assessment is largely conducted based on two scenarios. In a first scenario, many small turbines are assumed, and in contrast, in a second scenario, a few large turbines.

Because of the parametric range covered, a highly comprehensive description and assessment of the protected asset is enabled. The parameters of the scenarios reflect the expected advancing state of the art and therefore differ for the different zones that are expected to be established for the development of offshore wind energy.

Table 2: Model parameters for the consideration of the areas and sites (for the allocation of zones, see Abbildung 3; Update for diameter of foundation and scour protection in accordance with Hoffmann, Quiroz & Widerspan, 2022).

Parameter	Zone 1/2		Zone 3		Zone 4/5	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2	Scenario 1	Scenario 2
Power per turbine [MW]	5	15	15	20	15	30
Hub height [m]	100	150	150	165	150	210
Rotor diameter [m]	140	240	240	270	240	350
Total height [m]	170	270	270	300	270	385
Diameter of foundation, monopile [m]	6.7	10.6	11.3	11.9-13.5	11.3	14-18
Diameter of scour protection, monopile [m]	30	48	51	54-61	51	63-81

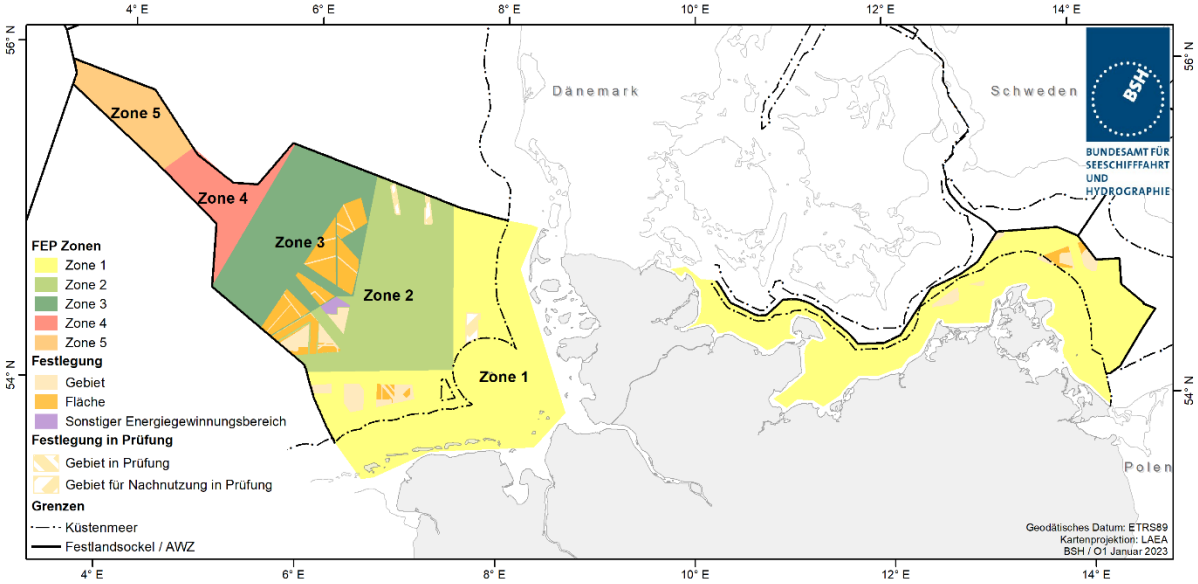

Figure 3: Overview of Spatial Development Plan zones (new layout).

Sites for platforms (transformer or accommodation platforms)

Also, for the assessment of locations for platforms (transformer, converter, or accommodation platforms), certain parameters are assumed as a basis for the assessment. These include the number of platforms, the length of interarray cabling [km], the diameter of one or several foundations [m], and the area for foundations (including scour protection) [m²].

Table 3: Parameters for the consideration of grid connections and platforms

Grid connection		320 kV	525 kV	220 kV

converter platforms transformer/accom-modation platforms*	66 kV	155 kV	66 kV	
Specific Length of interarray cabling [km/MW]	approx. 0.12	approx. 0.12	approx. 0.12	approx. 0.12
Number of converter platforms	1	1	1	0
Area of converter platform foundation [m²]	approx. 600	approx. 600	approx. 600	
Number of transformer plat-forms	0	2	0	1
Number of accommodation platforms	2	0	2	0
Diameter of foundation [m]**	approx. 2 × 10	approx. 2 × 10	approx. 2 × 10	approx. 10
Diameter of scour protection [m]	approx. 2 × 50	approx. 2 × 50	approx. 2 × 50	approx. 50

* The figures for transformer/residential platforms refer to the number of transformer/accommodation platforms per grid connection (only for completions from 2026) for the different connection concepts. Only the length of the interarray cabling depends on the expected generation capacity of the respective site and was determined on the basis of existing plans.

** The calculation of the site use is based on the assumption of a monopile foundation. It is assumed that monopile and jacket each have approximately the same total area use on the sea bed.

Routing and route corridors for subsea cables

When designating routes and route corridors for subsea cables (grid connection cables, inter-connectors, and cross connections), certain wid-ths of the cable trench [m] and a certain area of the crossing constructions [m2] are assumed. In particular, the environmental impacts of construction, operation, and repair are consi-dered.

Presently, there are initial indications that the di-mension of cable trenches in some regions of EEZ of the Baltic Sea while using certain devices are to some extent clearly over the width of 1 m assumed here. This can especially happen in ar-eas where soft mud lies on the hard moraine clay. Such a seabed structure can lead to the overlying mud being heavily eroded during cable insertion and the trench becoming wider than presumed to reach the required burial depth, which should be seen as unavoidable and ac-ceptable. Currently, it is not assumed that this shall result in considerable adverse effects for the relevant protected assets.

An adjustment of the impact assessment of the cumulative land use cannot be done yet because there is no concretisation of the existing cable concerned und the resulting forecast uncertainty for the future cables. An adjustment of the model parameters and evaluation of impacts on the en-vironment for the protected assets of site, sea-bed, benthos, and biotopes is done in the further revision process as required, provided concrete information is available.

Relevant planning and technical principles

By regulating planning and engineering princip-les in the Spatial Development Plan, the space requirements can be minimised, and the poten-tial environmental impacts reduced to a mini-mum. The predominant number of planning prin-ciples serve to prevent or reduce environmental impacts and are not expected to lead to signifi-cant effects.

The Site Development Plan also contains some planning principles that do not relate to the reduction of environmental impacts. If these are based on the objectives of maritime spatial planning, they are to be observed to a lesser extent than the binding nature of the regional planning objectives. Remaining planning principles are examined for probable significant environmental impacts on protected assets.

With regard to the technical principles, a DC system as a self-commutated high-voltage DC transmission with a voltage level of ± 320 kV was already designated within the framework of the North Sea spatial offshore grid plan (BFO) and was thus also the subject of the environmental assessment of the BFO. Changes in the standard transmission capacity will be examined in the environmental report.

1.6 Data sources and indications of difficulties in compiling the documents

With regard to the data and knowledge bases for the SEA, please refer to Chapter 5 of the scope for the current SEA dated 30 June 2022.

Indications of difficulties in compiling the documents

Indications of difficulties arising when compiling the data (e.g. as technical gaps or lack of knowledge) are to be presented according to Section 40, para. 2, number 7 UVPG. There are still gaps in knowledge in places, especially with regard to the following points:

- Long-term effects from the operation of offshore wind farms
- Effects of shipping on individual protected assets
- Effects of research activities
- Data for assessing the state of the environment of the various protected assets for the area of the outer EEZ
- Cumulative effects

In principle, forecasts on the development of the living marine environment after implementation of the SEA for ROP 2021 remain subject to certain uncertainties. There is often a lack of long-term data series or analytical methods (e.g. for the intersection of extensive information on biotic and abiotic factors) in order to better understand complex interactions of the marine ecosystem.

In particular, there is a lack of detailed area-wide sediment and biotope mapping outside the nature conservation areas of the EEZ. As a result, there is a lack of a scientific basis on which to assess the impacts of the possible use of statutorily protected biotopes. Currently, a sediment and biotope mapping with a spatial focus on the nature conservation areas is being carried out on behalf of the BfN and in cooperation with the BSH, research and university institutions, and an environmental agency.

Furthermore, there are no scientific assessment criteria for some protected assets, both with regard to the assessment of their status and with regard to the impacts of anthropogenic activities on the development of the living marine environment, to allow cumulative effects to be considered in both temporal and spatial terms.

Various R&D studies on assessment approaches, including for underwater noise, are currently being prepared on behalf of the BSH. The projects serve the continuous further development of a uniform quality-checked basis of marine environmental information for the assessment of potential impacts of offshore installations.

The environmental report will also list specific information gaps or difficulties in compiling the documents for the individual protected assets.

2 Description and assessment of the state of the environment

According to Section 40, para. 2, number 3 UVPG, the environmental report includes a description of the characteristics of the environment and the current state of the environment in the area of investigation of the SEA. The description of the current state of the environment is required in order to be able to forecast its change upon implementation of the plan. The subject of the inventory are the protected assets listed in Section 2, para. 1, sentence 2, No. 1 to 4 UVPG as well as interactions between them. The information is presented in a problem-oriented fashion. The focus is thus on possible existing pressures, environmental elements requiring special protection, and the protected assets that will be most affected by the implementation of the plan. In spatial terms, the description of the environment is based on the respective environmental impacts of the plan.

In accordance with Section 5, para. 3, sentence 5 WindSeeG, the description and assessment of the state of the environment is to be limited to additional or other significant impacts on the environment as well as to necessary updates and elaborations. Within the framework of the present SEA, it was examined in detail whether there are any updates or elaborations with regard to the state of the environment. Insofar as no updates or elaborations are required in comparison with the environmental reports on ROP 2021, for the respective protected assets, please refer to the corresponding statements in Chapter 2 of the Baltic Sea Environmental Report on ROP 2021.

2.1 Site

For the protected asset of spatial resources (Section 2, para. 1, No. 3 UVPG), the consumption of land must be considered in particular. Land economy is therefore also reflected in the guidelines and principles of ROP 2021.

The basis for the designations of the current Spatial Development Plan are the increased statutory expansion targets from Section 1, para. 2, sentence 1 WindSeeG, which envisage an achievement of 30 GW by 2030, 45 GW by 2035, and 70 GW by 2045. Against the background of the limited availability of land in the German EEZ of the North Sea and Baltic Sea, it must be taken into consideration when designating the expected generation capacity that these expansion targets can be achieved as far as possible with the sites available. In order to achieve the statutory expansion targets, it is therefore imperative that the sites available for offshore wind energy are developed sparingly.

A land-saving development is achieved by designating the expected generation capacity on the sites. As part of the revision of the Spatial Development Plan, the output on individual sites was increased considerably compared with the designations of Spatial Development Plan 2020 in order to achieve efficient land use with regard to the increased expansion targets. Furthermore, this can be ensured by bundling subsea cables as much as possible in the sense of parallel routing as well as routing them parallel to existing structures and built facilities (Chapter 6.4 Spatial Development Plan). On the other hand, an efficient use of land can be achieved by designating technical principles such as the use of more efficient grid connection technologies (Chapter 5 Spatial Development Plan), which can greatly reduce the number of grid connection systems required.

Another aspect of sustainable and efficient use of spatial resources is the obligation to deconstruct structures, subsea cables, and the like after the end of their operating life so that these sites are available for subsequent use (Chapter II.6.1.5 Spatial Development Plan).

2.2 Sediments

With regard to the status description and status assessment of the protected asset sediments, please refer to the statements in Chapter 2.2 of the Baltic Sea Environmental Report on ROP 2021.

With regard to the data availability on sediment distribution on the sediments, there is updated information from the “Sediment mapping” project of the BSH in the EEZ; this is being carried out in cooperation with the BfN. Here, the level of knowledge has increased compared with ROP 2021. The current data availability of the – compared with existing maps (e.g. BSH/IOW, 2012) – more detailed maps is shown in Abbildung 4.

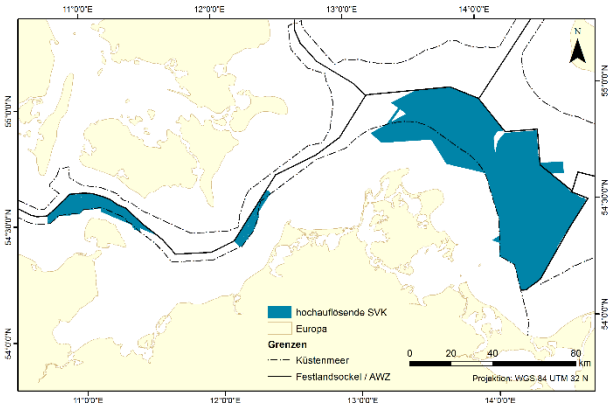

Figure 4: Detailed sediment distribution maps scale 1:10,000 (current data availability).

The current investigations confirm the statements in Chapter 2.2 of the Baltic Sea Environmental Report on ROP 2021.

The surface sediments in the area of additionally planned grid connection cables in the Danish EEZ from gate O-I and the converter platform OST-2-4 to gate O-X essentially consist of fine sediments of mostly soft to pasty consistency, which is typical for the Arkona basin (also refer ROP 2021). To the south-east border of the basin (in the direction of gate O-I), the content of fine sand increases. Individual stones and/or blocks also cannot be ruled out mainly in the south-east border area of the Arkona basin.

To the south of the Adlergrund in the area of Bay of Pomerania, the interconnectors I-OST-13, I-OST-14 and I-OST-15 run between the gates O-XII and O-XIII. Primarily, fine sand, secondarily, even medium-grain sand can be encountered in this area. Occurrences of stones and/or blocks should be anticipated in the direction of both the gates.

2.3 Water

With regard to the status description and status assessment of the protected asset water, please refer to the statements in Chapter 2.3 of the Baltic Sea Environmental Report on ROP 2021. Any updates or elaborations of the status description are not apparent compared with the SEA for ROP 2021.

2.4 Plankton

With regard to the status description and status assessment of the protected asset plankton, please refer to the statements in Chapter 2.4 of the Baltic Sea Environmental Report on ROP 2021. Compared with the SEA for ROP 2021, only updates are to be presented.

2.5 Types of biotopes

With regard to the data availability and status description of the protected asset types of biotopes, please refer to the statements in Chapter 2.5 of the Baltic Sea Environmental Report on ROP 2021. Compared with the SEA for ROP 2021, only necessary updates or elaborations are to be presented. The new Site O-2.2 to be considered in Area O-2, which has changed in its extent and location compared with Spatial Development Plan 2020, is also included because the same types of biotopes as in the already considered Area O-2 are expected because of the natural conditions or are already included in the original Site O-2.2 considered in the environmental report on Spatial Development Plan 2020.

The planned additional grid connections to the Danish power grid from gate O-I and the converter station OST-2-4, each to gate O-X run largely along the routes or areas O-2 and O-1, already described in Site Development Plan 2020, so that descriptions given in the environmental report of Site Development Plan 2020 also cover these grid connections.

Editing of the biotope map of the German areas of the Baltic Sea (Marx et al. 2024) also shows no significant changes for this maritime area compared to the previous version of Schiele et al. (2013).

Within the framework of the current Spatial Development Plan, which is published according to the WindSeeG, the following benchmark for assessing the compatibility of the designations with legally protected types of biotopes results from Section 72, para. 2 WindSeeG: Section 30, para. 2, sentence 1 BNatSchG shall be applied to projects under the WindSeeG with the proviso that a significant adverse effect on biotopes within the meaning of Section 30, para. 2, sentence 1 BNatSchG shall be avoided as far as possible.

A consideration of the potential occurrence and potential adverse effect on legally protected types of biotopes in the areas, sites, and platform sites as well as the routes for subsea cables is provided in Chapter 4.15.

2.6 Benthos

With regard to the status description and status assessment of the protected asset benthos, please refer to the statements in Chapter 2.6 of the Baltic Sea Environmental Report on ROP 2021. Compared with the SEA for ROP 2021, only updates or elaborations are to be presented. The assessment of the status described there is supplemented by the findings from newly collected data described below.

Site O-1.3

For Site O-1.3, new findings are available from investigations carried out in autumn 2018 and spring 2019 (IFAÖ 2019); these largely confirm the statements made in the Baltic Sea Environmental Report on ROP 2021 and the Environmental Report on Spatial Development Plan 2020. Thereafter, the area is colonised by a community of silt-rich soft-bottom fauna below the halocline. For Site O-1.3, one Red List species is added from the investigations. This is the polychaete *Platynereis dumerilii* (RL category G).

Area O-2, Site O-2.2

With regard to Area O-2, results from baseline studies on the “Baltic Eagle” project in 2018-2019 can be used as a supplement (MARILIM 2019, MARILIM 2020); these data largely confirm the statements made in the Baltic Sea Environmental Report on ROP 2021 and the Environmental Report on Spatial Development Plan 2020. For Area O-2, two Red List species are added from the investigations. These are the bryozoe *Alcyonidium gelatinosum* (RL category 3) and the hydrozoe *Sertularia cupressina* (RL category G). They increase the number of endangered species in Area O-2 to three. However, both species are sessile hard-bottom dwellers and not typical representatives of the silt community typical of Area O-2, and were limited to isolated finds.

Compared with Spatial Development Plan 2020, the location and size of Site O-2.2 located in Area O-2 has changed. Based on the location and the same abiotic conditions, it is assumed here that the settlement by the benthos is largely the same and please refer to the statements on Area O-2 in the Baltic Sea Environmental Report on ROP 2021 and in the Environmental Report on Spatial Development Plan 2020 as well as the additions here above.

Connecting lines O-I – O-X and OST-2-4- following O-X

The planned additional grid connection to the Danish power supply grid from gate O-I and the converter station OST-2-4, each to gate O-X run largely along the routes or along areas O-2 and

O-1, already described in Site Development Plan 2020, so that descriptions made in the environmental report of Site Development Plan 2020 are included for these as well. New insights leading to significant changes in the structure of the benthic community and the occurrence of endangered species and thus, a change in the significance of the community in this maritime area, are also not under consideration in the current studies (e.g., 50hertz 2022, IOW 2024).

2.7 Fish

With regard to the status description and status assessment of the protected asset fish, please refer to the statements in Chapter 2.7 of the Baltic Sea Environmental Report on ROP 2021. Compared with the SEA for ROP 2021, only updates or elaborations are to be presented.

For Site O-1.3, current results from the site investigations (campaign in autumn 2018, spring and autumn 2019) confirm a characteristic fish community of the south-western Baltic Sea with a stable species and dominance structure (IFAÖ 2019). The fish status assessment of ROP 2021 is still valid.

2.8 Marine mammals

With regard to the status description and status assessment of the protected asset marine mammals, please refer to the statements in Chapter 2.8 of the Baltic Sea Environmental Report on ROP 2021. Compared with the SEA for ROP 2021, only updates or elaborations are to be presented.

The most up-to-date data on the status of harbour porpoise populations in the Baltic Sea are provided by investigations from MiniSCANS II (Unger et al., 2021) for the Belt Sea area as well as data from Danish, Swedish, and Polish monitoring programmes for the Central Baltic Sea population (Swistún et al., 2019, Owen et al., 2021, ICES 2020). In addition, the data from the SAMBAH project were evaluated with updated models and published (Amundin et al. 2022).

The Mini-SCANS II data indicate a decreasing trend in the Belt Sea since 2011; however, this still needs to be confirmed by trend analysis. Current abundance (Mini-SCANS II) in the Belt Sea is estimated at 17,301 (95% CI: 11,695–25,688) animals (Unger et al, 2021).

The population of the central Baltic Sea is estimated at 491 (95% CI: 71–1,105) individuals according to Amundin et al. (2022), and a continued negative trend has been predicted in population models (North Atlantic Marine Mammal Commission and the Norwegian Institute of Marine Research, 2019). However, new acoustic data from Sweden, Denmark, and Poland indicate that the population of the central Baltic Sea is not declining further; with large uncertainties, the data may even indicate a slight increase (Owen et al, 2021, Swistun et al, 2019, ICES, 2020).

Taking these data into consideration, there are no changes in the assessment of the importance of Areas O-1 and O-2: The two areas are of medium importance for the harbour porpoise. The high seasonal importance of the areas results from the possible use by individuals of the separate and highly endangered Baltic Sea population of harbour porpoise during the winter months. Area O-3 is of medium importance.

Harbour seals and grey seals

For the four stock units of harbour seals subdivided according to HELCOM and ICES, the following data are available from the current censuses: in the Limfjord, 1,378 individuals, in Kattegat and the Danish Belt Sea, 8,023, in the south-western Baltic Sea, 1182, and in Kalmarsund, 1778 individuals in 2019 (Kalmarsund) or 2020 (all other stock units) (ICES, 2021).

The grey seal population in the Baltic Sea is estimated at 40,000 animals, thereby confirming a further increase in the stock (ICES, 2021).

The description and assessment of the status of seals does not change with respect to the state-

ments in Chapter 2.8 of the Baltic Sea Environmental Report on ROP 2021. Areas O-1 and O-2 are of low to at most medium importance for seals, and Area O-3 is of low importance.

2.9 Seabirds and resting birds

With regard to the status description and status assessment of the protected asset seabirds and resting birds, please refer to the statements in Chapter 2.9 of the Baltic Sea Environmental Report on ROP 2021. Compared with the SEA for ROP 2021, only necessary updates or elaborations are to be presented.

In addition, current investigations are now available for Areas O-1 and O-2 within the framework of the benchmark assessment and the preliminary investigation of sites. These investigations confirm the already known species composition, its spatial distribution, and the seasonality of the seabird species occurring there (BIOCONSULT SH, IBL & IFAÖ 2020, BIOCONSULT SH & IFAÖ 2020, 2021a, b).

In the meantime, an updated version of the "European Red List of Birds" is available; this contains only one list for Europe and no longer distinguishes between continental Europe (EU) and the area of the 27 member states (EU27) (BIRDLIFE INTERNATIONAL 2021). The red-necked grebe, the velvet scoter, and the black scoter are listed as Vulnerable (VU); the red-necked grebe is newly listed in this category (formerly LC). The long-tailed duck is no longer classified as vulnerable (VU) but rather only as least concern (LC) as are the little gull, the herring gull, the guillemot, and the razorbill (all previously classified as NT: near-threatened) The table was supplemented by the SPEC categories, which categorise the conservation needs of the species (BIRDLIFE INTERNATIONAL 2017). However, these changes do not lead to a changed assessment of the criterion conservation status for the areas under consideration in the overall assessment, especially because of the unchanged status of the species mentioned in the "HELCOM Red List of Baltic Sea Species" (HELCOM 2013). Tabelle 5 summarises the classification of the most common resting bird species in the EEZ into current national and international threat categories.

Table 4: Assignment of the most important seabird and resting bird species of the German EEZ in the Baltic Sea to the current national and international endangerment categories.
Definition according to IUCN: LC = least concern; NT = near-threatened; VU = vulnerable; EN = endangered; CR = critically endangered (BIRDLIFE INTERNATIONAL 2021). Definition according to SPEC: SPEC 1 = European species requiring global conservation measures (i.e. classified as CR, EN, VU, or NT on a global scale). SPEC 2 = Species WITH, SPEC 3 = Species WITHOUT a distribution focus in Europe, which require Europe-wide conservation measures (i.e. are classified on a European scale as Regionally Extinct, CR, EN, VU, NT or as having a declining or depleted population or as rare; BIRDLIFE INTERNATIONAL 2017).

Common name (*Scientific name*)	Appendix I of Birds Directive[1]	European Red List of Birds[2]	HELCOM Red List of Baltic Sea Species[3]	SPEC Category[4]
Red-throated diver *(Gavia stellata)*	X	LC	CR	3_a
Black-throated diver *(Gavia arctica)*	X	LC	CR	3_a
Slavonian grebe *(Podiceps auritus)*	X	NT	NT	1_{a+b}
Red-necked grebe *(Podiceps grisegena)*		VU	EN	
Little gull *(Hydrocoloeus minutus)*	X	LC	NT	3_{a+b}

Herring gull *(Larus argentatus)*		LC		2_b
Greater black-backed gull *(Larus marinus)*		LC		
Common gull *(Larus canus)*		LC		
Long-tailed duck *(Clangula hyemalis*)		LC	EN	1_a
Velvet scoter *(Melanitta*		VU	EN	1_a
Common scoter (*Melanitta nigra*)		VU	EN	
Black guillemot *(Cepphus grylle*)		LC	NT	
Guillemot *(Uria aalge*)		LC		3_b
Razorbill *(Alca torda*)		LC		1_b

1 Directive 2009/147/EC of the European Parliament and of the Council
2 BIRDLIFE INTERNATIONAL (2021) European Red List of Birds.
3 HELCOM (2013) HELCOM Red List of Baltic Sea species in danger of becoming extinct.
4 BIRDLIFE INTERNATIONAL (2017) European Birds of Conservation Concern
a hibernating
b breeding

Compared with the Baltic Sea Environmental Report on ROP 2021, there have been no changes in the state of knowledge on the occurrence and distribution of species in the area under consideration and on the status assessment. The status assessment there is still valid.

2.10 Migratory birds

With regard to the status description and status assessment of the protected asset migratory birds, reference is made to the explanations in Chapter 2.10 of the Baltic Sea Environmental Report on ROP 2021. Compared with the SEA for ROP 2021, only necessary updates or elaborations are to be presented. The status assessment of these areas and sites continues to be valid – even against the background of the designations of Spatial Development Plan 2023.

2.11 Bats and bat migration

For a status description and status assessment of the protected asset bats, please refer to Chapter 2.11 of the Baltic Sea Environmental Report on ROP 2021. Compared with the SEA for ROP 2021, only necessary updates or elaborations are to be presented.

In addition, current findings from the BfN research project “BATMOVE” (FKZ 3515 821900) are now available (SEEBENS – HOYER et al. 2021). As part of the research project, acoustic data on the occurrence of bat migration was collected at seven stations in the German Baltic Sea. The westernmost station was on the Fehmarn Belt, the easternmost on the Arkona platform. Overall, bat activity was measured at all stations. The Arkona platform showed the least bat activity. However, the authors point out that at some stations, including the Arkona platform, data were collected only over a short period of time so far. Further survey years are necessary. In addition, the current data sources are not sufficient in order to be able to identify geographical

patterns in the sense of potential densification areas over the Baltic Sea. Overall, the BAT-MOVE research project confirms the current state of knowledge about bat migration over the Baltic Sea. Further investigations are needed in order to be able to describe this in more detail.

Compared with the Baltic Sea Environmental Report on ROP 2021, there have been no fundamental changes in the state of knowledge on the occurrence and intensity of bat migration. According to the current state of knowledge, the estimates in the Baltic Sea Environmental Report on ROP 2021 continue to apply.

2.12 Biological diversity

With regard to the status description status and assessment of biodiversity, please refer to the statements in Chapter 2.12 in the Baltic Sea Environmental Report on ROP 2021. The SEA has shown that no necessary updates or elaborations are apparent in this respect.

2.13 Air

With regard to the status description and estimation of the protected asset air, please refer to the statements in Chapter 2.13 of the Baltic Sea Environmental Report on ROP 2021. The SEA has shown that no necessary updates or elaborations are apparent in this respect.

2.14 Climate

With regard to the status description and status assessment of the protected asset climate, please refer to the statements in Chapter 2.14 of the Baltic Sea Environmental Report on ROP 2021. The SEA has shown that no necessary updates or elaborations are apparent in this respect.

2.15 Seascape

With regard to the status description and status assessment of the protected asset seascape, please refer to the statements in Chapter 2.15 of the Baltic Sea Environmental Report on ROP 2021. The SEA has shown that no necessary updates or elaborations are apparent in this respect.

2.16 Cultural heritage and other material assets

With regard to the status description and status assessment of the protected asset cultural heritage and other material assets, please refer to the statements in Chapter 2.16 in the Baltic Sea Environmental Report on ROP 2021. The SEA has shown that no necessary updates or elaborations are apparent in this respect.

2.17 Protected asset human beings, including human health

With regard to the status description and status assessment of the protected asset humans, please refer to the statements in Chapter 2.17 of the Baltic Sea Environmental Report on ROP 2021. The SEA has shown that no necessary updates or elaborations are apparent in this respect.

2.18 Iteractions between the protected assets

With regard to the interactions of the various components with each other, please refer to the explanations in Chapter 2.18 in the Baltic Sea Environmental Report on ROP 2021. The SEA has shown that no necessary updates or elaborations are apparent in this respect.

3 Expected development in the event of non-implementation of the plan

The development of offshore wind energy plays a key role in meeting the climate protection and energy policy objectives of the German government. This is also reflected in the statutory expansion targets for offshore wind energy (Section 1, para. 2, sentence 1 WindSeeG).

The purpose of the Spatial Development Plan is to spatially define the areas and sites for wind turbines as well as the expected generation capacity on them and the necessary routes and locations for the entire required grid infrastructure or grid topology in the EEZ (Section 4, para. 2, Section 5 WindSeeG). Furthermore, the Spatial Development Plan also develops the temporal component of the development by determining the temporal sequence of the calls for tender for the sites for offshore wind turbines and the calendar years of the commissioning of grid connection cables. The Spatial Development Plan also designates which site is to be centrally pre-surveyed and which is not in accordance with Section 5, para. 1, sentence 1, No. 3 WindSeeG). In addition, areas for other forms of energy generation can also be spatially designated for the practical testing and implementation of innovative concepts.

In accordance with the explanatory memorandum to WindSeeG, there are no alternatives (BT-Drs. 20/1634, p. 60). The law is necessary to achieve Germany's ambitious expansion targets for offshore wind energy as a significant contribution to the climate targets. On 3 February 2022, nature conservation issues relating to the development of offshore wind energy were discussed with nature conservation associations together with the BMU. On 8 February 2022, the existing offshore dialogue process was continued at ministerial level with the participation of the BMU, the Federal Ministry of Transport and Digital Infrastructure, the FNA, the BSH, the BfN, the transmission system operators, and the offshore industry. A broad consensus emerged for the further development of offshore wind energy and the implementation of the expansion targets.

Against this background and in view of the drastic consequences of climate change – also for the marine environment – which would have to be expected if the climate protection targets were not achieved, the assumption of a zero alternative in which development is assumed without the additional development of offshore wind energy is unrealistic.

In order to achieve the expansion targets set out in Section 1, para. 2, sentence 1 WindSeeG, the construction of offshore wind turbines is necessary. As described above, no viable alternatives with which the climate protection targets could otherwise be achieved are currently apparent. Accordingly, the legislature considered the adverse effects on the marine environment caused by the legally designated expansion targets for offshore wind energy against the achievement of the climate protection targets within the framework of the expansion targets according to Section 1, para. 2, sentence 1 WindSeeG in favour of the orderly development of wind energy up to those expansion targets. As a result of this decision, the Spatial Development Plan serves the spatially and temporally ordered and efficient development of offshore wind energy with a series of additional regulations designed to minimise the adverse effect on the marine environment of the Baltic Sea.

In order to be able to feed the electricity generated in the offshore wind farms in the EEZ into the onshore extra-high voltage grid, it is absolutely necessary to lay current-carrying subsea cables to the grid connection points on land. In this respect, too, there is no apparent alternative to the planned expansion targets for offshore wind energy (including its grid connection) because of the need to protect the climate. In this framework, too, comprehensive planning by the

Spatial Development Plan promotes the sparing use of land, and further regulations in the WindSeeG ensure that the environmental impacts of the subsea cables and pipelines designated in the Spatial Development Plan are as low as possible in each case.

With regard to the assessment for the individual protected assets, reference is made to the statements in Chapter 3 of the Baltic Sea Environmental Report on Spatial Development Plan 2020. In this respect, no additional or other significant impacts are to be expected from the present revision of the plan. Furthermore, the SEA revealed that no required updates or elaborations are apparent with regard to the likely development in the case of the non-implementation of the plan.

4 Description and assessment of likely significant effects on the marine environment of implementing the Site Development Plan

In the following, the description and evaluation of the impacts on the environment concentrate on the protected assets for which significant impacts cannot be excluded from the outset by the implementation of Spatial Development Plan 2023. This includes the protected assets sediments/spatial resource, benthos, types of biotopes, fish, marine mammals, seabirds and resting birds, migratory birds, bats and bat migration, climate, seascape, and cultural heritage and other material assets

According to Section 40, para. 1, sentence 2 UVPG, the likely significant impacts on the environment of the implementation of the plan must be assessed. According to Section 40, para. 3 UVPG, the environmental impacts of the plan are provisionally assessed with a view to effective environmental precaution. According to Section 3, sentence 2 UVPG, the environmental assessment serves to ensure effective environmental precaution according to the applicable laws. According to Section 5, para. 3, No. 5 WindSeeG, the Spatial Development Plan shall exclude any threat to the marine environment with regard to the designations contained in the plan. The marine environment includes the protected assets and their habitat, including possible interactions, described in this environmental report. In the corresponding assessment of adverse effects on the marine environment, the special designations of Section 5, para. 3, No. 5 WindSeeG (with regard to protected areas) and Section 72, Para. 2 WindSeeG (with regard to legally protected types of biotopes) must also be observed.

Protected assets for which a significant adverse effect was ruled out in the environmental report on Spatial Development Plan 2020 (cf Chapter 2) and for which an assessment of the question of whether there are indications of additional or other significant environmental impacts or whether updates or elaborations of the SEA already carried out seem necessary for this protected asset are not taken into consideration (Section 72, para. 1 WindSeeG). This concerns the protected assets plankton, water, and air as well as the protected asset humans, including human health. Possible impacts on the protected asset biological diversity are dealt with in the individual protected assets. Overall, the objects of protection listed in Section 2, para. 1 UVPG are examined before the species protection and site protection assessments are presented. Statements on the general protection of nature and seascape according to Section 13 BNatSchG are also covered in the assessment of the individual protected assets.

4.1 Sediments/spatial resource

4.1.1 Areas, sites, and platforms

Wind turbines and platforms are still almost exclusively installed as deep foundations. The construction and operation of wind turbines can have various impacts on the protected assets sediments and spatial resource; these are described in detail in Chapter 4.1.1 of the Baltic Sea Environmental Report on Spatial Development Plan 2020.

Overall, even with the expansion of Site O-2.2 in Area O-2, no significant impacts on the protected asset sediments and spatial resource are to be feared.

4.1.2 Subsea cables

The construction and operation-related impacts caused by subsea cables are described in detail in Chapter 4.1.2 of the Baltic Sea Environmental Report on Spatial Development Plan 2020.

With regard to the protected asset of sediments, no significant negative impacts are to be ex-

pected from the designations in Spatial Development Plan 2023 on subsea cables. On the contrary, adverse impacts are avoided in comparison with non-implementation of the plan because the designations of the plan aim to minimise the use of the sediments by reducing and bundling grid connection systems and minimising crossing structures.

With regard to the protected asset of spatial resource, no significant impacts are to be expected as a result of the designations of Spatial Development Plan 2023. In total, based on the information on the model wind farm (in accordance with Chapter 4.5.3 of the scope of the current SEA), 0.027% of the area of the EEZ of the Baltic Sea is directly taken up by the designations of Spatial Development Plan 2023 for Scenario 1 and 0.025% for Scenario 2.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north should also not cause significant impacts.

4.2 Water

4.2.1 Areas and sites

The construction and operation of wind turbines and platforms can lead to construction-, installation-, and operation-related impacts on the protected asset water.

Construction-related impacts

The introduction of the foundation elements leads to a re-suspension of sediments in the immediate vicinity. Depending on the fine grain content in the sediment, turbidity plumes may form in the lower water column and thus lead to reduced sight depths. With high proportions of fines, stronger turbidity plumes can form; in exceptional cases, this can also reduce planktonic primary production. Depending on the organic content, this can result in higher oxygen consumption and the release of nutrients and pollutants in the short term. These impacts are classified as small-scale, short-term, and of low intensity because of the prevailing sediment characteristics in the areas considered by the Spatial Development Plan. Structural and functional impairments are not expected.

Installation-related impacts

The support structures of WT represent obstacles in the water body that lead to a change in the flow conditions on both a small and medium scale. Numerical modelling of flow conditions in offshore wind farms has already been carried out within the framework of the GIGAWIND project (Zielke et al. 2001, Mittendorf & Zielke 2002) and the R&D project “QuantAS” (Buchard et al. 2010)

From the modelling results it can be deduced that the flow velocity will increase in the immediate construction areas. The influence of a single structure on the flow extends laterally to only a small area. This can lead to a change in the dynamics of the stratification conditions in the water body in the immediate vicinity of the supporting structures. This can lead to an increased oxygen input in greater water depths in a stratified water body. The current velocities in the Baltic Sea are generally classified as low with the exception of the Belt Sea in the western transition area.

Furthermore, the swell changes as a result of the supporting structures because they cause additional friction in the wave field. This leads to a slight decrease in wave height on the side facing away from the swell and to a slight increase in wave height on the side facing the current (Hoffmanns & Verheij 1997, Chakrabari 1987). According to the results of the Gigawind project, the influence of a single structure on the swell, similar to that of the current, is limited to distances of about one to two structure diameters laterally and a few diameters behind. Wave dissipation will result in low attenuation. Likewise, there is a slight reduction in the wind input caused by the wake flow effect.

Investigations with a numerical modelling in the R&D project “QuantAS” were able to show that the influence of wind turbines on the salt-water inflow and the associated oxygen input into the western Baltic Sea in the Arkona Basin has no significant impact (Burchard et al. 2010). The changes in the flow regime and swell as a result of wind turbines or offshore wind farms are long-term and medium-scale. The intensity of the effects is low and positive because of the increased oxygen input. Based on this intensity assessment, the structural and functional changes are minor. Immediately after completion of the construction work, the natural conditions are restored.

Operation-related impacts

To ensure operation for offshore installations (wind turbines and platforms), techniques that may be associated with material discharges into the marine environment are used. In particular, the protection of the structures from corrosion is associated with permanent emissions into the marine environment. At the same time, corrosion protection is essential for the structural integrity of the turbines. Galvanic anodes (sacrificial anodes) are used on the foundation structures as a common corrosion protection variant in the underwater area. The gradual dissolution of these anodes releases the components into the marine environment. The anode mass required for a service life varies depending on the foundation structure, building type, and local environmental conditions. According to current experience in the offshore industry, emissions from wind turbines are around 150–750 kg per installation per year. Galvanic anodes used for offshore wind energy typically consist of aluminium-zinc-indium alloys (approx. 95% aluminium, 2.5–5.75% zinc, 0.015–0.04% indium; DNV GL 2010). In principle, the galvanic anodes may also contain small quantities of particularly environmentally critical heavy metals (e.g. cadmium, lead, copper) because of the production process (Reese et al. 2020). These are also released into the marine environment during operation. It must also be taken into consideration that inputs from corrosion protection are distributed throughout the Baltic Sea system by distribution and dilution processes and do not necessarily accumulate locally and lead to harmful concentrations.

As an alternative to galvanic anodes, impressed current anodes have now established themselves on the market and are increasingly being used. These external current anodes are inert and only associated with minimal emissions (e.g. as a result of material removal).

With regard to the impacts of corrosion protection-related emissions in the area of offshore wind farms, the BSH is conducting the research project “OffCHEm” (https://www.bsh.de/DE/THEMEN/Forschung_und_Entwicklung/Aktuelle-Projekte/OffChEm/OffChEm_node.html) in cooperation with the Helmholtz Centre Hereon. The data obtained so far for the German Bight show that the concentrations of the selected elements in both water and sediment are largely within the range of variability known for the area of investigation. However, in certain weather conditions, local increases in concentration of indium, gallium, zinc, and aluminium were observed in the water. Local increases in concentration were also evident in the sediment, especially for lead; however, the causes of these are not clearly identifiable. At present, there are no discernible direct impacts from the use of galvanic anodes. However, the continued operation and development of offshore wind energy will also lead to a further increase in material emissions from corrosion protection.

According to the precautionary principle, material discharges are to be avoided according to the state of the art for the protection of the marine environment (cf Planning principle “emission reduction” under 6.1.12 Spatial Development Plan 2023). In particular, the use of external power systems is to be preferred. Furthermore,

the use of galvanic anodes is only permitted in combination with coatings, which significantly reduces emissions from galvanic anodes into the body of water. Subsequently, only galvanic anodes for which the production-related content of environmentally critical heavy metals is minimised may be used.

When taking into consideration these requirements, the impacts from corrosion protection are assessed as long-term, small-scale, and of low intensity according to the current state of knowledge. Structural and functional changes are minor.

For the operation of the wind turbines and platforms, high volumes of operating materials hazardous to water (including hydraulic oils, lubricating greases, transformer oils and diesel for emergency power generators, and extinguishing agents) are inevitably required in some cases. Because of their material properties, these substances have a fundamental hazard potential for the marine environment. The risks arising from operational substance leaks/accidents can be prevented by taking structural and operational precautionary and safety measures (e.g. enclosures, double-walled tanks, catch basins, and management concepts). The same applies to fuel changes and refuelling measures to be carried out. If environmentally compatible and, as far as possible, biodegradable substances are used, the overall impacts on the marine environment resulting from accidental discharges is assessed as low, taking into consideration the probability of occurrence.

4.2.2 Platforms

The construction-, installation-, and operation-related impacts of the platforms on the water column largely correspond to those of the wind turbines and are presented in Chapter 4.2.1.

In addition to the material emissions mentioned in Chapter 4.2.1., further emissions into the water can occur at specific points during the regular operation of platforms. Accumulating rainwater and drainage water may contain oil as a result of the operating materials contained in the equipment of the platform (e.g. operating materials released through leakages). Light liquid separators (oil separators) are therefore used to reduce the oil content of this sewage water. According to technical availability and the current state of implementation, the oil content can be procedurally reduced to 5 ppm. On manned platforms, sewage water from sanitary facilities, laundry, and canteen operations is treated appropriately by certified sewage water treatment plants. On low manned platforms, this sewage water is basically collected and disposed of ashore. For the purpose of systems cooling, closed cooling systems without material discharges have been established on the platforms. Only in justified exceptional cases, when the required cooling capacity cannot be achieved by these systems (such as converter platforms), can “open” state-of-the-art seawater cooling systems be used in addition. To ensure the permanent operational readiness of these system-relevant cooling systems, biocides (usually sodium hypochlorite) are added to protect pipelines and pumps from marine fouling. The sea cooling water is then discharged back into the sea; the components are then subject to local distribution and dilution processes.

The impacts of the aforementioned platform-side emissions into the water are also assessed as long-term, small-scale and of low intensity, assuming implementation of the state of the art and compliance with the minimisation requirement (cf Chapter 6.1.12 Spatial Development Plan 2023) according to the current state of knowledge. Structural and functional changes are minor.

4.2.3 Subsea cables

In the course of laying and operating subsea cables, there are generally only minor construction-related impacts on the protected asset water: The laying of cables in the sediments leads to a

re-suspension of sediments in the immediate vicinity. Depending on the fine grain content in the sediment, turbidity plumes may form in the lower water column and thus lead to reduced sight depths. With high proportions of fines, stronger turbidity plumes can form; in exceptional cases, this can also reduce planktonic primary production. Depending on the organic content, a higher oxygen consumption as well as a release of nutrients and pollutants can be the short-term result. These impacts are classified as small-scale, short-term, and of low intensity in the German EEZ of the Baltic Sea. Adverse structural and functional effects are not to be expected.

The routing systems additionally defined in the current Site Development Plan as well as the expansion of gate O-XIII by 600 m to the north should also not cause significant impacts.

4.3 Benthos

4.3.1 Areas and sites

The construction and operation of wind turbines can have various impacts on the macrobenthos; these are described in detail in Chapter 4.2.1 of the Environmental Report on Spatial Development Plan 2020. These impacts can occur in a comparable manner in all areas designated for wind energy use. The impact on individual benthic species and communities depends on their specific sensitivity to disturbances and, if necessary, must be assessed on a case-by-case basis in the subordinate planning and approval levels based on additionally collected inventory data. Compared with Spatial Development Plan 2020, Spatial Development Plan 2023 includes an expanded site for wind energy and is accompanied by partially more intensive use of spatial resources on the individual sites. Nevertheless, according to the current state of knowledge, this does not result in any significant impacts on the protected asset benthos. Only small areas (usually 0.1–0.2% of the individual area) outside protected areas will be permanently affected by the project. Overall, the construction-related impacts on the protected asset benthos are assessed as short-term and small-scale; this is confirmed by findings from the operational monitoring of wind farms already in operation.

4.3.2 Platforms

The construction-, installation-, and operation-related impacts of the converter platforms on the benthic fauna largely correspond to those of the wind turbines and are described in detail in Chapter 4.2.2 of the Environmental Report on Spatial Development Plan 2020. They are spatially or temporally limited so that no significant adverse effects are to be expected. Additional, potentially significant impacts compared with Spatial Development Plan 2020 are not currently expected.

4.3.3 Subsea cables

The laying and operation of subsea cables can also have impacts on the macrozoobenthos. Detailed descriptions can be found in Chapter 4.2.3 of the Environmental Report on Spatial Development Plan 2020. These impacts are small-scale and apply in a comparable way to all transmission line corridors. Taking into consideration the currently already applied preventive and mitigation measures, no significant impacts on the benthic communities are expected from the laying and operation of the subsea cables.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north should also not cause significant impacts.

4.4 Types of biotopes

Possible impacts of the construction and operation of wind turbines and platforms and the laying and operation of subsea cables on the protected asset biotopes correspond to those described in Chapter 4.1 and Chapter 4.3 on the protected assets sediments and macrozoobenthos.

They can result from a direct claim on biotopes, a possible covering over by sedimentation of material released as a result of construction, and potential habitat changes. Significant construction-related, site-related, and operation-related impacts for biotopes not protected by law can generally be ruled out based on the assessments described in Chapter 4.1 and Chapter 4.3. Permanent habitat changes caused by the installation are limited to the immediate area of rock fills required in the case of subsea cables.

A special consideration of the possible loss of function and area and thus the significant adverse effect on the legally protected biotopes according to Section 30 BNatSchG is given in Chapter 4.15.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north should also not cause significant impacts.

4.5 Fish

4.5.1 Areas and sites

According to the current state of knowledge, the development of offshore wind energy is not expected to have any significant impacts on fish fauna as a result of the construction, foundations, and operation of WT. Detailed descriptions can be found in Chapter 4.4.1 of the Baltic Sea Environmental Report on Spatial Development Plan 2020. The statements made there are supported by current findings. For example, investigations from Belgian OWF showed increased fish densities of various species (e.g. plaice, sole, or common dragonet) inside the OWFs compared with outside (DEGRAER et al. 2020). In addition to the reef effect, the increased fish abundance could also be related to the restrictions on fishery in the OWF sites. In addition, after nine survey years in the Belgian OWF “C-Power”, there are first indications of a refuge effect for certain fish species (DEGRAER et al. 2020).

In general, the impact assessments to date are based on the assumption of a navigation ban in the OWF sites and the associated exclusion of active fishery. If these conditions change, an adjustment of the impact assessment for the fish fauna is to be expected.

After assessing the representations in the environmental reports on Spatial Development Plan 2020, there are, according to the current state of knowledge, no additional or other significant impacts on the protected asset fish for Spatial Development Plan 2023.

4.5.2 Platforms

The construction-, installation- and operation-related impacts of the converter platforms on the fish fauna are spatially and temporally limited; this no significant adverse effects are to be expected. Detailed descriptions can be found in Chapter 4.4.2 of the Baltic Sea Environmental Report on Spatial Development Plan 2020. No additional or other significant impacts are currently expected as a result of the revision of the plan; furthermore, the SEA revealed that no required updates or elaborations are apparent.

4.5.3 Subsea cables

The general impacts of subsea cables on fish fauna are presented in Chapter 4.4.3 of the Baltic Sea Environmental Report on Spatial Development Plan 2020. The development of subsea cables and pipelines generally takes into consideration the gentlest possible laying methods, the bundling of pipelines, and an optimised cable laying procedure.

Compared with the SEA for Spatial Development Plan 2020, no additional or other significant impacts of subsea cables on the protected asset fish are to be expected as a result of the increased development; furthermore, the SEA revealed that no necessary updates or elaborations are apparent.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north should also not cause significant impacts.

4.6 Marine mammals

4.6.1 Areas and sites

The function and importance of the areas for wind energy (O-1 to O-3) in the German EEZ of the Baltic Sea for harbour porpoises were assessed in Chapter 2 according to the current state of knowledge. One change compared with Spatial Development Plan 2020 is the extension of Site O-2.2.

By designating or expanding these areas for offshore wind energy in ecologically suitable locations outside nature conservation areas, negative impacts on marine mammals are avoided and reduced. In addition, designations were made for the protection of the marine environment with regard to the consideration of best environmental practice in accordance with the Helsinki Convention as well as the state of the art. In this context, regulations on the avoidance and mitigation of negative impacts on marine mammals caused by the construction and operation of wind turbines, in particular in the form of noise mitigation requirements, which may also provide for the coordination of construction work on projects constructed at the same time, are to be adopted at the approval level. This corresponds to the current approval practice. By means of measures ordered in the downstream approval procedures and taking into consideration the current state of science and technology in the reduction of impulsive sound inputs, significant impacts on the harbour porpoise, the harbour seal, and the grey seal can be excluded. Direct disturbance of marine mammals at the individual level as a result of sound emissions during the construction phase, especially during pile driving, is to be expected on a regional and temporary basis. However, because of the high mobility of the animals and the aforementioned measures to be taken to avoid and reduce intensive noise emissions, significant impacts can almost certainly be ruled out. This is also true from the point of view that shipping could have impacts on marine mammals sensitive to disturbance because these impacts are rather short-lived and local. The formation of sediment plumes is largely to be expected on a local and temporal scale. A habitat loss for marine mammals could thus occur locally and for a limited period of time. Impacts resulting from sediment and benthic changes in the area of the foundations of a wind farm are considered insignificant for marine mammals. Locally, at least for the harbour seal and the grey seal, the food spectrum may consist to a greater extent of benthic organisms. However, because of the extensive foraging range of harbour seal and grey seal and the limitation of benthic changes to the foundation sites, such changes are not considered significant. Impacts at the population level are not known and are rather unlikely because of predominantly short-term and local effects in the construction phase.

Significant impacts of the wind turbines in Areas O-1 to O-3 on marine mammals during the operational phase can also be excluded with certainty based on current knowledge. Investigations carried out as part of the operational monitoring of offshore wind farms have so far not provided any indications of avoidance effects on harbour porpoises as a result of the operation of wind farms (BioConsult, 2020; IfAÖ et al., 2020; PGU, 2021). This also includes wind farm-related shipping traffic. Investigations have clearly shown that the underwater noise emitted by the turbines cannot be clearly distinguished from other sound sources (e.g. waves or ship noise) even at short distances. The wind farm-related shipping traffic was also hardly differentiated from the general ambient noise, which is introduced by various sound sources such as other shipping traffic, wind, waves, rain, and other uses (Matuschek et al. 2018). So far, avoidance has been observed only during the installation of the foundations;

this may be related to the large number and varying operating conditions of vehicles on the site.

As a result of the SEA, according to the current state of knowledge and taking into consideration the protective measures mentioned above, no significant impacts on the protected asset marine mammals are to be expected from the construction and operation of wind turbines within the areas and sites of the plan.

4.6.2 Platforms

The statements made in Chapter 4.6.1 for areas and sites apply to platforms as well.

4.6.3 Subsea cables

The potential construction- and operation-related impacts from subsea cables are set out in Chapter 4.5.2 of the SEA for Spatial Development Plan 2020. Compared with the SEA for Spatial Development Plan 2020, no additional or other significant impacts of subsea cables on the protected asset marine mammals are to be expected; furthermore, the SEA revealed that no necessary updates or elaborations are apparent.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north should also not cause significant impacts.

4.7 Seabirds and resting birds

4.7.1 Areas and sites

The general impacts of the areas and sites on seabirds and resting birds are presented in Chapter 4.6.1 of the Baltic Sea Environmental Report on Spatial Development Plan 2020. Compared with the SEA for Spatial Development Plan 2020, no additional or other significant impacts of subsea cables on the protected asset seabirds and resting birds are to be expected as a result of the extension of Site O-2.2. Furthermore, the SEA revealed that no required updates or elaborations are apparent.

4.7.2 Platforms

The general impacts of platforms on seabirds and resting birds are presented in Chapter 4.6.2 of the Baltic Sea Environmental Report on Spatial Development Plan 2020. Compared with the SEA for Spatial Development Plan 2020, no additional or other significant impacts of platforms on the protected asset seabirds and resting birds are to be expected as a result of the extension of Site O-2.2. Furthermore, the SEA revealed that no required updates or elaborations are apparent.

4.7.3 Subsea cables

The general impacts of subsea cables on seabirds and resting birds are presented in Chapter 4.6.3 of the Baltic Sea Environmental Report on Spatial Development Plan 2020. Compared with the SEA for Spatial Development Plan 2020, no additional or other significant impacts of subsea cables on the protected asset seabirds and resting birds are to be expected. Furthermore, the SEA revealed that no required updates or elaborations are apparent.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north should also not cause significant impacts.

4.8 Migratory birds

4.8.1 Areas and sites

The construction and operation of wind turbines can have various impacts on bird migration and thus migratory birds; these are described in detail in Chapter 4.7.1 of the Baltic Sea Environmental Report on Spatial Development Plan 2020.

With regard to the determination of Area O-2 and Site O-2.2, it is pointed out that an assessment and possibly the designation of measures will be required in the context of the subsequent assessment levels in order to mitigate the potential impacts of a wind farm project implemented on

Site O-2.2 on migratory birds (cf Planning principle 6.1.7 of Spatial Development Plan 2023). This is in line with official practice and the approach taken in the “Baltic Eagle” project, which is also located in Area O-2.

According to the current state of knowledge, the designations of Spatial Development Plan 2023 do not result in any additional significant impacts.

In addition, in accordance with planning principle 6.7.1 of Spatial Development Plan 2023 for the monitoring bird of collisions with wind turbines in offshore wind farms, state-of-the-art collision detection systems shall be installed at several representative turbines within all sites and areas for other forms of energy generation designated in the Spatial Development Plan. Within the framework of the precautionary principle under environmental law for the protection of migratory birds, collision monitoring should, in principle, be carried out with regard to actual collisions of birds with wind turbines for OWFs.

4.8.2 Platforms

The construction-, installation-, and operation-related impacts of platforms on bird migration and thus migratory birds are described in detail in Chapter 4.7.2 of the Baltic Sea Environmental Report on Spatial Development Plan 2020. No additional or other significant impacts on migratory birds are currently expected as a result of this revision of the plan. Furthermore, the SEA revealed that no required updates or elaborations are apparent.

4.8.3 Subsea cables

Installation- and operation-related impacts of the planned subsea cables on migratory birds can be excluded with the necessary certainty. A possible collision risk from construction vehicles can be classified as low because of the short-term nature of the construction phase.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north should also not cause significant impacts.

4.9 Bats and bat migration

4.9.1 Areas and sites

The impacts of offshore wind energy projects on bats are described in Chapter 4.8.1 of the Baltic Sea Environmental Report on Spatial Development Plan 2020.

In the BATMOVE research project, the authors estimate that at stations with larger offshore structures, unlike at small buoys, the first signs of exploratory behaviour were recorded on the basis of activity patterns. However, further investigations at suitable locations are required for quantification and more detailed description (SEEBENS-HOYER et al. 2021).

According to the current state of knowledge, no additional or other significant impacts are to be expected as a result of the present revision of the Spatial Development Plan.

4.9.2 Platforms

The construction-, installation-, and operation-related impacts of platforms on bats are described in Chapter 4.8.2 of the Baltic Sea Environmental Report on Spatial Development Plan 2020. No additional or other significant impacts are expected as a result of this revision of the plan; furthermore, the SEA revealed that no necessary updates or elaborations are apparent.

4.9.3 Subsea cables

Significant impacts on bats from the laying and operation of subsea cables can be ruled out with the required degree of certainty.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north should also not cause significant impacts.

4.10 Climate

No significant negative impacts on the climate are to be expected as a result of the designations of the site development plan.

The CO_2 savings associated with the development of offshore wind energy is expected to have positive impacts on the climate in the long term. This can make an important contribution to achieving the climate protection goals of the German government.

Table 5: Calculation of the CO_2 avoidance potential for the years 2020, 2030, and 2038.

	installed capacity	Full load hours	Annual electricity production	CO_2 avoidance factor	CO_2 avoidance per year
	GW	h/a	GWh/a	g CO_2eq/kWh	Mt CO_2eq/a
2020	7.2	3,800	27,360	701	19.2
2030	30	3,200	96,000	701	67.3
2038	60	3,400	204,000	701	143.0

Assuming the revision of the current CO_2 avoidance factor of electricity from offshore wind energy (UBA, 2019), this results in a CO_2 avoidance potential of approx. 67 and 143 Mt CO_2 equivalents per year for 2030 and 2038, respectively. For comparison: Annual emissions from power plants in the energy industry were 294.5 Mt CO_2 equivalents per year in 2016 (BMU, 2019).

Tabelle 6 shows the avoidance potential for the years 2020, 2030, and 2038.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north should also not cause significant impacts.

4.11 Seascape

4.11.1 Areas and sites

The impacts of the designations of the Spatial Development Plan on offshore wind energy are described in Chapter 4.10.1 of the Baltic Sea Environmental Report on Spatial Development Plan 2020.

Even with the realisation of an offshore wind farm in the area of Site O-2.2, the adverse effect on the seascape by the planned wind turbines can be classified as low because large areas of Site O-2.2 would be hidden by the development on Site O-2.1.

According to the valuation of Section 15, para. 1, no. 3 of Federal Compensation Ordinance (BKompV), an adverse effect on the protected asset of seascape should be anticipated despite the distance of offshore wind farms to the coast and to the islands. However, Section 15, para. 1, no. 3 of the BkompV (Federal Compensation Ordinance) schedules the lowest rating grade 2 for wind turbines at the level of compensation. This is justified by the fact that this seascape zone has largely escaped the eye of an ‘average’ observer, especially due to the great distance from the coast and island (BT Drs. 19/17344, Pg. 172). So, in principle, according to the valuation of Section 15, para. 1, no. 3 of the BkompV, there is an adverse effect on the scenery in the EEZ due to facilities under Section 65 of the Offshore Wind Energy Act E – except for different subsea cables and pipelines. However, Section 15, para. 1, no. 3 of the BKompV schedules the lowest rating grade 2 for wind turbines at the level of compensation for wind turbines in the EEZ. This is justified by the fact that the seascape zone of the EEZ has largely escaped the eye of an ‘average’ observer, especially due to the great distance from the coast and island (BT Drs. 19/17344, Pg. 172). The adverse effects arising for the scenery are thus compensated at the approval level by corresponding compensation measures.

4.11.2 Subsea cables

For subsea cables, negative impacts on the seascape can be ruled out as a result of the laying as subsea cables.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north should also not cause significant impacts.

4.12 Cultural heritage and other material assets

The designations for the planning, construction, and operation of wind turbines and subsea cables and pipelines aim to avoid or reduce construction-related disturbances to the sediments affecting discovered and undiscovered cultural heritage by involving the specialist authorities at an early stage. Synergy effects are to be promoted through cooperation in the analysis of sub-substrat investigations and samples of the sediments; this will be carried out in the context of the large-scale development of marine areas for wind energy and can provide new insights into cultural traces such as submerged seascapes.

The SEA for the Spatial Development Plan does not include a systematic survey or assessment of existing underwater cultural heritage. There is also no systematic survey in the downstream procedures; however, occasion-related investigations can be carried out or ordered. Within the scope of the suitability assessment and determination, in particular the underlying preliminary site investigations of the bathymetry as well as the side scan sonar and the magnetometer are compared and, if necessary, verified by means of Remotely Operated Vehicles (ROV). These results of the site investigation are evaluated with regard to the protected asset of sediments. Cultural assets identified in this evaluation process (e.g. shipwrecks) are included in the suitability assessment.

In the planning approval procedure (which follows the determination of suitability or, in the case of sites that have not been centrally pre-investigated, the designation as a site in the Spatial Development Plan as the next level with environmental assessment), the BSH regularly orders the following in the event that any cultural and material assets are found: On the part of the Project Developer, it must be ensured through suitable measures and with the involvement of monument protection and monument specialist authorities that scientific investigations and documentation of the properties can be carried out before the start of construction work and that objects of an archaeological or historical nature can be preserved and conserved either on site or through recovery. Conservation on site should be a priority.

According to the current state of knowledge, there is thus no reason to fear significant impacts on the protected asset cultural heritage and other material assets.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north should also not cause significant impacts.

4.13 Cumulative effects

4.13.1 Sediments/spatial resource, benthos, and types of biotopes

A significant part of the impacts on the environment of the areas and sites, platforms, and subsea cables on the sediments, benthos, and types of biotopes will occur only during the construction period (formation of turbidity plumes, sediment redeposition) and in a spatially narrowly defined area. Because of the gradual implementation of the construction projects, significant construction-related cumulative environmental impacts are not particularly likely. Possible significant cumulative impacts on the sediments, which could have a direct impact on the protected asset benthos and the types of biotopes,

therefore result primarily from the permanent claim of the sedimentsof the foundations of the turbines, the scour protection required depending on the site conditions, and in part, from the laid cable systems (crossing structures).

According to the precautionary principle, the maximum values resulting from the range of the model wind farm scenarios were used to calculate the claimed area of the sediments due to installations (cf Chapter 4.5.3 of the scope for the current SEA of 30 June 2022). The calculation of the loss of function resulting from the interarray cabling was carried out in accordance with the reported capacity, assuming a 1 m wide cable trench. In the area of the cable trench, however, the adverse effect on sediment and benthic organisms will be essentially temporary. In the case of crossing particularly sensitive biotopes such as reefs, a permanent adverse effect would have to be assumed.

Based on this conservative estimate, a maximum of 75.18 ha of area will be claimed for the areas and sites for wind energy use or temporarily adversely affected in the case of interarray cabling. Of this, 1.15 ha or 11500 m² is allotted to a converter platform with associated scour protection.

A mostly temporary loss of function on an area of around 55 ha (but refer note in Section 1.5) arises for the subsea cables according to the present state of knowledge. Outside the sensitive biotopes, a permanent loss of area and function as a result of the cable systems results exclusively from the crossing structures that become necessary. Based on an area of approx. 750 m² per crossing structure, the direct land use for approx. 50 crossing structures amounts to approx. 3.8 ha. Overall, a maximum of approx. 133.2 ha of area is strained or in case of subsea cables, temporarily affected, which corresponds to a share of approx. 0.3‰ in the total EEZ area.

In addition to the direct use of the sediments and thus of the habitat of the organisms that have settled there, the installation foundations, scour protection, and crossing constructions lead to an additional supply of hard substrate. As a result, hard substrate-loving species untypical of the site can colonise and directly or indirectly influence the natural soft substrate community. In addition, artificial substrates can lead to an altered spread of invasive species, among others. These indirect effects can lead to cumulative effects resulting from the construction of several offshore structures or rock fills in crossing areas of subsea cables and pipelines. However, reliable findings on effects beyond the sites of the wind farms or on the altered connectivity of invasive species are not yet available.

Because the (mainly temporary) claimed seafloor is below 0.1% of the EEZ area in the cumulative consideration of the grid infrastructure and the wind farm sites, according to current knowledge, no significant adverse effects that lead to a threat to the marine environment with regard to the sediments and the benthos are to be expected – even in the cumulation of indirect effects.

An additional potential site for wind energy in the territorial sea was integrated into the cumulative assessment of the SEA of Spatial Development Plan 2023. This is a testing ground located in the territorial sea of the federal state of Mecklenburg–Western Pomerania: Because of the relatively low proportion of the spatial area, whichis claimed by the testing ground in relation to the total area under consideration, according to current knowledge, no significant adverse effects are to be expected – even in cumulation – that would lead to a threat to the marine environment with regard to the protected assets sediments/spatial resource as well as benthos and biotopes.

4.13.2 Fish

The wind farms of the Baltic Sea can have an additive effect beyond their immediate location; this becomes particularly relevant as the number

of farms increases. The impacts of the OWFs are concentrated on the regular prohibitions of navigation on active fishery that have been imposed up to now as well as on the change in habitat and the corresponding interactions.

The general species composition of the fish fauna could change directly because species with different habitat preferences than the established species (e.g. reef dwellers) find more favourable living conditions and occur more frequently.

Possible effects of a large-scale development of offshore wind energy and the associated accumulation of local impacts could be:

- a change in species composition and diversity
- establishment and distribution of fish species adapted to reef structures
- an increase in the number of older individuals as a result of the expected reduction in fishing pressure
- better conditions for the fish because of a larger and more diverse food base.

In the event of a change to the previous navigation regulations for OWFs and the associated exclusion of active fishery in the OWF sites, a reassessment of cumulative effects on fish fauna would be necessary.

Overall, there is a need for research on whether and to what extent cumulative effects of OWFs in the Baltic Sea affect the fish stocks of individual species in the long term.

An additional potential site for wind energy in the territorial sea was integrated into the cumulative assessment of the SEA of Spatial Development Plan 2023. This is a testing ground located in the territorial sea of the federal state of Mecklenburg–Western Pomerania: Overall, according to current knowledge and in compliance with the known avoidance and mitigation measures, the construction of a testing ground in the territorial sea will not lead to any significant cumulative effects on fish fauna.

4.13.3 Marine mammals

Construction-related impacts

Cumulative impacts on marine mammals, especially harbour porpoises, may occur mainly because of noise exposure during the installation of deep foundations. For example, marine mammals can be significantly affected by the fact that – if pile driving is carried out simultaneously at different locations within the EEZ – there is not enough equivalent habitat available to avoid and retreat to.

So far, the implementation of offshore wind farms and platforms has been relatively slow and gradual. To date, pile driving has been carried out at three wind farms in the German EEZ of the Baltic Sea. Since 2011, all pile driving work has been carried out using technical noise mitigation measures. Since 2014, the noise emission values have been reliably complied with and even undercut thanks to the successful use of noise mitigation systems. There was no temporal overlap of the three construction sites so far. There was thus no overlapping of sound-intensive pile driving works that could have led to cumulative impacts. Only in the case of the construction of the “EnBW Baltic 2” wind farm was it necessary to coordinate the pile driving work – including the deterrence measures – because of the installation with two construction vessels.

The analysis of the noise results with regard to noise propagation and the possibly resulting accumulation has shown that the propagation of impulsive noise is strongly limited when effective noise-minimising measures are applied (BRANDT et al. 2018, DÄHNE et al., 2017).

In order to avoid and mitigate cumulative impacts on the harbour porpoise population in the German EEZ, the orders of the downstream approval procedure shall designate a restriction of

the sound exposure of habitats to maximum permitted proportions of the EEZ and nature conservation areas (BMU, 2013). According to this, the propagation of sound emissions may not exceed defined areas of the German EEZ and nature conservation areas. This ensures that sufficient suitable habitats are available for the fauna to escape at all times. The primary purpose of the ordinance is to protect marine habitats by preventing and minimising disturbances caused by impulsive sound input. The ordinance of avoidance and mitigation measures in Areas O-1 and O-2 will also focus in particular on the protection of animals of the highly endangered harbour porpoise population of the central Baltic Sea.

An additional potential site for wind energy in the territorial sea was integrated into the cumulative assessment of the SEA of Spatial Development Plan 2023. This is a testing ground located in the territorial sea of the federal state of Mecklenburg–Western Pomerania:

Significant cumulative effects for marine mammals resulting from the realisation of the testing ground can be ruled out in consideration of avoidance and mitigation measures. The Spatial Development Plan areas for wind energy in the German EEZ are located at distances of over 70 km from the testing ground. The distance to the nature conservation area “Kadetrinne” is approx. 17 km, impacts resulting from sound input during pile driving can thus be excluded. The distance of the testing ground from the EEZ or shipping routes in the EEZ also suggests that cumulative effects from the WT in the testing ground and shipping traffic are also to be classified as not significant. However, the areas and sites for the development of offshore wind energy in the German EEZ of the Baltic Sea are located at such large distances that even a synchronous installation in the testing ground and in sites of the EEZ could not lead to any cumulative effects as a result of sound input.

As a result, the current state of knowledge confirms that, through appropriate avoidance and mitigation measures at the approval level, significant impacts as a result of impulsive sound input during installation work in the testing ground or cumulative impacts as a result of simultaneous installation work with other offshore projects can be ruled out with the necessary certainty.

Operation-related impacts

According to the current state of knowledge, cumulative impacts from the operation of offshore wind turbines are not expected.

Sound inputs as a result of the operation of installations

The investigation of underwater noise in and around offshore wind farms has so far shown that the sound emitted by the turbines can be perceived only in the immediate vicinity (up to 100 m from the turbine). As part of a research project on behalf of the BSH (R&D project “OWF Noise”), the data from the underwater noise measurements at all wind farms in operation are currently being evaluated and subsequently assessed. The results from the research project to date have confirmed the following (as of 30 May 2022):

- The construction of the foundation (e.g. monopile, jacket) apparently has no influence on the sound radiated. Monopile wind turbines are no louder or quieter than other foundation types.
- Gearless wind turbines may be somewhat quieter than turbines with gearboxes.
- An increase of the sound level with the nominal capacity was not detected. On the contrary, in the range from 2 MW to 8 MW, there is a tendency for the level to drop by 2 to 3 dB.

In view of the planned development, monitoring measures will continue to be necessary and will be specified at the authorisation level. An overview of the planned monitoring measures is provided in Chapter 8.

Estimation of service traffic

In addition to the noise emitted by the operation of the turbines, inputs from service traffic must also be taken into account. Service traffic in this context means all movements by vessels related to the regular supply and maintenance of the installations as well as any repair work of installations that may arise.

In the present analysis, the vessels used for the transfer of passengers were specifically included. It is assumed that these vessels most frequently carry out passenger transfers between the wind farms and the base ports, are able to develop higher cruising speeds, and thereby contribute to the increase in ambient noise in the sea. In contrast, large construction vessels are used to replace components at longer intervals or only as required. Their contribution to ambient noise is thus rather small.

In a first approximation, the proportion of service traffic at selected locations in the vicinity of the offshore wind farms “Wikinger” and “ArkonaBeckenSüdost” with the aim of being able to assess possible cumulative effects was examined as an example.

The selected counting gate and shipping traffic for July 2021 are shown in Abbildung 5. The gate is also located within the Natura 2000 site “Westliche Rönnebank”. Perpendicular to this gate, the ship movements were evaluated. Traffic from the north-east to the south-west is shown in green; traffic in the opposite direction is shown in black. Along the gate is also the CPOD station “FFH”, which has been operated in the cluster monitoring of the two wind farms since 2014.

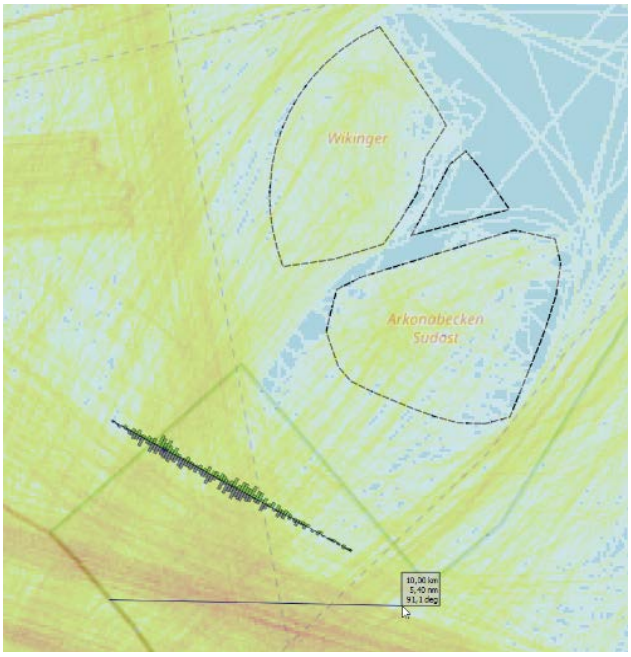

Figure 5: Analysis of shipping traffic to and from the wind farms “Wikinger” and “ArkonaBeckenSüdost” with AIS data from July 2021 (Map: BSH, based on HELCOM data).

Overall, the data show little shipping traffic in the vicinity of the OWFs, especially compared with the area south west of the area investigated. Service traffic accounts for about 1/3 of total ship movements, the largest share being ferries.

Table 6: Number of vessel movements along the gate and proportion of service traffic in July 2021.

July 2021	Proportion [%]	Ship movements [number]
OWF service	32.3	209
Ferries	43.7	283
Other	24.1	156

The analysis was carried out for July 2021 (i.e. the "worst case" because most maintenance traffic takes place in the summer months. It can be assumed that there are also maintenance-free months in winter so that there is a significantly reduced service traffic then.

4.13.4 Seabirds and resting birds

For the protected asset seabirds and resting birds, it was assessed whether additional or other significant environmental impacts arise compared with the SEA for the existing Spatial Development Plan 2020 or the SEA for ROP 2021. In addition, an examination was carried out to determine whether an update and elaboration of the assessment of the impacts on the protected asset seabirds and resting birds was necessary. The assessment has shown that there are no additional or other significant environmental impacts and that, in this respect, no updates or elaborations are required compared with the SEA on Spatial Development Plan 2020.

An additional potential site for wind energy in the territorial sea was integrated into the cumulative assessment of the SEA of Spatial Development Plan 2023. This is a testing ground located in the territorial sea of the federal state of Mecklenburg–Western Pomerania:

Impacts during the construction phase of the testing ground such as scaring and attraction are limited in time and space. Significant cumulative installation- or operation-related impacts can be excluded with the necessary certainty because of the large distances to other wind farm projects. Therefore, according to the current state of knowledge, no significant cumulative effects of the testing ground on seabirds and resting birds are to be assumed.

4.13.5 Migratory birds

For the description and assessment of cumulative effects, please refer to Chapter 4.12.5 of the Baltic Sea Environmental Report on Spatial Development Plan 2020. At the present time, there are no findings to the contrary. The description and assessment of cumulative effects there therefore continue to apply to the designations of Spatial Development Plan 2023. Thus, no additional or other significant impacts are expected as a result of this revision of the Spatial Development Plan; furthermore, the SEA revealed that no necessary updates or elaborations are apparent.

An additional potential site for wind energy in the territorial sea was integrated into the cumulative assessment of the SEA of Spatial Development Plan 2023. This is a testing ground located in the territorial sea of the federal state of Mecklenburg–Western Pomerania: For a final assessment on bird migration and thus migratory birds, the LEP refers to the downstream approval level, where concrete data on bird migration would be available, and points out possibilities for monitoring during operation and ordinances for shutdown periods. The BSH also agrees with this estimation for the testing ground. According to the current state of knowledge, no significant cumulative impacts are identified. A detailed assessment and, if necessary, the ordinance of measures must take place within the framework of the specific approval procedure.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north also do not give rise to contrary estimates on the cumulative effects.

4.14 Interactions

With regard to the description and assessment of interactions, reference is made to the statements in Chapter 4.13 of the Baltic Sea Environmental Report on ROP 2021.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north also do not give rise to contrary estimates on the interactions.

4.15 Assessment of biotope protection law

In accordance with Section 30, para. 2, sentence 1 BNatSchG, all actions that may cause destruction or other significant adverse effect on the biotopes listed in Section 30, para. 2, sentence 1 BNatSchG are generally prohibited. In accordance with Section 72, para. 2 WindSeeG, Section 30, para. 2 BNatSchG shall be applied to projects under the WindSeeG with the proviso that a significant adverse effect on biotopes within the meaning of Section 30, para. 2, sentence 1 BNatSchG shall be avoided as far as possible.

The direct and permanent utilisation of a biotope, which is protected according to Section 30, para. 2 BNatSchG, is generally considered to be a significant adverse effect. Following the methodology of LAMBRECHT & TRAUTNER (2007), an adverse effect can be classified as non-significant in individual cases if, taking into consideration all impact factors and considering them cumulatively, various qualitative–functional, quantitative–absolute, and relative criteria are met. A central component of this evaluation approach is the orientation values for quantitative-absolute area losses of an affected biotope occurrence, which may not be exceeded depending on its overall size. A maximum value of 1% has been established as a guideline for relative loss of area. Because a detailed assessment cannot be carried out within the framework of the Spatial Development Plan because of the lack of biotope mapping for most areas and sites, please refer to the subordinate planning and approval levels. A detailed description of the interventions to be taken into consideration, which could represent significant adverse effects within the meaning of the BNatSchG, has already been provided in the environmental reports on ROP 2021 and Spatial Development Plan 2020. The statements made there on the occurrence and potential impact of the individual areas and sites for wind turbines and transmission line corridors also remain valid.

Compared with the benchmark of the previous assessment based on Section 30, para. 2 BNatSchG, Section 72, para. 2 WindSeeG sets lower requirements for possibly permissible adverse effects on legally protected biotopes. Therefore, in the absence of indications of additional or other significant impacts, it can be concluded from the result of the SEA on Spatial Development Plan 2020 in the first-law conclusion that the requirements of Section 72, para. 2 WindSeeG are also met by the designations in Spatial Development Plan 2023.

In the following, only findings that deviate from the representations in the environmental reports for ROP 2021 and Spatial Development Plan 2020 based on new data and new areas and sites included in the Spatial Development Plan are presented. Furthermore, the subsea cables outside the sites and areas are considered separately.

Area O-2

In accordance with the investigations carried out in this area (IFAÖ 2020a, 2020b), no occurrences of legally protected biotopes are to be expected.

Site O-2.2

No occurrences of legally protected biotopes are to be expected in the area of Site O-2.2.

Subsea cables

No statement can be made on the use of specially protected biotopes according to Section 30, para. 2 BNatSchG because of the lack of a reliable scientific basis. An area-wide sediment and biotope mapping of the EEZ, which is currently being carried out, will provide a more reliable assessment basis.

In practice, protected biotopes are usually bypassed in the course of route planning; significant adverse effects are thus generally avoided.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north should also not cause significant impacts.

4.16 Species protection assessment

According to Section 37, para. 1, sentence 2, No. 1 to 3 BNatSchG, species protection generally includes

- protection of wild species of fauna and flora and their biocoenoses from adverse effects from humans and safeguarding of their other living conditions
- protection of habitats and biotopes of wild animal and plant species, and
- The reintroduction of fauna and flora of displaced wild species in suitable biotopes within their natural distribution area.

Within the framework of special species protection according to Section 44 et seq. BNatSchG, special regulations apply to animals of specially or strictly protected species. According to Section 44, para. 1, No. 1 BNatSchG, wild animals of specially protected species may not be injured or killed. According to Section 44, para. 1, No. 2 BNatSchG, wild fauna of strictly protected species and European bird species may not be significantly disturbed during breeding, rearing, moulting, hibernation and migration periods. Significant disturbance occurs when the conservation status of the local population of a species deteriorates as a result of the disturbance. In this context, it does not matter whether a relevant damage or disturbance is based on reasonable grounds nor do motivations, motives, or subjective tendencies play a role in the fulfilment of the prohibitions (LANDMANN/ROHMER, 2018).

An assessment according to Section 44, para. 1, No. 3 BNatSchG is not carried out in depth. According to this, it is prohibited to remove from nature, damage, or destroy breeding or resting places of wild animals of specially protected species. Reproduction sites are all those sites that are necessary for successful reproduction starting with mating and ending with the completion of the rearing of the young as far as it is site-specific. Resting places are those areas to which animals retreat for thermoregulation, resting, sleeping or other recreation, hiding, or protection. Resting and sunbathing places are also considered resting places within the meaning of Section 44, para. 1, No. 3 BNatSchG (Lau in: Frenz/Müggenborg, Bundesnaturschutzgesetz, 2nd ed. 2016, Section 44, marginal no. 21). The term “breeding and resting place” is to be understood in a spatially limited sense. (Landmann/Rohmer UmweltR/Gellermann, 98th EL April 2022, BNatSchG Section 44 marginal no. 19). No such spatially limited reproduction or resting places are known in the area of influence of the plan under consideration here. Therefore, the realisation of this fact is ruled out in the present case.

Whether the site development plan meets the wildlife conservation provisions of Section 44, para. 1, No. 1 and No. 2 BNatSchG for specially protected animal species is examined in the context of this study on assessment of wildlife conservation regulations. It will examine in particular whether the plan violates prohibitions under wildlife conservation regulations. The species protection assessment is carried out at the higher level of the sectoral plan. A detailed assessment of wildlife conservation regulations for the individual sites and projects must be carried out as part of the assessment of the suitability of specific sites or the project approval procedure in question.

With regard to the assessment under species protection law, please refer to the statements in

Chapter 5 of the Baltic Sea Environmental Report on ROP 2021. In this context, the SEA in the current revision procedure of the Spatial Development Plan was limited to additional or other significant environmental impacts as well as to necessary updates and elaborations according to the tiering required in accordance with Article 5, para. 3, sentence 5–7 WindSeeG as well as Section 39, para. 3, sentence 1–3 UVPG.

At the present time, there are no findings that indicate the realisation of prohibited species under species protection law for the species under consideration. With regard to the comments on migratory birds and the designation of Site O-2.2, reference is made to the comments in Chapter 4.8.1 of this SEA. A detailed assessment must be carried out at the downstream audit level.

In addition, in accordance with planning principle 6.7.1 of Spatial Development Plan 2023 for the monitoring bird of collisions with wind turbines in offshore wind farms, state-of-the-art collision detection systems shall be installed at several representative turbines within all sites and areas for other forms of energy generation designated in the Spatial Development Plan. Within the framework of the precautionary principle under environmental law for the protection of migratory birds, collision monitoring should, in principle, be carried out with regard to actual collisions of birds with wind turbines for OWFs.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north also do not give rise to contrary estimates regarding species protection.

4.17 Compatibility assessment/assessment under site protection law

The site development plan is a plan within the meaning of Section 36, sentence 1, No. 2 BNatSchG so that Section 34, para. 1–5 BNatSchG is to be applied accordingly. It cannot be ruled out from the outset that the plan, individually or in interaction with other projects or plans, is likely to significantly adverse affect the area within the meaning of Section 34, para. 1, sentence 1 BNatSchG. As a result, the compatibility of the plan with the area must be reviewed. In this context, the SEA in the current revision procedure of the Spatial Development Plan was limited to additional or other significant environmental impacts as well as to necessary updates and elaborations, which are not recognisable with regard to the habitat protection for the EEZ of the Baltic Sea according to the tiering required in accordance with Section 5, para. 3, sentence 5–7 WindSeeG as well as Section 39, para. 3, sentence 1–3 UVPG.

With regard to the assessment for the legal framework governing the conservation of natural habits, please refer to the statements in Chapter 6 of the Baltic Sea Environmental Report on ROP 2021.

Marine mammals

Because of the particular sensitivity of marine mammals, especially harbour porpoises, the following section examines the compatibility of the designations with the purposes of protection and conservation objectives of the nature conservation areas at the higher level of the plan.

<u>“Pommersche Bucht – Rönnebank” nature conservation area</u>

In accordance with Section 9, para. 1, No. 3 NSGPbrV, the adverse effect on the conservation objectives or purposes of protection of the “Pommersche Bucht-Rönnebank” nature conservation area by the implementation of the plan must be examined.

The assessment of the impacts of the plan is based on the purpose of protection of the protected area “Pommersche Bucht – Rönnebank”. According to Section 3, para. 1 NSGPbrV, the overarching purpose of protection is to achieve the conservation objectives of the Natura 2000 sites by permanently preserving the marine

area, the diversity of its habitats, biocoenoses, and species relevant to these areas, and the uniqueness of this part of the Baltic Sea, which is characterised by the Oderbank, the Adlergrund, and the Rönnebank as well as the slope areas of the Arkona Basin.

According to Section 3, para. 2, No. 3 of the Ordinance, the NSGPbrV comprises the conservation or, where necessary, the restoration of the specific ecological values and functions of the area, in particular the populations of harbour porpoises, grey seals, and seabird species as well as their habitats and natural population dynamics.

Protected marine mammalspecies

Finally, under Section 4–6, para. 1 NSGPbrV, the Ordinance of 22 September 2017 sets out objectives to ensure the survival and reproduction of the marine mammal species listed in Section 3, para. 2 NSGPbrV of Annex II of the Habitats Directive – harbour porpoise and grey seal – as well as to conserve and restore their habitats.

In accordance with Section 4, para. 3, the protection of harbour porpoises in Area I shall require in particular the conservation or, where necessary, the restoration

- of the natural population densities of this species with the aim of achieving a favourable conservation status, their natural spatial and temporal distribution, health status, and reproductive fitness, taking into consideration natural population dynamics, natural genetic diversity within the population, and genetic exchange opportunities with populations outside the area
- of the area as a harbour porpoise habitat largely free of disturbance and unaffected by local pollution
- of unfragmented habitats and the possibility of migration of the harbour porpoise within the central Baltic Sea and into the western Baltic Sea and Belt Sea
- of the essential food resources of harbour porpoises, in particular the natural population densities, age class distributions, and distribution patterns of organisms serving as food resources for harbour porpoises.

The same is regulated in Section 6, para. 3 NSGPbrV for the harbour porpoise in Area III of the protected area as well as in Section 5, para. 3 NSGPbrV.

In accordance with Section 5, para. 1 NSGPbrV, the purpose of protection in Area II is to maintain or restore a favourable conservation status not only of the harbour porpoise but also of the grey seal.

Please refer to the results of the compatibility assessment on Spatial Development Plan 2019/Spatial Development Plan 2020.

Possible adverse effects on the purposes of protection of the “Pommersche Bucht – Rönnebank” nature conservation area resulting from the implementation of designations of the present plan, also taking into consideration the designation of the extended Site O-2.2, can be ruled out with certainty if the orders in the subordinate project approval procedures are complied with.

“Fehmarn Belt” nature conservation area

In accordance with Section 3 NSGFmbV, the compatibility of the implementation of the plan with the purposes of protection of the “Fehmarnbelt” nature conservation area must be examined.

According to Section 3, para. 1 NSGFmbV, the overarching purpose of protection of the “Fehmarnbelt” nature conservation area is the realisation of the conservation objectives of the Natura 2000 site through the permanent preservation of the marine area and the diversity of its habitats, biocoenoses, and species relevant to

this area as well as the special character of the sandbank in the form of megaripples.

In accordance with para. 2, the protection includes

the preservation or, where necessary, the restoration

- of the specific ecological values and functions of the area, in particular its characteristic morphodynamics as well as the hydrodynamics shaped by the water exchange between the North Sea and the Baltic Sea, a natural or near-natural expression of the marine macrophyte populations and the species-rich gravel, coarse sand and shell layers
- of the populations of harbour porpoises and harbour seals, including their habitats and natural population dynamics
- of its connecting and stepping stone function for the ecosystems of the western and central Baltic Sea

In accordance with Section 3, para. 3, No. 2 NSGFmbV, the purposes of protection pursued include, in particular, the conservation or, where necessary, the restoration of a favourable conservation status of the harbour porpoise and harbour seal species.

In accordance with Section 3, para. 5 NSGFmbV, the protection of harbour porpoise and harbour seal requires in particular, the conservation or restoration of

- the natural population densities of these species with the aim of achieving a favourable conservation status, their natural spatial and temporal distribution, health status, and reproductive fitness, taking into consideration natural population dynamics, natural genetic diversity within the population, and genetic exchange opportunities with populations outside the area
- the area as a feeding and migratory habitat for harbour porpoises and harbour seals and as a breeding and nursery habitat for harbour porpoises with as little disturbance as possible and largely unaffected by local pollution
- unfragmented habitats and the possibility of migration of harbour porpoises and harbour seals within the Baltic Sea, in particular to the adjacent and neighbouring nature conservation areas of Schleswig-Holstein and Mecklenburg–Western Pomerania and to the resting places along the Danish (especially Rødsand) and German coasts
- the essential food resources of harbour porpoises and harbour seals, in particular the natural population densities, age class distributions, and distribution patterns of organisms serving as food resources for harbour porpoises and harbour seals.

Please refer to the results of the compatibility assessment on Spatial Development Plan 2019/Spatial Development Plan 2020.

Possible adverse effects on the purposes of protection of the “Fehmarnbelt” nature conservation area resulting from the implementation of the designations of this plan can be ruled out with certainty if the instructions in the subordinate project approval procedure are complied with.

“Kadetrinne” nature conservation area

In accordance with Section 3 NSGKdrV, the compatibility of the implementation of the plan with the purposes of protection of the “Kadetrinne” nature conservation area must be examined.

According to Section 3, para. 1 NSGKdrV, the overriding purpose of protection of the “Kadetrinne” nature conservation area is to achieve the conservation objectives of the Natura 2000 site by permanently preserving the marine area and the diversity of its habitats, biocoenoses, and species relevant to this area as well as the

special importance of the channel system existing here for the exchange of water between the North Sea and the Baltic Sea. The protection includes

- the conservation or, where necessary, the restoration of the specific ecological values and functions of the area, in particular its characteristic morphodynamics as well as the hydrodynamics shaped by the exchange of water between the North Sea and the Baltic Sea
- the populations of harbour porpoises, including their habitat and natural population dynamics
- its connecting and stepping stone function for the ecosystems of the western and central Baltic Sea

In accordance with Section 3, para. 3, No. 2 NSGKdrV, the purposes of protection pursued include the maintenance or restoration of a favourable conservation status of the harbour porpoise. In accordance with Section 3, para. 5 NSGKdrV, the protection of the harbour porpoise requires, in particular, the conservation or, insofar as necessary, the restoration

- of the natural population densities of this species with the aim of achieving a favourable conservation status, their natural spatial and temporal distribution, health status, and reproductive fitness, taking into consideration natural population dynamics, natural genetic diversity within the population, and genetic exchange opportunities with populations outside the area
- of the area as a feeding, migratory, breeding, and nursery habitat for harbour porpoises with as little disturbance as possible and largely unaffected by local pollution
- of unfragmented habitats and the possibility of the migration of marine mammals within the central Baltic Sea and into the western Baltic Sea
- of the main organisms serving as a food resources for the harbour porpoise, in particular the natural population densities, age class distributions, and distribution patterns

Please refer to the results of the compatibility assessment on Spatial Development Plan 2019/Spatial Development Plan 2020.

Possible adverse effects on the purposes of protection of the “Pommersche Bucht – Rönnebank” nature conservation area resulting from the designations of the plan in question can be excluded with sufficient certainty if the instructions in the subordinate project approval procedure are complied with.

Avifauna

With regard to bird species to be protected in Sub-area 4 of the “Pommersche Bucht – Rönnebank”nature conservation area, the statements in the Baltic Sea Environmental Report to ROP 2021 continue to apply.

FFH habitat types

With regard to the FFH habitat types “reef” and “sandbank” in the nature conservation areas “Fehmarnbelt”, “Kadetrinne”, and “Pommersche Bucht – Rönnebank”, the statements in the Baltic Sea Environmental Report on ROP 2021 continue to apply.

Overall result

At the present time, there are no findings that indicate the realisation of prohibitions under site protection law for the designations made in Spatial Development Plan 2023. A detailed assessment must be carried out at the downstream audit level.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north also do not give rise to contrary estimates.

4.18 Transboundary effects

The present SEA concludes that, as things stand at present, the designations of Spatial Development Plan 2023 do not have significant impacts on the areas of the neighbouring countries bordering the German EEZ of the Baltic Sea.

For the protected assets of sediments and water, plankton, benthos, types of biotopes, seascape, and cultural heritage and other material assets as well as humans, including human health, significant transboundary effects can generally be excluded. In the area of the German Baltic Sea, significant transboundary effects could arise for the highly mobile protected biological assets fish, marine mammals, and seabirds and resting birds as well as migratory birds and bats only if considered cumulatively.

For the protected asset fish, the SEA concludes that, according to the current state of knowledge, no significant transboundary effects on fish are to be expected from the implementation of Spatial Development Plan 2023 because the identifiable and predictable effects are small-scale and temporary in nature.

This also applies to the protected assets marine mammals as well as seabirds and resting birds. These use the designated areas and sites for offshore wind energy predominantly as migration areas. There is unlikely to be any significant loss of habitat for strictly protected marine and resting bird species. According to the current state of knowledge and taking into consideration impact-reducing and damage-limiting measures, significant transboundary effects can be excluded.

For example, the installation of the foundations of wind turbines and platforms is permitted in the specific approval procedure only if effective noise mitigation measures are implemented. Against the background of the special threat of the separate Baltic Sea population of harbour porpoise, intensive monitoring measures are to be carried out as part of enforcement and, if necessary, the noise mitigation measures are to be adapted or the construction work coordinated in order to exclude any cumulative effects.

For migratory birds, the wind turbines and platforms constructed on the sites of Spatial Development Plan 2023 may represent a barrier or a collision risk. The collision risk should be minimised by taking appropriate measures to avoid attraction effects (e.g. through lighting). With regard to the barrier effect, a conclusive cumulative assessment is not possible with the current state of knowledge.

A cumulative assessment of the hazard risk for bat migration is also not possible at this stage because sufficient knowledge of migration routes, migration heights, and migration intensities is still lacking. It can generally be assumed that any significant transboundary effects will be prevented by the designations of the Spatial Development Plan in the same way that appropriate avoidance or minimisation measures are applied to migratory birds.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north also do not give rise to contrary estimates.

5 Evaluation of the overall plan

In summary, with regard to the planned areas and sites, platforms, and subsea cable routes, the orderly, coordinated overall planning of Spatial Development Plan 2023 will minimise impacts on the marine environment as far as possible. With strict adherence to preventive and mitigation measures, in particular noise mitigation during the construction phase and to protect migratory birds, significant impacts can be avoided through the implementation of the designated areas and sites as well as platforms.

The laying of subsea cables can be designed to be as environmentally friendly as possible by, among other things, avoiding protected areas and biotopes and choosing a minimally disruptive cable laying procedure The planning principle for the increase of sediment temperature should ensure that significant negative impacts of cable heat-up on benthic communities are prevented. Avoiding crossings of subsea cables with each other as far as possible also serves to prevent negative impacts on the marine environment, in particular on the protected assets sediments, benthos, and the types of biotopes.

Based on the above descriptions and assessments, it must be concluded for the SEA, also with regard to any interactions, that, according to the current state of knowledge and at the comparatively abstract level of sectoral planning, no major impacts on the marine environment within the area of investigation are to be expected as a result of the planned designations. The potential impacts are frequently small-scale and mostly short-term because they are limited to the construction phase.

Most of the areas and sites lie within the priority areas for wind energy of ROP 2021. Sufficient knowledge is available for these areas. So far, there is a lack of sufficient scientific knowledge and uniform assessment methods for the cumulative assessment of impacts on individual protected assets such as migratory birds and bat migration. Therefore, these impacts cannot be conclusively assessed within the framework of the present SEA or are subject to uncertainties and require more detailed examination within the framework of downstream planning stages.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north also do not give rise to contrary estimates.

6 Measures to prevent, reduce and offset any significant adverse effects of the site development plan on the environment

With regard to the measures envisaged to prevent, reduce, and offset any significant adverse impacts of the Spatial Development Plan on the marine environment, please refer to the statements in Chapter 8 of the Baltic Sea Environmental Report on Spatial Development Plan 2020.

Furthermore, the principle of maritime spatial planning 2.4 (6) from ROP 2021 on the requirement of preventive and mitigation measures within the designated bird migration corridors applies accordingly to the Spatial Development Plan (cf Planning principle 6.1.7). As soon as mass migration takes place in these areas (which demonstrably leads to a significantly increased risk of collision), measures for the protection of migratory birds, in particular those that exclude the possibility of birds colliding with wind turbines (e.g. shutting down of turbines) must be initiated without delay.

7 Examination of reasonable alternatives

In accordance with Art. 5, para. 1, sentence 1 SEA Directive in conjunction with the criteria in Appendix I SEA Directive and Section 40, para. 2, No. 8 UVPG, the environmental report contains a brief description of the reasons for the choice of the reasonable alternatives examined. Essentially, different types of alternatives can be considered for an examination of reasonable alternatives – in particular strategic, spatial or technical alternatives. The prerequisite is always that these are reasonable or can be seriously considered.

In principle, it should be noted that preliminary investigation of possible and conceivable alternatives is already inherent in all designations of the Spatial Development Plan in the form of standardised technical and planning principles. As can be seen from the reasoning of the individual planning principles, the respective principle is already based on a consideration of possible affected public concerns and legal positions so that a “preliminary examination” of possible alternatives has already taken place. There are already many different uses and legally protected concerns in the EEZ. An overall assessment of the uses and functions in the EEZ has already been carried out as part of the preparation and revision of the maritime spatial plan. The objectives and principles of ROP 2021 are to be largely adopted in Spatial Development Plan 2023 and will be reviewed and weighed up with regard to the specific subjects of regulation of the concerns and rights presented in this procedure.

The zero alternative (i.e. not implementing the Spatial Development Plan) is not a reasonable alternative because the development of offshore wind energy is indispensable for achieving the national climate protection goals according to the current state of technology and scientific knowledge in order to avert drastic negative impacts of anthropogenic climate change – also for the state of the marine environment. The importance of achieving the expansion targets is now explicitly stated in Section 1, para. 3 WindSeeG. Accordingly, the construction of offshore wind turbines and offshore grid connection cables is in the overriding public interest and serves public safety (cf also Chapter 3).

The purpose and aim of introducing a sectoral plan with not only spatial but also temporal designations and standardised technology and planning principles is the precautionary control of the development of offshore wind energy necessary for climate protection. This is intended to ensure at the planning level that the legally designated expansion targets for offshore wind energy can be achieved through a spatially ordered and spatial resource saving development (Section 4, para. 2, No. 2 WindSeeG) and that environmental concerns are also examined at the planning level.

A strategic alternative (e.g. with regard to the targets of the federal government on which the planning is based) is not currently being considered for the Spatial Development Plan because the statutory expansion targets of the federal government represent the planning horizon for Spatial Development Plan 2023. The expansion targets result from the legal provision in Section 1, para. 2, sentence 1 WindSeeG. These are classified as imperative for climate protection; they are in the overriding public interest and serve public safety. Furthermore, they are also an essential basis for the demand planning of the onshore grid expansion. Because a coordinated approach to onshore and offshore grid and capacity expansion to mitigate vacancies or curtailments appears to make sense, choosing an alternative expansion strategy in this context is out of the question.

Spatial alternatives are rare in view of the underlying territorial context of ROP 2021 and against the backdrop of the considerably increased expansion targets. In accordance with Section 1, para. 2 WindSeeG, the aim of the WindSeeG is

to increase the installed capacity of offshore wind turbines connected to the grid to at least 30 GW by 2030, to at least 40 GW by 2035, and to at least 70 GW by 2045.

As is clear from the designations of Spatial Development Plan 2023, the designated sites are not sufficient to achieve the long-term expansion target of at least 70 GW. Nevertheless, in order to keep the need for additional potential areas as low as possible, a comparatively high power density is taken as a basis on the designated sites. Compared with Spatial Development Plan 2020, this has been considerably increased for some sites in the current Spatial Development Plan. This is based on the results of an accompanying expert report on the Spatial Development Plan revision procedure on behalf of the BSH (Dörenkämper et al., 2022). To determine the expected annual energy production and the influence of shadowing effects on the electricity yield, extensive modelling was carried out in various development scenarios as part of a scientific report.

As a result, the power density on the sites is considerably increased – even if this reduces the expected full-load hours. A higher overall output is thus possible on the sites designated in Spatial Development Plan 2023. In the area covered by Spatial Development Plan 2023, this leads to a total installed capacity of approx. 36.5 GW compared with the assumptions in the revision procedure of the ROP. In ROP 2021, a capacity potential of 40 GW was assumed to achieve the statutory expansion target. From an environmental and nature conservation point of view, an increase in power density seems preferable to the alternative of having to develop additional and possibly environmentally sensitive areas.

8 Measures planned for monitoring environmental impacts of implementing the site development plan

With regard to the planned monitoring measures, reference is made to the statements in Chapter 10 of the Baltic Sea Environmental Report on Spatial Development Plan 2020 and Chapter 10 of the Baltic Sea Environmental Report on the maritime spatial plan of the EEZ.

New in Spatial Development Plan 2023 is the requirement to provide collision monitoring as a matter of principle (cf Planning Principle 6.1.7). The installation of state-of-the-art collision detection systems such as sensors and/or suitable camera systems at several representative installations is envisaged.

9 Non-technical summary

9.1 Subject and occasion

In the context of the revision of the Spatial Development Plan initiated on 17 December 2021, areas and sites are designated for the implementation of the statutory expansion targets for offshore wind energy that go beyond Spatial Development Plan 2020 and were therefore not included in the SEA carried out in previous preparation, update, and revision procedures of the Spatial Development Plan.

In contrast to the last revision of the Spatial Development Plan, with the conclusion of the revision procedure for maritime spatial planning, there is now an up-to-date maritime spatial plan, the ROP 2021, including SEA. The revision of the Spatial Development Plan essentially builds on the designations of the maritime spatial planning for offshore wind energy and subsea cables and pipelines and develops them in terms of sectoral planning.

Against this background, the SEA for the revision of the Spatial Development Plan is largely based on the results of the SEA carried out in the maritime spatial planning revision procedure. According to Section 5, para. 3, sentence 5–7 WindSeeG, it must be determined at which stage certain environmental assessments are to be focussed in order to avoid multiple assessments in multi-stage planning and approval processes. The environmental assessment shall be limited to additional or other significant impacts on the environment as well as to necessary updates and elaborations.

In accordance with Section 72, para. 1 WindSeeG, the assessment of the environmental impact of offshore wind turbines or installations for other forms of energy generation according to the provisions of the UVPG based on an SEA already carried out according to Sections 5 to 12 WindSeeG for the site development plan or the site investigation shall be limited to additional or other significant impacts on the environment as well as to any necessary updates and elaborations.

Accordingly, the SEA carried out in the procedure for the update and revision of the Spatial Development Plan is to be limited to additional or other significant environmental impacts and to necessary updates and elaborations compared with the SEA for ROP 2021 and compared with more recent results from site investigations or from Spatial Development Plan 2020.

In the following, the scope of the assessment is therefore limited to additional or other significant environmental impacts as well as to necessary updates and elaborations.

The main document of the SEA is the present Environmental Report. It identifies, describes, and assesses the likely significant impacts that the implementation of the Spatial Development Plan will have on the environment and possible alternative planning options, taking into consideration the essential purposes of the plan. The update and revision of the Spatial Development Plan and the implementation of the SEA will be carried out taking into consideration the environmental conservation objectives.

9.2 Methodology of the Strategic Environmental Assessment

The methodology is based primarily on the designations of the plan to be examined. Within the framework of this SEA, it is determined, described, and evaluated for each of the designations whether the designations have likely significant impacts on the protected assets concerned. According to Section 1, para. 4 UVPG in conjunction with Section 40, para. 3 UVPG, in the environmental report the competent authority provisionally assesses the environmental impacts of the designations with regard to effective environmental precautions in accordance with applicable laws. According to the special legal benchmark of Section 5, para. 3, sentence 1, No.

2 WindSeeG, the designations may not pose a threat to the marine environment. In addition, the provisions of Section 5, para. 3, sentence 1, No. 5 WindSeeG (protected areas) and Section 72, para. 2 WindSeeG (marine biotopes) must be observed in particular.

The methodology of the Strategic Environmental Assessment is comprehensively explained in the scope for the current SEA. Reference is made at this point to the designated scope of 30 June 2022.

Data sources

With regard to the data and knowledge basis for the SEA and any difficulties in compiling the documents, please refer to Chapter 5 of the scope of the current SEA of 30 June 2022.

9.3 Summary of the assessments related to the protected assets

Site

For the protected asset of spatial resource (Section 2, para. 1, No. 3 UVPG), the consumption of this must be considered in particular.

Against the background of the limited availability of spatial area in the German EEZ of the North Sea and Baltic Sea, it must be taken into consideration when designating the expected generation capacity that these expansion targets can be achieved as far as possible with the sites available. In order to achieve the statutory expansion targets, it is therefore imperative that the sites available for offshore wind energy are developed sparingly.

In view of the increased expansion targets, the basis for a spatial resource-saving development is an efficient use of the areas available for offshore wind energy.

In total, depending on the scenario, 0.025% to 0.027% of the area of the EEZ of the Baltic Sea is directly taken up by the designations of Spatial Development Plan 2023. Against this backdrop, there is no reason to worry about significant impacts on the protected asset of spatial resource.

Sediments

With regard to the status description and status assessment of the protected asset sediments, please refer to the statements in Chapter 2.2 of the Baltic Sea Environmental Report on ROP 2021. The current investigations of the “Sediment mapping” project in the EEZ confirm the statements in the aforementioned environmental report.

Overall, there are no significant impacts on the protected asset sediments. For details on the assessment of potential impacts, please refer to the Baltic Sea Environmental Report on Spatial Development Plan 2020.

Water

With regard to the status description and status assessment of the protected asset water, please refer to the statements in Chapter 2.3 of the Baltic Sea Environmental Report on ROP 2021. Any updates or elaborations of the status description are not apparent compared with the SEA for ROP 2021.

According to the current state of knowledge, there is no reason to worry about significant impacts on the protected asset water.

Benthos

With regard to the status description and estimation of the protected asset benthos, please refer to the statements in Chapter 2.6 of the Baltic Sea Environmental Report on ROP 2021. The assessment of the status described there is supplemented by the findings from newly collected data described below.

For Site O-1.3, new findings are available from investigations carried out in autumn 2018 and spring 2019 (IFAÖ 2019); these largely confirm the statements made in the Baltic Sea Environmental Report on ROP 2021 and the Environmental Report on Spatial Development Plan

2020. Thereafter, the area is colonised by a community of silt-rich soft-bottom fauna below the halocline.

For Site O-1.3, one Red List species is added from the investigations. This is the polychaete *Platynereis dumerilii* (RL category G).

With regard to Area O-2, results from baseline studies on the "Baltic Eagle" project in 2018-2019 can be used as a supplement (MARILIM 2019, MARILIM 2020); these data largely confirm the statements made in the Baltic Sea Environmental Report on ROP 2021 and the Environmental Report on Spatial Development Plan 2020. For Area O-2, two Red List species are added from the investigations. These are the bryozoe *Alcyonidium gelatinosum* (RL category 3) and the hydrozoe *Sertularia cupressina* (RL category G). They increase the number of endangered species in Area O-2 to three. However, both species are sessile hard-bottom dwellers and not typical representatives of the silt community typical of Area O-2, and were limited to isolated finds.

Compared with Spatial Development Plan 2020, the layout and size of Site O-2.2 located in Area O-2 have changed. Based on the location and the same abiotic conditions, it is assumed here that the settlement by the benthos is largely the same; refer to the statements on Area O-2 in the Baltic Sea Environmental Report on ROP 2021 and in the Environmental Report on Spatial Development Plan 2020 as well as the additions here above.

The construction-, installation-, and operation-related impacts of the wind turbines, converter platforms, and subsea cables on benthic fauna are described in detail in Chapter 4.2 of the Environmental Report on Spatial Development Plan 2020. They are spatially or temporally limited so that no significant adverse effects are to be expected. Additional, potentially significant impacts compared with Spatial Development Plan 2020 are not currently expected.

Biotopes

With regard to the data availability and status description of the protected asset biotopes, please refer to the statements in Chapter 2.5 of the Baltic Sea Environmental Report on ROP 2021. The new Site O-2.2 to be considered in Area O-2, which has changed in its extent and size compared with Spatial Development Plan 2020, is also included because the same biotopes as in the already considered Area O-2 are expected because of the natural conditions or are already included in the original Site O-2.2 considered in the environmental report on Spatial Development Plan 2020.

Possible impacts of the construction and operation of wind turbines and platforms and the laying and operation of subsea cables on the protected asset biotopes correspond to those described in Chapter 4.1 and Chapter 4.3 on the protected assets sediments and macrozoobenthos.

They can result from a direct claim on biotopes, a possible covering over by sedimentation of material released as a result of construction, and potential habitat changes. Significant construction-, installation, and operation-related impacts on biotopes not protected by law can generally be ruled out. In subsea cables, permanent habitat changes caused by the installation are limited to the immediate area of artificial hard substrates, which become necessary in the case of crossings.

A summary of the potential occurrence and potential impact of the legally protected biotopes according to Section 30 BNatSchG in the areas and sites as well as the corridors of the subsea cables is provided in the following section "Biotope protection".

Fish

According to current knowledge, the fish communities typical of the habitat occur in the German EEZ. The pelagic fish community, represented by herring, sprat, salmon, and sea trout, has been identified, as has the demersal fish

community, consisting of large fish species such as cod, plaice, flounder and dab. Because of the habitat-typical fish communities, the fish fauna is of average importance with regard to species uniqueness.

According to the current state of knowledge, the planned sites do not represent a preferred habitat for any of the protected fish species. As a result, the fish stock in the planning area is not of outstanding ecological importance compared with adjacent marine areas. According to the current state of knowledge, the planned construction of wind farms and the associated platforms and submarine cable routes are not expected to have a significant adverse effect on the protected asset fish. The impacts on the fish fauna during the construction of the wind farms, platforms, and subsea cables are limited in space and time.

During the construction phase of the foundations, the platforms and the laying of the subsea cables, the fish fauna may be temporarily subjected to adverse effects in small areas by sediment turbulence and the formation of turbidity plumes. The turbidity in the water is expected to decrease again quickly because of the prevailing sediment conditions and current conditions. Based on the current state of knowledge, the adverse effects will therefore remain small-scale and temporary. Overall, small-scale adverse effects on adult fish can be expected to be minimal. In addition, the fish fauna is adapted to the natural sediment turbulence caused by storms that are typical here. Furthermore, during the construction phase, noise and vibrations may lead to the temporary repellence of fish. Noise during the construction phase must be reduced by appropriate measures.

Further impacts on the fish fauna may come from the additionally introduced hard substrates. Recent scientific investigations from Belgian OWFs in the North Sea showed increased fish densities of various species (e.g. plaice, sole, and common dragonet) inside the OWFs compared with outside (DEGRAER et al. 2020). In addition to the reef effect, the increased fish abundance could additionally be related to the restrictions on fishery as a result of the previous navigation regulations in the OWF sites. The increase of sediment temperature and magnetic fields that could emanate from subsea cables are also not expected to have any lasting impacts on mobile fish fauna.

In general, the impact assessments to date are based on the assumption of a navigation ban in the OWF sites and the associated exclusion of active fishery. If these conditions change, an adjustment of the impact assessment for the fish fauna is to be expected.

According to the current state of knowledge, the planned construction of wind farms and the associated converter platforms and submarine cable routes is not expected to have a significant adverse effect on the protected asset fish.

Marine mammals

With regard to the status description and estimation of the protected asset marine mammals, please refer to the statements in Chapter 2.9 of the Baltic Sea Environmental Report on ROP 2021.

Taking into consideration current knowledge, nothing changes in the status assessment and evaluation. Areas O-1 and O-2 are of medium importance for harbour porpoise and seasonally (winter months) of high importance.

For seals, these two areas are of low to at most medium importance; Area O-3 is of low importance. Area O-3 is of medium importance for the harbour porpoise. The seasonally high importance of Areas O-1 and O-2 for the harbour porpoise is due to the fact that they are probably animals of the highly endangered population of the central Baltic Sea.

Significant impacts from the construction of wind turbines in the sites covered by Spatial Development Plan 2023 can be ruled out for the harbour porpoise, harbour seal, and grey seal provided

that noise mitigation measures are taken in the downstream approval procedures, taking into consideration the current state of science and technology in reducing impulsive sound inputs.

Significant impacts of the wind turbines in Areas O-1 to O-3 on marine mammals during the operational phase can also be excluded with certainty based on current knowledge.

Seabirds and resting birds

With regard to the status description and status assessment of the protected asset seabirds and resting birds, please refer to the statements in Chapter 2.9 of the Baltic Sea Environmental Report on ROP 2021.

In addition, current investigations are now available for Areas O-1 and O-2 within the framework of the benchmark assessment and the preliminary investigation of sites. These investigations confirm the already known species composition, its spatial distribution, and the seasonality of the seabird species occurring there. In general, the occurrences of all species show strong intra- and interannual fluctuations. (BIOCONSULT SH, IBL & IFAÖ 2020, BIOCONSULT SH & IFAÖ 2020, 2021a, b).

An update of the "European Red List of Birds" (BIRDLIFE INTERNATIONAL 2017) has not led to any change in the assessment of the criterion conservation status for the areas under consideration.

The construction-, installation-, and operation-related impacts of the wind turbines, converter platforms, and subsea cables on seabirds and resting birds are described in detail in Chapter 4.6 of the Environmental Report on Spatial Development Plan 2020 for the Baltic Sea. They are spatially or temporally limited so that no significant adverse effects are to be expected. Additional, potentially significant impacts compared with Spatial Development Plan 2020 are not currently expected.

Migratory birds

With regard to the status description and status assessment of the protected asset migratory birds, reference is made to the explanations in Chapter 2.10 of the Baltic Sea Environmental Report on ROP 2021. The status assessment of these areas and sites continues to be valid – even against the background of the designations of Spatial Development Plan 2023.

The construction and operation of wind turbines can have various impacts on bird migration and thus migratory birds; these are described in detail in Chapter 4.7.1 of the Baltic Sea Environmental Report on Spatial Development Plan 2020.

With regard to the determination of Area O-2 and Site O-2.2, it is pointed out that an assessment and, if, the designation of measures will be required in the context of the subsequent assessment levels in order to mitigate the potential impacts of a wind farm project implemented on Site O-2.2 on migratory birds. This is in line with official practice and the approach taken in the "Baltic Eagle" project, which is also located in Area O-2.

According to the current state of knowledge, the designations of Spatial Development Plan 2023 for areas and sites do not result in any additional significant impacts. The same applies to subsea cables and platforms.

Bats

For a status description and status assessment of the protected asset bats, please refer to Chapter 2.11 of the Baltic Sea Environmental Report on ROP 2021.

In addition, current findings from the BfN research project "Batmove" (FKZ 3515 821900) are now available (SEEBENS – HOYER et al. 2021). As part of the research project, acoustic data on the occurrence of bat migration was collected at seven stations in the German Baltic Sea. The westernmost station was on the Fehmarn Belt, the easternmost on the Arkona platform. Overall, bat activity was measured at all

stations. The Arkona platform showed the least bat activity. However, the authors point out that at some stations, including the Arkona platform, data were collected only over a short period of time so far. Further survey years are necessary. In addition, the current data sources are not sufficient in order to be able to identify geographical patterns in the sense of potential densification areas over the Baltic Sea. Overall, the BATMOVE research project confirms the current state of knowledge about bat migration over the Baltic Sea. Further investigations are needed in order to be able to describe this in more detail.

Compared with the Baltic Sea Environmental Report on ROP 2021, there have been no fundamental changes in the state of knowledge on the occurrence and intensity of bat migration. According to the current state of knowledge, the estimates in the Baltic Sea Environmental Report on ROP 2021 continue to apply.

The impacts of offshore wind energy projects on bats are described in Chapter 4.8.1 of the Baltic Sea Environmental Report on Spatial Development Plan 2020.

In the BATMOVE research project, the authors estimate that at stations with larger offshore structures, unlike at small buoys, the first signs of exploratory behaviour were recorded on the basis of activity patterns. However, further investigations at suitable locations are required for quantification and more detailed description (SEEBENS-HOYER et al. 2021).

However, according to the current state of knowledge, no additional or other significant impacts are to be expected as a result of Spatial Development Plan 2023.

Air

The SEA has shown that, compared with the statements in the Baltic Sea Environmental Report on ROP 2021, no necessary updates or elaborations of protected asset air are apparent. This applies accordingly to the assessment of environmental impacts on the protected asset. Here, too, please refer to the Baltic Sea Environmental Report on ROP 2021. Overall, the designations of Spatial Development Plan 2023 do not result in any measurable impacts on the protected asset air.

Climate

The SEA has shown that, compared with the statements in the Baltic Sea Environmental Report on ROP 2021, no necessary updates or elaborations of protected asset climate are apparent. This applies accordingly to the assessment of environmental impacts on the protected asset. Here, too, please refer to the Baltic Sea Environmental Report on ROP 2021. Negative impacts on the climate are not expected; on the contrary, the CO_2 savings associated with the development of offshore wind energy can be expected to have positive impacts on the climate in the long term.

Seascape

The SEA has shown that, compared with the statements in the Baltic Sea Environmental Report on ROP 2021, no necessary updates or elaborations of the protected asset seascape considering the compensation measures under BKompV are apparent. This applies accordingly to the assessment of environmental impacts on the protected asset. Here, too, please refer to the Baltic Sea Environmental Report on ROP 2021. Overall, no significant impacts on the protected asset seascape can be assumed.

Cultural heritage and other material assets

With regard to the status description and status assessment of the protected asset cultural heritage and other material assets, please refer to the statements in Chapter 2.16 in the Baltic Sea Environmental Report on ROP 2021.

The SEA for the Spatial Development Plan does not include a systematic survey or assessment of existing underwater cultural heritage. The

same applies to downstream procedures. However, investigations may be carried out or ordered on an *ad hoc* basis.

According to the current state of knowledge, there is thus no reason to fear significant impacts on the protected asset cultural heritage and other material assets.

Humans, including human health

The SEA has shown that, compared with the statements in the Baltic Sea Environmental Report on ROP 2021, no necessary updates or elaborations of protected asset humans are apparent. This applies accordingly to the assessment of environmental impacts on the protected asset. Here, too, please refer to the Baltic Sea Environmental Report on Spatial Development Plan 2020. Overall, no significant impacts on the protected asset “humans” are to be expected.

9.4 Cumulative impacts

In the cumulative assessment of the SEA of Spatial Development Plan 2023, the assessment for the testing ground in the territorial sea of Mecklenburg–Western Pomerania was integrated. Significant cumulative effects resulting from the realisation of the testing ground can be ruled out in consideration of avoidance and mitigation measures. According to the current state of knowledge, no significant cumulative impacts can be identified for the protected asset migratory birds. Here, however, a detailed assessment and, if necessary, ordering of measures must take place within the framework of the concrete approval procedure.

Sediments, benthos and types of biotopes

Significant construction-related cumulative adverse effects on the protected assets sediments, benthos, and biotopes are not to be expected because of the fundamental small-scale nature of the respective effects and the gradual development of the wind farms and the grid connection systems.

Possible cumulative impacts on the sediments, which could also have a direct impact on the protected asset benthos and on specially protected types of biotopes, result from the permanent direct areause of the foundations of the wind energy installations and platforms and from the cable systems laid. According to the precautionary principle, the maximum values resulting from the range of the model wind farm scenarios were used to calculate the proportion of claimed sediments.

Based on this conservative estimate, a maximum of 75.18 ha of area will be claimed for the areas and sites for wind energy use or temporarily adversely affected in the case of interarray cabling. Of this, 0.06 ha or 600 m² is allotted to a converter platform with associated scour protection.

For the subsea cables, this results in a mostly temporary loss of function over an area of around 40.3 ha. Outside the sensitive biotopes, a permanent loss of area and function as a result of the cable systems results exclusively from the crossing structures that become necessary. Based on an area of approx. 750 m² per crossing structure, the direct area use for approx. 45 crossing structures amounts to approx. 3.38 ha. This means that, in total, approx. 118.8 ha of the sediments will be claimed or, in the case of the subsea cables, temporarily adversely affected; this corresponds to a share of approx. 0.27‰ of the total EEZ area.

In addition to direct use, installation foundations, scour protection, and crossing structures lead to an additional supply of hard substrate. As a result, hard substrate-loving species untypical of the site can colonise and exert an influence on the community of natural soft substrates. In addition, artificial substrates can lead to an altered spread of invasive species, among others. These indirect effects can lead to cumulative effects resulting from the construction of several offshore structures or rock fills in crossing areas

of subsea cables and pipelines. However, reliable findings on effects beyond the sites of the wind farms or on the altered connectivity of invasive species are not yet available. Because the (mainly temporary) occupation is below 0.1% of the EEZ area in the cumulative consideration of the grid infrastructure and the wind farm sites, according to current knowledge, no significant adverse effects that lead to a threat to the marine environment with regard to the sediments and the benthos are to be expected – even in the cumulation of indirect effects.

Fish

The wind farms of the Baltic Sea can have an additive effect beyond their immediate location; this becomes particularly relevant as the number of farms increases. The impacts of the OWFs are concentrated on the regular prohibitions of navigation on fishery that have been imposed up to now as well as on the change in habitat and the corresponding interactions.

The general species composition of the fish fauna could change directly because species with different habitat preferences than the established species (e.g. reef dwellers) find more favourable living conditions and occur more frequently.

In the event of a change to the previous navigation regulations for OWFs and the associated exclusion of active fishery in the OWF sites, a reassessment of cumulative effects on fish fauna would be necessary.

Overall, there is a need for research on whether and to what extent cumulative effects of OWFs in the Baltic Sea affect the fish stocks of individual species in the long term.

Marine mammals

Cumulative impacts on marine mammals, especially harbour porpoises, may occur mainly because of noise exposure during the installation of deep foundations. For example, marine mammals can be significantly affected by the fact that – if pile driving is carried out simultaneously at different locations within the EEZ – there is not enough equivalent habitat available to avoid and retreat to.

In order to avoid and mitigate cumulative impacts on the harbour porpoise population in the German EEZ of the Baltic Sea, the orders of the downstream approval procedure shall therefore designate a restriction of the sound exposure of habitats to maximum permitted proportions of the EEZ and nature conservation areas (BMU, 2013).

Seabirds and resting birds

With regard to the cumulative effects on the protected asset seabirds and resting birds, please refer to the statements in Chapter 4.11.4 of the Baltic Sea Environmental Report on ROP 2021 and in Chapter 4.12.4 of the Baltic Sea Environmental Report on Spatial Development Plan 2020.

Migratory birds

For the description and assessment of cumulative effects, please refer to Chapter 4.12.5 of the Baltic Sea Environmental Report on Spatial Development Plan 2020. At the present time, there are no findings to the contrary. The description and assessment of cumulative effects there therefore continue to apply to Spatial Development Plan 2023.

9.5 Result of the nature conservation assessments

Assessment of biotope protection law

In accordance with Section 30, para. 2, sentence 1 BNatSchG, all actions that may cause destruction or other significant adverse effect on the biotopes listed in Section 30, para. 2, sentence 1 BNatSchG are generally prohibited. In accordance with Section 72, para. 2 WindSeeG, Section 30, para. 2, sentence 1 BNatSchG shall be applied to projects under the WindSeeG with the

proviso that a significant adverse effect on biotopes within the meaning of Section 30, para. 2, sentence 1 BNatSchG shall be avoided as far as possible. The direct and permanent use of a biotope protected according to Section 30, para. 2 BNatSchG is generally considered to have a significant adverse effect if it has significant negative impacts on the biotope in question. Following the methodology of LAMBRECHT & TRAUTNER (2007), an adverse effect can be classified as non-significant in individual cases if, taking into consideration all impact factors and considering them cumulatively, various qualitative–functional, quantitative–absolute, and relative criteria are met. Because a detailed assessment is not possible within the framework of the Spatial Development Plan because of the lack of biotope mapping for most areas and sites, please refer to the subordinate planning and approval levels. A detailed description of the interventions to be taken into consideration, which could represent significant adverse effects within the meaning of the BNatSchG, has already been provided in the environmental reports on ROP 2021 and Spatial Development Plan 2020. The statements made there on the occurrence and potential impact of the individual areas and sites for wind turbines and transmission line corridors also remain valid.

In accordance with the investigations carried out, no occurrences of legally protected biotopes are to be expected in Area O-2 or Site O-2.2. With regard to the subsea cables, no statement can be made on the use of specially protected biotopes according to Section 30, para. 2 BNatSchG because of the lack of a reliable scientific basis. An area-wide sediment and biotope mapping of the EEZ, which is currently being carried out, will provide a more reliable assessment basis.

In practice, protected biotopes are usually bypassed in the course of route planning; significant adverse effects are thus generally avoided. In view of the designations of Spatial Development Plan 2023, significant adverse effects on biotopes within the meaning of Section 30, para. 2 BNatSchG are avoided as much as possible so that the requirements of Section 72, para. 2 WindSeeG are met.

Species protection assessment

With regard to the assessment under species protection law, please refer to the statements in Chapter 5 of the Baltic Sea Environmental Report on ROP 2021. In this context, the SEA in the current revision procedure of the Spatial Development Plan was limited to additional or other significant environmental impacts as well as to necessary updates and elaborations according to the tiering required in accordance with Article 5, para. 3, sentence 5–7 WindSeeG as well as Section 39, para. 3, sentence 1–3 UVPG.

At the present time, there are no findings that indicate the realisation of prohibited species under species protection law for the species under consideration. With regard to migratory birds and the designation of Site O-2.2, reference is made to the comments in Chapter 4.8.1 of this SEA. A detailed assessment must be carried out at the downstream audit level.

Assessment under site protection law

With regard to the assessment for the legal framework governing the conservation of natural habits, please refer to the statements in Chapter 6 of the Baltic Sea Environmental Report on ROP 2021. In this context, the SEA in the current revision procedure of the Spatial Development Plan was limited to additional or other significant environmental impacts as well as to necessary updates and elaborations, which are not recognisable with regard to the habitat protection for the EEZ of the Baltic Sea according to the tiering required in accordance with Section 5, para. 3, sentence 5–7 WindSeeG as well as Section 39, para. 3, sentence 1–3 UVPG.

9.6 Transboundary impacts

The present SEA concludes that, as things stand at present, the designations of Spatial Development Plan 2023 do not have significant impacts on the areas of the neighbouring countries bordering the German EEZ of the Baltic Sea.

For the protected assets sediments and water, plankton, benthos, biotopes, seascape, and cultural heritage and other material assets as well as humans, including human health, significant transboundary effects can generally be excluded. In the area of the German Baltic Sea, significant transboundary effects could arise for the highly mobile protected biological assets fish, marine mammals, and seabirds and resting birds as well as migratory birds and bats only if considered cumulatively.

For the protected asset fish and marine mammals as well as seabirds and resting birds, the SEA concludes that, according to the current state of knowledge, no significant transboundary effects on fish are to be expected from the implementation of Spatial Development Plan 2023 because the identifiable and predictable effects are small-scale and temporary in nature. Marine mammals as well as seabirds and resting birds use the areas mainly as migration areas. There is unlikely to be any significant loss of habitat for strictly protected marine and resting bird species. According to the current state of knowledge and taking into consideration impact-reducing and damage-limiting measures, significant transboundary effects can be excluded. For example, the installation of the foundations of wind turbines and platforms is permitted in the specific approval procedure only if effective noise mitigation measures are implemented. Against the background of the special threat of the separate Baltic Sea population of harbour porpoise, intensive monitoring measures are to be carried out as part of enforcement and, if necessary, the noise mitigation measures are to be adapted or the construction work coordinated in order to exclude any cumulative effects.

For migratory birds, the wind turbines and platforms constructed on the sites of Spatial Development Plan 2023 may represent a barrier or a collision risk. The collision risk should be minimised by taking appropriate measures to avoid attraction effects (e.g. through lighting). With regard to the barrier effect, a conclusive cumulative assessment is not possible with the current state of knowledge.

A cumulative assessment of the hazard risk for bat migration is also not possible at this stage because sufficient knowledge of migration routes, migration heights, and migration intensities is still lacking. It can generally be assumed that any significant transboundary effects will be prevented by the designations of the current Spatial Development Plan in the same way that appropriate avoidance or minimisation measures are applied to migratory birds.

9.7 Measures to prevent, reduce and offset significant negative impacts of the Spatial Development Plan on the marine environment

With regard to the measures envisaged to prevent, reduce, and offset any significant negative impacts of Spatial Development Plan 2023 on the marine environment, please refer to the statements in Chapter 8 of the Baltic Sea Environmental Report on Spatial Development Plan 2020 (BSH 2020).

9.8 Examination of reasonable alternatives

In accordance with Art. 5, para. 1, sentence 1 SEA Directive in conjunction with the criteria in Appendix I SEA Directive and Section 40, para. 2, No. 8 UVPG, the environmental report contains a brief description of the reasons for the choice of the reasonable alternatives examined. Essentially, different types of alternatives can be

considered for an examination of reasonable alternatives – in particular strategic, spatial or technical alternatives.

The zero alternative (i.e. not implementing the Spatial Development Plan) is not a reasonable alternative because the development of offshore wind energy is indispensable for achieving the national climate protection goals according to the current state of technology and scientific knowledge in order to avert drastic negative impacts of anthropogenic climate change – also for the state of the marine environment. The importance of achieving the expansion targets is now explicitly stated in Section 1, para. 3 WindSeeG. Accordingly, the construction of offshore wind turbines and offshore grid connection cables is in the overriding public interest and serves public safety (cf also Chapter 3).

The purpose of the introduction of a sectoral plan is the precautionary control of the development of offshore wind energy, which is necessary for climate protection.

A strategic alternative (e.g. with regard to the targets of the federal government on which the planning is based) is not currently being considered for the Spatial Development Plan because the expansion targets of the federal government represent the planning horizon for the current Spatial Development Plan. The expansion targets result from the legal provision in Section 1, para. 2, sentence 1 WindSeeG.

Spatial alternatives are rare in view of the underlying territorial context of ROP 2021 and against the backdrop of the considerably increased expansion targets.

For possible reasonable alternatives in detail, please refer to Chapter 9 of the Baltic Sea Environmental Report on Spatial Development Plan 2020.

9.9 Measures planned for monitoring environmental impacts of implementing the Spatial Development Plan

With regard to the planned monitoring measures, please refer to the statements in Chapter 10 of the Baltic Sea Environmental Report on Spatial Development Plan 2020 (BSH 2020) and Chapter 10 of the Baltic Sea Environmental Report on the maritime spatial plan of the EEZ (BSH 2021).

9.10 Evaluation of the overall plan

In summary, with regard to the planned areas and sites, platforms, and subsea cable routes, the orderly, coordinated overall planning of Spatial Development Plan 2023 will minimise impacts on the marine environment as far as possible. With strict adherence to preventive and mitigation measures, in particular noise mitigation during the construction phase and to protect migratory birds, significant impacts can be avoided through the implementation of the designated areas and sites as well as platforms.

The laying of subsea cables can be designed to be as environmentally friendly as possible by, among other things, avoiding protected areas and biotopes and choosing a minimally disruptive cable laying procedure The planning principle for the increase of sediment temperature should ensure that significant negative impacts of cable heat-up on benthic communities are prevented. Avoiding crossings of subsea cables with each other as far as possible also serves to prevent negative impacts on the marine environment, in particular on the protected assets of sediments, benthos, and the types of biotopes.

Based on the above descriptions and assessments, it must be concluded for the SEA, also with regard to any interactions, that, according to the current state of knowledge and at the comparatively abstract level of sectoral planning, no major impacts on the marine environment within the area of investigation are to be expected as a result of the planned designations. The potential

impacts are frequently small-scale and mostly short-term because they are limited to the construction phase.

Most of the areas and sites lie within the priority areas for wind energy of ROP 2021. Sufficient knowledge is available for these areas. So far, there is a lack of sufficient scientific knowledge and uniform assessment methods for the cumulative assessment of impacts on individual protected assets such as migratory birds and bat migration. Therefore, these impacts cannot be conclusively assessed within the framework of the present SEA or are subject to uncertainties and require more detailed examination within the framework of downstream planning stages.

The routing systems additionally defined in the Site Development Plan-E as well as the expansion of gate O-XIII by 600 m to the north also do not give rise to contrary estimates.

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