9 Non-technical summary (Baltic Sea)

9.1 Brief presentation of contents and the most important objectives of the Maritime Spatial Plan, relationship to other relevant plans and programmes, objectives of environmental protection

9.1.1 Brief presentation of contents and the most important objectives of the regional development plan

The Maritime Spatial Plan at hand specifies for the first time the targets and principles for the development of the German Exclusive Economic Zone (EEZ) on the basis of § 18 a Spatial Planning Act of 18 August 1997 (BGBl. I, p. 2081, 2102), which was last amended through Article 10 of the Act dated 9 December 2006 (BGBl. I p. 2986; in the following: ROG 1998), which still applies under § 29 para. 1 ROG dated 22 December 2008 (BGBl. I p. 2986; in the following: ROG) for procedures regarding the preparation of Maritime Spatial Plans, which were initiated formally before 31 December 2008. The Federal Republic of Germany's EEZ in the Baltic Sea comprises an area of ca. 4,500 km².

The Maritime Spatial Plan at hand concerns an overall spatial plan with spatially-relevant designations for the following areas:

- Commercial use
- Scientific use
- Ensuring the safety and ease of maritime navigation
- Protection of the marine environment

The designation of targets and principles are based on the following developmental requirements:

- The special importance of shipping – as expressed in the United Nations Convention on the Law of the Sea (UNCLOS) – shall also be taken into consideration within the scope of spatial planning. Therefore the recognized sea lanes essential to international navigation as defined by Art. 60 Para. 7 UNCLOS will be defined as the basic structure, which must be kept undisturbed, of the Maritime Spatial Plan. Other uses have to fit into this structure.
- In accordance with the Federal Government's sustainability strategy, the objective of spatial development is to support the development of offshore wind energy use. This comprises the provision of sufficiently dimensioned areas for achievement of the development objectives mentioned in the strategy as well as safeguarding of an orderly conduction of the electricity produced through the sea in offshore wind farms through the sea in the direction of land.
- Uses such as exploitation of non-living resources, laying cables and pipelines as well as research are to be given enough space and security for further development, and at the same time to retain sufficient flexibility for not yet foreseeable future developments. Based on this background, designations will be made for mentioned uses; and for another thing, wide portions of the EEZ will be kept free of designations. For instance, the concerns of the fishing industry – for which a stipulation of spatial categories is not possible on account of the EU's regulatory competence and the lacking definability of fishing grounds – can also be taken into consideration.
- In addition to the professionally planned safeguard of NATURA 2000 areas, a contribution to the protection of the marine environment as a valuable open space for nature shall be made. Special consideration of the marine environment is to be given when other uses formulate demands concerning the marine area.

9.1.2 Relationship to other relevant plans and programmes

The Maritime Spatial Plan for the German EEZ concerns single-stage planning, i.e. it is neither derived from overriding plans nor does it provide specifications for subordinate plan levels. The approval level immediately follows the spatial development planning.

However, it is important to consider other plans and analyses in or adjacent to the analysis area. This particularly applies to the stipulation of two preferred areas for wind energy according to § 3a Marine Facilities Ordinance (SeeAnlV), for which strategic environmental assessments have been carried out and which, after including further concerns and conclusive consideration on the level of spatial planning have been adopted as priority areas in the spatial plan, as also stipulated by § 18 para. 3 sent. 2 ROG 1998.

In addition, coordination processes are indicated with the federal states which have been active in the coastal waters on a regional planning basis. This is the case in the Baltic Sea area for the State of Mecklenburg-Western Pomerania. After revision of the state spatial development plan in May 2005, the State of Mecklenburg-Western Pomerania is now making regional planning statements for the territorial sea. Currently the state development plan of Schleswig-Holstein 2009 is under preparation, which is adressing the coastal sea of Schleswig-Holstein.

9.1.3 Presentation and consideration of environmental protection objectives

Environmental protection objectives provide information on which environmental status will be targeted in the future (environmental quality objectives). Environmental protection objectives can be gathered in an overall display of the international, joint and national conventions or regulations which deal with marine environmental protection and on the basis of which the Federal Republic of Germany has advocated certain principles and obligated itself to objectives. These conventions or regulations serve as a specification for the pending arrangement of the Maritime Spatial Plan and Environmental Report.

Specifications mostly ensue from:

- International conventions on marine environmental protection in which the Federal Republic is a contracting party, e.g. the HELCOM (Helsinki Commission) convention, on the basis of which the “Baltic Sea Action Plan” will be developed.
- Relevant EU directives and specifications particularly FFH-RL (Flora Fauna Habitat Directive; FFH Directive), Vogelschutz-RL (Birds Directive), WRRL (EU Water Framework Directive; WFD), MSRL, GFP (Common Fisheries Policy; CFP) as well as other objectives within the scope of the European Maritime Policy.
- National objectives which particularly ensue from the general outline and the principles of the ROG, the protection and preservation objectives of NATURA 2000 areas in the EEZ as well as the “Federal Government Strategy for the Use of Wind Energy at Sea” within the scope of the Federal Government’s sustainability strategy.

The aforementioned environmental objectives will be taken into consideration in various ways within the Maritime Spatial Plan:

- Definition of guidelines regarding spatial development of the EEZ for implementation of environmental protection objectives
- Source-related regulations for environmental protection with regard to the individual uses
- Textual principles regarding protection and maintenance of marine nature and landscape

Consideration of protected areas according to Habitats- and Bird Directives

9.2 Description and assessment of environmental status

9.2.1 Seabed

The Baltic Sea is an inland sea of the Atlantic Ocean and linked to the North Sea via the Little and Great Belt as well as the Øresund (Sound). The seabed relief is distinguished by its characteristic basin and sill structure. The Baltic Sea basin assumes the function of sedimentation areas with the characteristic silt sediments. However, the sills with their deeply-indented channels are of decisive importance for the Baltic Sea's ecosystem, because they control the water exchange and consequently the complex physical, chemical and biological processes. For instance, 73 % of the entire water exchange between the North Sea and Baltic Sea occurs via the Darss Sill (Cadet Channel).

The deeper underground of the south-western Baltic Sea region is substantially characterised by two main structures, the Baltic Shield and the adjacent south-western Central European or North German-Polish Depression, which are both separated by the large trans-European disturbance system of the Tornquist Zone.

A global climatic deterioration set in about 2.4 or 1.8 million years ago, which culminated in the glaciation cycles of the Pleistocene Epoch and ended ca. 10,000 years ago, accompanied by sea level fluctuations of up to 130 metres with wide-ranging impact on the paleogeographic conditions. The present-day Baltic Sea Depression was formed during the two large glacial advances of the Saale glaciation period. During the last glacial period (Weichsel)the entire Baltic Sea basin was covered by the Scandinavian Ice Sheet, the glaciersof which modelled the Baltic Sea Depression in its present-day form.

The late and post-glacial development of the Baltic Sea is coupled with the global sea-level rise and the isostatic rebound as a consequence of the removal of the weight on the Earth's crust and can be subdivided into four major stages:

- Baltic Glacial Reservoir (up to 10,200 years ago)
- Yoldia Sea (10,200 – 9,300 years ago)
- Ancylus Lake (9,300 – 8,000 years ago), and
- Littorina Sea (8,000 years – today)

Based on the basin and sill arrangement of the Baltic Sea, six sub areas have been demarcated based on geological, geomorphologic and oceanographic criteria:

Kiel Bight is located at the southern exit of the Little and Great Belt in the western Baltic Sea. The Fehmarn Belt and Fehmarn Sound form its eastern boundary. It is a typical firth coast with narrow, deeply-indented inlets. The water depths range from 5 metres on the Stoller Grund to 42 metres in the Vinds Grav Channel near Fehmarn. In view of the sedimentary distribution, the residual sediment deposits in the EEZ are concentrated in the area west of Fehmarn. The sandy areas are to be found particularly in the vicinity of the Great Belt Channel on the relatively level sea bottom at depths of 15 to 18 metres, where sufficiently strong currents form "mega ripples" . Silty sands are prevalent i.e. west of Fehmarn. Mixed sediments appear in the deep channels of

the Great Belt and the Fehmarn Belt. Late glacial sands and banded clays underlie this Holocene sedimentary layer. Thereunder , Saale glacial period till and meltwater sands lie underneath in large parts of Kiel Bight, which in turn usually overlie older Ice Age or Tertiary clays and sands.

The 18 to 24-kilometre wide Fehmarn Belt takes on a special position for the water exchange of the belts with the adjacent eastward Baltic Sea basin, in which the exchange between North Sea and Baltic Sea water occurs mainly via the Great Belt – Fehmarn Belt system. Several mega ripple or “giant ripple” fields in the western Fehmarn Belt are an expression of these prominent hydrodynamic conditions. The giant ripples lie on a continuous layer of residual sediments comprised of stones in varying thickness which reach fist-size.

East of the Fehmarn Belt lies the **Mecklenburg Bight**, which is approximately demarcated along the 20-metre depth line to the Darss Sill and the Fehmarn Belt. Mecklenburg Bight has a maximum water depth of 28 metres. The distribution of surface sediments is characterised through a silt deposit beneath the 20-metre depth line, which becomes gradually sandier along the basin rim. The thickness of the silt in the centre of the basin lies between 5 to 10 metres. Medium-grained to coarse sands will be found along the basin rim. Larger deposits of coarse sand, gravel and residual sediments (stones, blocks) appear in the shallow water zones south of Fehmarn. The geological structure of the Mecklenburg Basin is characterised by the deposits of various Baltic Sea stages, which overlie the till from the last Ice Age.

The **Darss Sill** designates the waters between the Fischland-Darss Peninsula and the Danish islands Falster and Møn. The characteristic element is a submarine terrain ridge comprised of till that runs from the steep bank between Wustrow and Ahrenshoop in the north-westerly direction to Gedser Rev (reef). The furrow system of the Cadet Channel is cut up to 32 metres deep into this ridge. Here till ribs of 1 to 2 metres in height alternate with fine sand and silt areas in irregular succession. A stone and block covering of varying thickness is found in the Cadet Channel and particularly on its edges. Giant or mega ripples with crest distances of approximately 400 metres are observed within the channels. The adjacent north-easterly Falster-Rügen plate features much less relief and little morphological structure – with the exception of the Plantagenet Ground as well as a northerly-situated channel structure in the Arkona Basin. It is mainly covered by fine sand. The thickness of the sands lie between 10 to 50 metres. The geological structure of this sub area essentially consists of three till strata, the surface of which dips into the Arkona Basin west of a line between Darßer Ort – Møn. Above it sandy to silty sediments of various Baltic Sea stages follow.

The **Arkona Basin** is limited against the Falster-Rügen plate by the 40-metre depth line. In the west, the Kriegers Flak elevation extends into the basin. In the northeast, the Arkona Basin is connected with the Bornholm Basin via the Bornholmsgat; in the east, it adjoins to the shoals of the Rønne Bank with the Adlergrund as its western extension. The maximum water depth is more than 50 metres. The sedimentary distribution on the seabed consists almost exclusively of silty sediments. The geological structure consists of two till strata which overlie late and post-Ice Age clays and silts.

Kriegers Flak (also denoted as Møn Bank) is a shoal on the western edge of the Arkona Basin. Its water depths lie between 16 metres in the area of the Danish EEZ and 40 metres on the German side. In morphological terms, the area appears as a sea mount which dives down into the Arkona Basin in the east and south. The distribution of the surface sediments on the seabed is very heterogeneous and features typical sill character. In the German EEZ, the till is distributed in the north-western corner, which on the edges particularly crops out directly on the seabed up to the 25-metre depth line in the south or to the 40-metre depth line in the east. In the

shallower water depths it is prominently covered with stones and blocks (boulders), which in places form wall-like structures. In the south, a band of coarse sand and gravel – which is replaced by sands and clays with increasing water depth – connects with the till. In the east, the sporadically distributed, sand coverings and clays of minor thickness abut directly on the outcropping till. A distinct mussel growth (*Mytilus*) is characteristic in the areas of stone and block deposits.

The **Adlergrund** represents the western extension of the Rønne Bank, which stretches as a shoal from Bornholm in southwesterly direction. As a consequence of its glacial history of formation and the post-glacial transformation, the seabed has a very irregular relief. The water depths range from 5 to 25 metres. In many parts, residual sediments (coarse sand, fine gravel and stones) predominate over outcropping till. The stones are fist-size to head-size, and are found sporadically to extensively in these areas. In addition, blocks (boulders) of several metres in length are prevalent, which are covered with mussels (*Mytilus*) of varying thickness. Marine sands of minor thickness appear sporadically among the residual sediments or as elongate strips. On the northwest rim, the sands pass into the silts of the Arkona Basin. A continual transition into the sandy areas of the Pomeranian Bight and the Oder Bank is to be noted in the south. The geological structure of the Adlergrund is essentially characterised by till compressions, meltwater deposits of sands and gravels as well as chalk cropping out near the seabed, which on account of its glacial-tectonic stress features disturbance zones as well as intermediate layers of sands, gravels or stones.

The adjacent southern sub area of the **Oder Bank** is an elevation with water depths from 7 to about 20 metres. For the most part the seabed is structureless and consists mainly of fine sands. Residual sediments in the form of sporadic stone deposits are particularly found to the north and northeast of the Oder Bank in the Adlergrund Channel. In addition to sporadic stones with a diameter of up to 1 metre, mussel fields which are fist-sized to several square metres as well as smaller ripple fields of coarse sand also appear in the north-western area of the Oder Bank. The geological structure of the Oder Bank features till and Ice Age sands in its core.

The status assessment was made for the aspects “Rarity/Endangerment”, “Diversity / Characteristic” and “Naturalness”. Since the sediment types and soil forms are found throughout the Baltic Sea, though in parts are characteristic for the southwest Baltic Sea, the aspect of “Rarity/Endangerment” will be assessed as medium to slight. In the Baltic Sea EEZ, a high to medium “Diversity/Characteristic” is being found, which is reflected in the form of a heterogeneous sedimentary distribution in combination with distinct morphological conditions as well as heterogeneous sedimentary distribution and deficient soil forms, or homogeneous sedimentary distribution and distinct soil forms. On account of anthropogenic changes, which did not lead to loss of ecological functions, however, a medium “Naturalness” will be assumed.

Pollutants
Pollutants in the soil will be presented in Chapter 9.2.2. together with nutrients and pollutants in the water

9.2.2 Water

Marine physical quantities

The circulation of the Baltic Sea is characterised through the exchange of bodies of water with the North Sea through the belts and the sound. In the area near the surface, brackish Baltic Sea water flows into the North Sea, whereas on the bottom heavy, more saline North Sea water from the Kattegat penetrates into the Baltic Sea. This inflow of salt water is hindered through the

Drogden Sill (sill depth 9 metres) at the southern exit of the sound and the Darss Sill (sill depth 19 metres) east of the Belt Sea. Caused by specific weather situations, sporadic salt water incursions come about, in which high-saline and oxygen-rich water partially penetrates into the eastern, deeper basin of the Baltic Sea. Regarding these inflow events of salt water from the Kattegat into the Baltic Sea, which substantially contribute towards “aeration” of the deeper Baltic Sea basin, large salt water incursions, which transport large quantities of salt water into the Baltic Sea over a period of at least five days are being distinguished from medium-strength inflow events, which occur about 3 – 5 times per winter.

The effects of the offshore wind energy facilities (OWEF) on the flow are slight and locally limited to the close-up range. Since the priority areas “Kriegers Flak” and “Western Adlergrund” lie in the direct dispersion route of the high-saline bottom water, with medium-strength inflow events the underwater constructions of OWEF could lead to an increased mixture of surface and bottom water through increased friction with the flow, and thus to a dilution of bottom water. This then lighter bottom water would stratify somewhat higher in the water column on its route into the deeper basin of the Baltic Sea, and thus contribute less to the oxygen supply of deep water. In the region of the priority areas, the characteristic depth of the upper boundary layer of such medium-strength salt water tongues lies at 25 metres. Therefore, OWEF which will be erected in less depth may have relatively little influence on the salt water transformation of the inflowing water. With salt water incursions the boundary layers can lie much higher, but only insignificant dilution of bottom water can come about on account of the large quantity of salt water. Moreover, a possible influence is only to be expected with a massive development of offshore wind farm projects.

Model studies have shown that the majority of the water flowing in via the Drogden Sill flows clockwise around “Kriegers Flak". Studies conducted with regard to the possible influence of OWEF on salt water inflows in the Arkona Sea show that the area of the Baltic Sea lying in the German EEZ has even lesser significance for the salt water inflows than previously published observations and model results have suggested.

In the Baltic Sea, currents primarily originate through the influence of wind (drift current). If a current drifts onto a coast, gradient currents also come about as a result of the build-up. A third factor is the fresh water runoff of rivers (approximately 480 km^3/year). Considering precipitation and evaporation, this yields a fresh water surplus of 540 km^3/year, which corresponds to approximately 2.5 % of the Baltic Sea water volume. Tidal currents are negligible in the Baltic Sea. In the Fehmarn Belt, observes a net outflow of 8 cm/s on the surface and a net inflow of 7 cm/s on the bottom in the yearly average is being observed. The average velocities here lie on the scale of 30 cm/s on the surface and 16 cm/s on the bottom. In the large basin east of the belts, velocities near the surface lie at 10-18 cm/s and 7-13 cm/s near the bottom.

In the climatological annual course (1961-1990), the highest wind velocities in the Arkona Sea appear in December (with about 19 kn) and then continually decrease to 13 kn up until June. Afterwards the wind velocity again constantly increases until the end of November. In the yearly average, the wind velocity lies at 16.2 kn. This annual course is transferable to the height of the significant wave height of the sea motion. It amounts to nearly 1.4 m in December, decreases by the end of January to ca. 1.1 m and retains this value until mid-March. Then the value constantly decreases by the end of May to 0.7 m. Starting in June, the wave height again continually increases up until December. A fully developed swell comes about only rarely on account of the marginal size and the strong disarticulation of the Baltic Sea. In the Arkona Sea, the percentage of swell in the sea motion only amounts to approximately 4 %.

Water level fluctuations through tides are negligible in the Baltic Sea. The spring tidal range of the half-day tide lies under 10 cm in the area of the German EEZ. The Baltic Sea reacts very quickly to metereorological influences on account of its marginal. Extremely high or low water are primarily caused by the wind. Water levels of over 100 cm above or below mean sea level are designated as storm surge or low tide. In the longstanding average, these extreme water levels lie approximately 110-128 cm above or 115-130 cm below mean sea level. Individual events can lie substantially above these values. In addition to storm surges and low tides, natural oscillations of the Baltic Sea basin (Seiches) cause water level fluctuations on the scale of up to one metre.

In the climatological average, the lowest values in the monthly-averaged surface temperatures appear in February. The summery warming starts in April and reaches its maximum in August. The cooling phase starts in September. At the end of March/beginning of April, the development of a thermal stratification starts, which reaches its maximum in August with temperature differences of up to 12 ℃ between the surface and the bottom. In the course of September the thermal stratification rapidly diminishes; the western Baltic Sea is for the most part vertically homothermous.
The salt content in the western Baltic Sea generally decreases from west to east, whereby the horizontal gradients in the belts and in the sound are particularly distinct. In the longstanding average, the salt content near the surface in the Belt Sea can vary in the course of the year between 10 and 20, whereas values between 6 and 8 will be observed in the eastern Arkona Sea. The 10-isohaline – as an assumed boundary between the low-salinity brackish Baltic Sea water and the more saline water – reaches its most western position in the summer months and its most eastern position in December, when water is pushed from a western direction from the Skagerrak and Kattegat into the western Baltic Sea through the strong winter storms.

Vast parts of the Belt Sea and the deep basin are year-round haline-stratified (water stratification which is brought about through different salt contents), whereas shallow areas such as the Pomeranian Bight are vertically homohaline throughout the year or merely show a very slight stratification. The haline stratification in the Belt Sea and the deep basin intensifies in the spring, and in the summer reaches differences between salt content near the surface and near the bottom of over 10.

The wintry ice formation in the Baltic Sea south of 56°N proceeds irregularly. The icing can go through four characteristic stages of development here, which depend on the severity of the winter, the regional oceanographic conditions and also on the coastal morphology and sea depth.

In moderate ice winters, only the shallow bays – which because of their relatively self-contained location with regard to the sea do not have any appreciable water exchange with the warmer open sea – completely freeze over. To a lesser extent, ice also forms on the outer coasts, particularly before the east coast of Rügen and before Usedom. In strong ice winters, ice forms on the open sea; its degree of coverage on a large scale usually amounts to less than six tenth of the water surface. East of the Darss Sill, ice – in which the degree of coverage mainly amounts to less than six tenth – is only found in a narrow strip beyond the Baltic Sea coast. In very strong ice winters, the Baltic Sea completely freezes over west of Bornholm, and a broad strip of thick to very thick drift ice appears before the Baltic and Swedish coast. It mainly consists of white ice with a thickness of 30-70 cm. In the very rare extremely strong ice winters, a complete ice cover can also form in the sea area between Bornholm and the Baltic coast.

Suspended matter consists of mineral and/or organic material. The organic portion is strongly dependent on the season; the highest values appear during the plankton bloom in early summer.

In the event of stormy weather conditions with high seas, the suspended matter contents in the entire water column strongly increases through the whirling up of ground sediments. In the shallow water areas of the Baltic Sea, the sandy sediment is often covered by a layer of flocculent materials (fluff), which can be very easily resuspended and has a high portion of organic material .

For the German EEZ in the Baltic Sea, the data situation is very inhomogeneous with regard to in-situ measurements, and insufficient for statistically resilient statements. The highest concentrations are observed in the Oder Haff and in the Bodden. In the spring, suspended matter is increasingly introduced into the Pomeranian Bight through the strong fresh water runoffs (snow melt). Since easterly winds dominate in the spring, the suspended matter is mainly transported along the coast in the Arkona Sea. An increased concentration of suspended matter is also visible throughout the year via the Röd-Sand between the southern tip of Falster, the Gedser Odde and the southeast coast of Lolland. It originates primarily through current-related cliff erosion.

Nutrients and pollutants

On the one hand, the mass balance of the Baltic Sea is determined through natural processes and balances, but is also burdened through human activities. Pollutants from agriculture, industrial production and commerce will be transported into the sea via atmosphere and rivers. Wastewater from sewage plants and the direct runoff of surface waters polluted through fertiliser and pesticide leads to an increased input of nutrients, heavy metals and non-natural organic chemicals.

Many of the compounds and elements released and entering into the Baltic Sea have long retention periods in the marine environment. They will only be degraded with difficulty and slowly eliminated from the environment. So they have – intensified through their accumulation in the food chain – a high potential to accumulate in marine organisms and to have a negative effect on their immune system, reproductive ability and metabolism. Since the water exchange in the Baltic Sea takes place much slower than in the North Sea, the retention periods of pollutants are substantially longer here.

In addition to the toxicological aspects of the chemical burden of the marine ecosystem, special importance is attached to the nutrient mass balance of the sea. Nitrate, phosphate and silicate are essential components of the natural mass balance in the sea, without which biological growth is impossible. But inputs from agriculture, household wastewaters, commerce and combustion processes lead to an increased input and thus to an increased primary production; and, as a result of this, to oxygen deficiency and changes in the species spectrum in the adverse case.

A prerequisite for the assessment of the ecological status of the Baltic Sea is a precise as possible knowledge of the spatial and temporal changes of the chemical parameter. On behalf of the BSH, the IOW is implementing monitoring surveys for observation of the hydrographical-chemical status in the Baltic Sea.

Nutrients
Industrialisation has led to a substantial increase of nutrient concentrations in sea water. Eutrophication effects could already be proven along the Baltic Sea coast in the first half of the 20th century . The first signs for the open sea were found in the beginning of the 1960's.

The nutrient concentrations in the surface layer, similar to those in the German Bight, show a typical annual course with high concentrations in the winter and lower concentrations in the summer months. The winter months will be utilised for trend statements.

In the coastal waters, introduced national/international measures (construction of sewage plants, ban on detergent containing phosphate, reduction of fertiliser containing nitrate) make themselves felt. For instance, a substantial decline in phosphate concentrations could be observed in the first half of the 1990's. Unequivocal trends are hard to verify for the nitrogen compounds, which mainly stem from diffuse sources.

In the open Baltic Sea, nutrient trends on shorter time scales are characterised by internal exchange processes. From a longer point of view, however, the nutrient increase by the end of the 1970's can be attributed to human activities (eutrophication).

Oxygen
Oxygen deficits on the seabed level can be an indicator for eutrophication, since they are brought about through the microbial degradation of dead material that consumes oxygen. The limited water exchange with the North Sea, the soil morphology and the permanent haline stratification in the deep water of the central Baltic Sea to a great degree lead to oxygen deficiency and development of hydrogen sulphide at ground level.

The deeper parts of the waters in the western Baltic Sea are regularly characterised in the summer through oxygen deficiency. The intensity of the oxygen depletion in this connection is also influenced through meteorological (temperature, wind) and hydrographical (stratification) factors as well as the amount of nutrient inputs.

The year 2002 attracted attention through extreme oxygen deficiency, especially of the coast of Denmark and Schleswig-Holstein. Hydrogen sulphide, which forms upon complete lack of oxygen, emerged on a widespread basis, with its negative consequences for the soil fauna.

In the deep basins of the Baltic Sea, the salt water incursions from the North Sea necessary for water regeneration and oxygen supply have been appearing less and less since the middle of the 1970's. In the past 25 years, significant inflow events have only been observed in 1983, 1993 and 2003. In between, there were long-lasting stagnation periods with substantial concentrations of hydrogen sulphide in the deep water.

Metals
Although substantial advances have been made in the past decade in waste gas and wastewater purification, even today – above all near the coast, i.e. in spatial proximity to the emitters – metal concentrations which lie substantially above the background values are still being measures. They particularly enter into the marine environment via the rivers and the atmospheric transport. However, emissions at sea through the increasing shipping traffic are also of importance. The deposition of dusts containing heavy metal from the metal smelting in the Lübeck Bay was of historic importance.

The spatial analysis of the metal load in the surface sediment shows special load centres in the Lübeck Bay and less distinct in the Arkona Basin. Up until today, no trend can be recognised in the metal contents of the surface sediments in the western Baltic Sea due to the brevity of the available series of measurements. The metal contents in the fine-grain fraction of the surface sediments were essentially above the background reference values.

The metals cadmium, mercury, lead and zinc show a typical spatial distribution with gradients decreasing from west to east in the surface water of the EEZ. The concentrations of zinc in the Baltic Sea water were substantially above the background reference values. On the other hand, the other elements influenced through human activity show concentrations lying slightly above or in the proximity of the background reference values.

Organic pollutants

The majority of organic pollutants are of anthropogenic origin, i.e. the substances enter into the environment exclusively through human influence. About 2,000 mainly industrially-produced substances are currently seen as environmentally relevant because they are poisonous (toxic) or persistent in the environment and/or can accumulate in the food web (bioaccumulation). Since their application and their use can be extraordinarily varied, and their physical and chemical properties can also be very different, their distribution in the environment is dependent on a multitude of factors. For these reasons the individual pollutants in the sea show very different concentrations and distributions. Despite environmental protection measures taken in the past and the utilisation restriction for many substances, a great number of organic pollutants are still being verified in the Baltic Sea.

Within the scope of its monitoring tasks the IOW has measured ca. 30 organic pollutants in the sea water, in suspended matter and in sediments. The polar compounds such as the hexacyclohexane isomers (HCH isomers) and the modern pesticides (triazines, phenylcarbamides and phenoxyacetic acids) are in the water in substantially higher concentrations than the non-polar “classic” pollutants such as hexachlorobenzene (HCB), DDT, polychlorinated biphenyl (PCB) and polycyclic aromatic hydrocarbon (PAH). The non-polar substances in the water are only found in very slight concentrations (usually < 10 pg/L). The load near the coast is usually greater than in the open Baltic Sea. Most concentrations of pollutants in the Baltic Sea water are located in similar areas such as in the German Bight and North Sea. Somewhat greater concentrations are observed in the Baltic Sea with regard to the DDT group and γ-HCH. The concentrations of α-HCH are even approximately three times as high and those of β-HCH at least ten times as high as in the North Sea. The Oder River can be identified as the regional input source for quite a few pollutants, but the observed concentration gradients are much less than in the Elbe Vane in the German Bight. Due to the lack of stronger local sources, diffuse inputs such as the atmospheric deposition or direct sources in the sea (e.g. PAH inputs through shipping) gain in importance when viewed in relative terns. The PAH substance spectrum indicates combustion residues of fossil fuels (coal, oil, wood) as the source.

No robust trends can be indicated for most pollutants on account of high concentration fluctuations and observation periods that are too short. But a more long-term, clearer decline was determined for α and γ concentrations in the sea water; this decrease can be attributed to application prohibitions for these pesticides. No temporal trend has been recognisable up to now for PAH concentrations; however, there are seasonal differences with highest values in the winter.

The distribution of pollutants in the sediment is mainly influenced through sedimentary properties, whereby the highest concentrations are measured at stations with high silt portions. No trends were able to be determined up to now due to the short monitoring period of less than five years.

According to present-day state of knowledge, there are no direct dangers to the marine ecosystem based on the observed concentrations of most pollutants. An exception is the load

through the TBT (tributyl tin) utilised in ship's paint, whose concentration near the coast partially reaches the biological effect threshold. Furthermore, sea birds can be affected through the oil films from acute oil contaminations (shipping) floating on the water surface. During the evaluation it has to be taken into consideration that the toxicity consideration of individual pollutants is insufficient. On the contrary, the combined effect of the vast number of available pollutants has to be considered; but these effects, perhaps intensified through synergy effects, are for the most part unknown at present.

Radioactive substances (radionuclides)
The radioactive load of the Baltic Sea is characterised through the fallout from the Tschernobyl nuclear power plant accident in 1986. Although the radioactive load of the Baltic Sea is higher than in the North Sea as a result of artificial radionuclides, this does not represent any danger for man and nature according to present-day state of knowledge.

9.2.3 Phytoplankton and zooplankton

Plankton encompasses all organisms which float in the water. Plankton includes plant organisms (phytoplankton) and small animals or developmental stages of the life cycle of marine animals such as eggs and larvae (zooplankton). These mostly very small organisms constitute a fundamental component of the ecosystem. Zooplankton has a pivotal role in the marine ecosystem as a primary consumer of phytoplankton and moreover as the lowest secondary producer within the marine food chain. Bodies of water constitute the habitat of plankton. This is why a precise demarcation of habitats (other than for benthos, for instance) is only very restrictively possible for plankton. In the German EEZ there is a lack of long-term series which could give insights about natural succession, possible species shift as well as changes of abundance (frequency) and the biomass of phytoplankton and zooplankton. From the area of the German EEZ there are only samples from a few stations which have been taken by the IOW since 1979 within the framework of studies for HELCOM.
Eutrophication represents a great endangerment for the marine ecosystem of the Baltic Sea. The concentration of chlorophyll$_a$ in the water, as a measure for the biomass of phytoplankton, gives information about the degree of eutrophication. In view of eutrophication, the following direct effects on phytoplankton can be described:

- Increase of primary production and biomass
- Change of species spectrum
- Increase in the appearance of algal bloom
- Increase of turbidity and reduction of light penetration depth in the water
- Increase in the sedimentation of organic material

The Baltic Sea zooplankton consists of only a few species. Due to the variability in the salinity, a shift in the vertical distribution (submergence) occurs with the communities of the Baltic Sea. With regard to eutrophication, the following indirect effects are described for zooplankton:

- Increase of abundance and biomass
- Change of species spectrum

Based on the current state of knowledge with regard to the occurrence and status of phytoplankton and zooplankton, only very few restricted conclusions can be drawn concerning the status in the German EEZ:

Changes in the entire Baltic Sea ecosystem are to be noted:

- Slow changes after the beginning of the 1980's, even erratic change after 1987/88

Changes of phytoplankton in the western Baltic Sea:

- Increase of dinoflagellata
- Decrease of diatoms
- Increase of phytoplankton biomass
- Aperiodic and unpredictable appearance of toxic algal bloom
- Introduction of non-indigenous species
- Increase in the appearance of algal bloom

Changes of zooplanktons in the western Baltic Sea:

- The species composition has changed
- The number of non-indigenous species has increased
- Many non-indigenous species have already become established
- Many area-typical species have declined, among them such which belong to the natural food resources of the marine ecosystem
- The dominance conditions within the zooplankton group have changed

The changes of phytoplankton and zooplankton are connected with the changes of the entire Baltic Sea ecosystem.

9.2.4 Benthos and biotope types

Benthos encompasses the community living on the substrate surfaces or in soft substrates on the bottom of waters, whereby the animals which mainly reside in (endofauna) or on the bottom (epifauna) are described as zoobenthos.

Various records exist for the German Baltic Sea regarding description of macrozoobenthic communities. Gathering the flora and fauna living on the bottom of the Baltic Sea was started as early as the middle of the 19th century.

The invertebrate animals living on the bottom of the Baltic Sea consist first of all of marine immigrants from the North Sea area, of brackish water species and glacial relicts
. The salt content is the determining factor for the occurrence and distribution of benthos species. The majority of species consist of marine euryhalines (euryhaline: species tolerate great fluctuations of salt content) species which variously penetrate far into the Baltic Sea in dependence of their tolerance to diminishing salt content. For instance, the marine species diminish from the Belt Sea in the direction of the central and eastern Baltic Sea in favour of brackish and limnetic species, and reach their eastern distribution limit in the area of the Arkona Basin. Since the marine euryhaline species will not be replaced to the same extent through fresh water species, a decrease in the number of species is the consequence.

The statements concerning the total number of benthic species occurring in the German Baltic Sea area vary quite strongly, one registering 383 benthic species, but a total of 156 taxa have been previously verified since 1991 at 6 stations in the Baltic Sea (Kiel and Mecklenburg Bight, Arkona Sea). Of these taxa, however, 30-40 % (ca. 47-63 taxa) appear only occasionally. Other records list a total of 719 macrofauna taxa. A total of over 240 macrobenthos species have been verified in the Mecklenburg Bight. The dominant systematic main groups were the Polychaeta (71 taxa), Crustacea (57 taxa) and Mollusca (50 taxa). According to literature 126 taxa have been verified in the Arkona Sea up to now. However, a total of 113 different taxa have been verified in the “Western Adlergrund” priority area for wind energy and in the “Kriegers Flak” suitable area 83 taxa have been verified through the environmental compatibility studies of the individual procedures.

A community dominated by *Macoma balthica* and a deep water community from type *Abra alba/Arctica islandica* appear in the Kiel Bight. In the Mecklenburg Bight, the demarcation of communities is directly coupled with the depth zonation (salt, temperature and sediments). Three essential communities (*Mya-arenaria-Pygospio-elegans* coenosis, *Abra-alba-Arctica-islandica* coenosis and *Mysella-bidentata-Astarte-borealis* coenosis) were able to be characterised.
In the Arkona Sea, two communities were able to be named in the “Kriegers Flak” priority area for wind energy.
The first community settles in the shallow areas (up to 30 m water depth). The polychaet Travisia *forbesii*, the mussel *Mya arenaria*, the snail *Hydrobia ulvae* and the amphipod *Bathyporeia pilosa* are typical representatives of the community here.
The second community settles in the deeper areas (30- 40 m) and encompasses cold-water-loving species such as the mussel *Astarte borealis*, the glacial relict amphipods *Monoporeia affinis* and *Pontoporeia femorata*, the relict isopod *Saduria entomon* and the polychaet *Terebellides stroemi*.
On the other hand, three communities were able to be identified in the “Western Adlergrund” wind energy priority area.
Community A: dominated by the blue mussel *Mytilus edulis* and elements of its typical concomitant fauna (e.g. *Gammarus* spp., *Microdeutopus gryllotalpa*, *Jaera albifrons*). Community B: dominated by Oligochaeta, *Pygospio elegans* and *Hydrobia ulvae*. Community C: community of silk-rich soft bottoms below the halocline. Amongst other things, characteristic species are *Scoloplos armiger*, *Halicryptus spinulosus*, *Pontoporeia femorata*, *Diastylis rathkei*, *Ampharete* spp. and *Terebellides stroemi*.

With regard to the endangerment of macrozoobenthos, it is to be stated that 66 species of endangered species are listed in the “Red List and Species List of Benthic Invertebrate Animals in the German Sea and Coastal Area of the Baltic Sea”. According to the current state of knowledge, the German Baltic Sea EEZ has 38 Red List.

In the “List of Germany’s Biotope Types”, the Baltic Sea benthal is divided into the sedimentary areas below the 20-metre depth line and the abrasion areas above 20 metres.

Moreover, the biotope types – 1110 “Sandbanks” and 1170 “Reefs” – to be protected according to EU law have been identified in the German EEZ of the Baltic Sea. Their conservation value has been taken into consideration through the FFH regional reports “Fehmarn Belt” (DE 1332-301), “Cadet Channel” (DE 1339-301), “Western Rönne Bank” (DE 1249-301), “Adlergrund” (DE 1251-301) and “Pomeranian Bight with Oder Bank” (DE 1652-301).

Based on the current state of knowledge, it is to be stated in summary that the macrozoobenthos of the German Baltic Sea EEZ is to be regarded as average with regard to the utilised criteria Rarity and Endangerment as well as Diversity and Characteristic. This assessment is supported by the fact that a total of 66 endangered species are listed in the “Red List and Species List of Benthic Invertebrate Animals in the German Sea and Coastal Area of the Baltic Sea. The 66 species represent over 17 % of the total population size. According to the current state of knowledge, the German Baltic Sea EEZ has 38 Red List. A species list for the entire EEZ is not available at the moment. However, several studies provide references concerning the species diversity. Based on these studies, more than 200 species are estimated, so that the percentage of Red List species in the EEZ will lie in the above mentioned value. The species inventory of the Baltic Sea EEZ with its ca. 200 macrozoobenthos species is to be regarded as average, because a checklist lists a total of 719 taxa for the Kiel Bight alone. For the most part, the benthos communities also show no special features. With greater salinities, as they still prevail in

the deeper horizons (from ca. 20 m) of the German Belt Sea, the prerequisites are given for a relatively species-rich *Abra-alba* coenosis: the nomenclature is accompanied by white furrow shell (*Abra alba*), basket shell (*Corbula gibba*), Icelandic cyprine (*Arctica islandica*), trumpet worm (*Lagis koreni*), polychaet *Nephtys* species, the crustacean *Diastylis rathkei* or the common brittle star (*Ophiura albida*). On top of that there is also a series of further marine euryhaline polychaetes, crustaceans and mussels. In the actual Baltic Sea, the *Macom-balthica* coenosis predominates under saline-related species decline in the shallower regions.
With regard to the criterion “Naturalness”, it is to be stated that the benthos deviates from its original status on account of preloads (eutrophication, pollutant discharge and fishing industry). Especially to be emphasised in this connection are the destruction of the ground surface through intensive fishing activity, which causes a shift from long-lived species (mussels) to short-lived rapidly reproducing species. This is why today neither the species composition nor the zoobenthos biomass corresponds to the status which would be expected without human uses.

In summary, it is to be stated that the Baltic Sea EEZ has no outstanding significance with regard to the species inventory of benthos organisms. The identified benthos communities also do not show any extensive special features. Application of the Baltic Sea succession shows that the benthological status of the Baltic Sea has deteriorated by at least one level from 1932 to 1989. However, the individual steps in this succession model are also reversible if the conditions change as a result of environmental improvements.

9.2.5 Fishes

Fishes represent the most well-known group of marina fauna, and populate the seas from the surface down into the deep-sea trenches, where they have adapted to the respective prevailing habitat conditions.
The salt content plays an important role in the distribution of fish species. In addition, the sedimentary conditions for fish colonisation. Since the German sea areas of the Baltic Sea are located in the transition area between the Belt Sea (characterised by the North Sea) and the central Baltic Sea (actually dominated by brackish water), the German Baltic Sea can first of all be basically separated into the “western Baltic Sea” (which stretches eastward to Cadet Channel/Darss Sill) and the “central Baltic Sea” (which is located eastward).

In a comprehensive and up-to-date overview, 151 species are listed for the entire German Baltic Sea coast. The reference area encompasses the Baltic Sea coasts of Schleswig-Holstein and Mecklenburg-Western Pomerania, externally limited by the middle line established with the neighbouring countries. The documentation includes all species from our Baltic Sea area for which an established identification in the scientific sense has been made, even if merely in a single publication.

A regional classification of fish communities is contingent on various environmental parameters. For instance, the availability of food and hydrographical parameters such as water temperature and salinity play an important role in the survival and reproduction of many fish species. In the Baltic Sea, the distribution of fishes is contingent on the salt content; whereby this diminishes in the direction east and north. This leads to the fact that the number of species as well as the numerical abundance of marine fishes declines towards from the west to the east and north. This especially applies to the marine fishes. The fresh-water species have their maximum in the coastal waters of the middle Baltic Sea. Whereas 120 marine fish species are indigenous in the North Sea, one still finds 70 species in the Kiel and Mecklenburg Bight, 40 to 50 species in the southern and middle Baltic Sea, and 20 species in the Aland Sea, in the Gulf of Finland and in the Bothnian Sea. The fish community of the German Baltic Sea EEZ is separated into the community of the western and eastern EEZ for these reasons.

The current state of knowledge concerning the fish stocks if the EEZ is marginal. At present, there are only a few studies which have undertaken a priority sampling in the EEZ. This concerns current as well as current studies which have been conducted within the scope of environmental compatibility studies (ECS) for the wind farm project planned in the area of the EEZ.
In the western EEZ, 29 fish species could be verified currently; and in the eastern EEZ 51 fish species. The currently verified number of fish species for the entire EEZ amounts to 58.

With regard to the endangerment of Baltic Sea fishes, it is to be stated that only about 30 % of the species constantly found in the Baltic Sea (without wandering species) have been classified as endangered according to the Red List status . In the western EEZ, three species have a Red List status. Two species are listed in the Red List. This concerns the sea trout (*Salmo trutta*), which is regarded as highly endangered (Cat. 2), and the lumpfish (*Cyclopterus lumpus*), which is amongst the species with geographical restriction Cat. R). European bullhead (*Cottus gobio*) is regarded as highly endangered (Cat. 2). In the eastern EEZ, a total of 11 Red List species could be verified accordingly According to the Red List, the Atlantic salmon (*Salmo salar*) is threatened with extinction (Cat. 1). The red herring (*Alosa fallax*), the burbot (*Lota lota*) and the sea trout (*Salmo trutta*) are highly endangered (Cat. 2). The European eel (*Anguilla anguilla*), whitefish (*Coregonus maraena*), striped sea snail (*Liparis liparis*), sea stickleback (*Spinachia spinachia*) and the broad-nosed pipefish (*Syngnathus typhle*) are regarded as endangered (Cat. 3). The whitefish (*Cyclopterus lumpus*) is amongst the species with geographical restriction. Two of the nine Red List species are listed in Annexe II of the FFH Directive. This concerns the red herring (*Alosa fallax*) and the Atlantic salmon (*Salmo salar*), which has the status as a FFH species in the inland area. The highly endangered (Cat. 2) river lamprey (*Lampetra fluviatilis*) has been identified as another Annexe II species.

A separation into the regions West and East EEZ is made with the status assessment of the EEZ fish fauna.
The criteria which have already been proven in the environmental impact assessments relating to the offshore wind energy farm projects in the Baltic Sea and North Sea EEZ will be cited for assessment of fish communities. This concerns the criteria such as rarity and endangerment, regional or national importance, diversity and characteristic as well as naturalness.

Based on the available data, it is to be stated that the fish fauna of the western EEZ of the German Baltic Sea is characterised through the occurrence of three Red List species (sea trout, lumpfish and European bullhead), and is thus to be classified as average with regard to the criterion “rarity and endangerment”.

The fish fauna of the western Baltic sea can be classified according to the preferred habitat in the pelagic and benthic fish community. Sandy ground areas predominate in the western EEZ. Stony ground areas, which have special regional importance, are available in places (e.g. western Fehmarn). In summary, it can be said that the status of the fish community in the western EEZ is assessed as marginal to average on account of the data base at hand with regard to the criterion ‘regional or national importance’. This assessment can be justified due to the fact that on the one hand the described fish species communities in the southern Baltic Sea are also to be found in other locations, and that on the other hand regional diversely-structured areas with stony grounds occur, which offer a habitat for quite varying fish species.

The diversity of fish stocks is best expressed through the number of species, and the characteristic of an area is connected with the composition of the species association. The importance of the number of species can only be assessed in comparison with other studies. A

total of 151 fish species have been verified in the Baltic Sea and the Bodden; 29 currently found species can be assumed for the open Baltic Sea In the course of the past 28 years some registered 63 fish species in the German region of the Baltic Sea. In the western Baltic Sea, a total of 29 fish species have been verified in the EEZ area through current studies. Under consideration of the aforementioned assumption, the number of species found is to be classified as average. According to the data situation up to now, the habitat-typical fish communities are available in the western EEZ. The pelagic fish community represented by herring, sprat and sea trout have also been verified, as well as the demersal (living on the seabed) fish community consisting of large fish species such as cod, plaice, flounder and dab. Various small fish species such as groundlings and sand eels were also able to be verified. On account of the habitat-typical fish communities, the characteristic has an average importance.

The naturalness of fish stocks in the western EEZ is characterised by human activities, particularly the fishing industry. Due to the relatively typical species composition in the western EEZ, with altered stock composition of individual species, the “naturalness” of the stock has an average importance on the whole. It must be considered that the preload in the western EEZ is similar in all Baltic Sea regions as a result of the fishing situation.

The data situation up to now shows that the eastern EEZ is characterised through the occurrence of the FFH species red herring, river lamprey (*Lampetra fluviatilis*) and Atlantic salmon (*Salmo salar*, FFH status in the inland area). The salmon is abundant, the red herring rare and the river lamprey regularly appears in the Baltic Sea. Moreover, the highly endangered (Cat. 2) species sea trout and burbot have been frequently or rarely verified. Based on the occurrence of three FFH species, the fish community of the eastern EEZ has an above-average importance with regard to the criterion rarity/endangerment.
With regard to the criterion regional or national importance, the status of the fish community in the eastern EEZ is assessed as marginal to average. This assessment can be justified due to the fact that on the one hand the described fish species communities in the southern Baltic Sea are also to be found at other locations, and that on the other hand regional diversely-structured areas with stony grounds (e.g. in the Arkona Basin) occur, which offer a habitat for quite varying fish species.

The diversity of fish stocks (51 fish species) in comparison with the 29 species currently found in the open Baltic Sea and the 36 fish species which are constantly found in the middle Baltic Sea is to be classified as high. According to the data situation up to now, the habitat-typical fish communities in the eastern EEZ are available. The pelagic fish community represented by herring, sprat, salmon and sea trout have also been verified, as well as the demersal fish community consisting of large fish species such as cod, plaice, founder and dab. Various small fish species such as groundlings and sand eels were also verified. On account of the habitat-typical fish communities, the characteristic has an average importance.

The naturalness of fish stocks in the eastern EEZ is characterised by human activities, particularly the fishing industry. Due to the relatively typical species composition in the eastern EEZ, with altered stock composition of individual species, the “naturalness” of the stock has an average importance on the whole. It must be considered that the preload in the eastern EEZ is similar in all Baltic Sea regions as a result of the fishing situation.

9.2.6 Marine mammals

Three species of marine mammals are regularly found in the German Baltic Sea EEZ: harbour porpoises, grey seals and common seals. The two seal species have their lying & breeding places on islands and sandbanks in the region of coastal waters. As a result of their

high mobility, marine mammals are able to undertake long migrations in search of food, and thus to pursue their prey organisms (e.g. schools of fish) through large sea areas. The high mobility in dependence of the special conditions of the marine environment leads to a high spatial and temporal variability in the occurrence of marine mammals.

Based on the vast number of study programmes which have been conducted in the past years, particularly in German waters, the data situation with regard to marine mammals has substantially improved: MINOS, MINOS+, studies regarding the stipulation of sanctuaries, studies within the scope of ECS for offshore wind energy farms and procedures for stipulation of special suitability areas for wind energy.

The previous knowledge with regard to the occurrence and the status of the harbour porpoise population in the Baltic Sea can be summarised as follows:

- The population in the Baltic Sea has strongly declined in the past decades, mainly as a result of by-catch, decimation of fish stocks and food limitation
- There are no long-term data series in order to be able to estimate the trend development
- The abundance of north European populations has remained relatively stable in the period 1994 to 2005
- The population of German Baltic Sea waters shows seasonal distribution patterns; however, these are weaker than in the North Sea
- Distribution patterns are spatially as well as temporally not predictable
- Changes in the marine ecosystem have an effect on the population

Threats for the population originate from a series of anthropogenic activities:

- Fishing industry, through by-catch and decimation of fish stocks
- Marine environmental pollution, through introduction of organic and inorganic pollutants, oil inputs
- Eutrophication, through introduction of nutrients
- Shipping, mainly through acoustic emissions and collision danger
- Sonic emissions from other sources, such as research activities, military, construction activities

Threats for the population also originate from:

- Diseases (bacterial or viral origin)
- Climatic changes (impact on the marine food chain)

According to the state of knowledge, the following applies to the region of German waters:

- Abundance and distribution vary on an intraannual and interannual basis
- Seasonal distribution patterns are evident
- Seasonal variation in abundance appears
- Based on abundance and distribution patterns, use or importance of various sub-territories can be estimated as follows:
  - Sub-territory Kiel Bight: medium to high importance
  - Sub-territory Mecklenburg Bight: overall medium importance
  - Sub-territory Rügen: medium importance; partially high importance in the Oder Bank area
  - Sub-areas “Kriegers Flak” and “Westlich Adlergrund”: only marginal importance according to the current state of knowledge
- By-catch represents the main endangerment
- Sonic emissions through anthropogenic activities represent a potential endangerment, which can be reduced through sound minimising measures

Changes in the populations of marine mammals are linked with changes in the entire ecosystem of the Baltic Sea. Anthropogenic activities and climate change influence these changes in addition to the natural variability.

9.2.7 Seabirds

In the German waters of the Baltic Sea as well as in coastal waters and in the EEZ, 38 sea birds and waterfowl are regularly found. Of these, 20 species also regularly occur in larger populations as resting birds in the EEZ area. Quite a few areas of the German Baltic Sea waters have not only a national, but also considerable international importance for sea birds and waterfowl. For instance, the Pomeranian Bight, the Oder Bank and the Adlergrund are amongst the ten most important habitats for sea birds in the Baltic Sea. The IBA [Important Bird Area] region “Pomeranian Bight” and the VRL [EU Birds Directive] “SPA Pomeranian Bight” are to be particularly mentioned in this connection. In general, extensively shallow areas with water depths up to 20 metres and abundant food supply offer ideal conditions for sea birds to rest and overwinter. In particular, these rest areas are of importance if the populations shift further westward in search of food in the winter on account of ice formation or ice cover in the eastern Baltic Sea.

Based on the vast number of study programmes which have been conducted in the past years, particularly in German waters, the data situation with regard to sea birds and resting birds has substantially improved: MINOS, MINOS+, studies regarding the stipulation of sanctuaries, studies within the scope of ECS for offshore wind energy farms and procedures for stipulation of special suitability areas for wind energy.

The following valuable sea bird species according to Annexe I VRL are found in the German EEZ: red-throated diver (*Gavia stellata*), black-throated diver (*G. arctica*), Slavonian grebe (*Podiceps auritus*), little gull (*Larus minutus*), sandwich tern (*Sterna sandvicensis*), arctic tern (*S. paradisaea*), common tern (*S. hirundo*), black tern (*Chlidonias niger*). Sea ducks constitute the possibly most abundant and numerous bird group in the waters of the Baltic Sea.

In summary, the occurrence of resting birds in the German waters of the Baltic Sea can be described as follows:

- The most abundant sea ducks (common eider, long-tailed duck, common scoter and velvet scoter) clearly prefer areas near the coast with marginal water depths as well as shallow grounds in the offshore area such as the Adlergrund and the Oder Bank.
- Great crested grebe and red-breasted merganser also spend time in the areas near the coast; however, common guillemot and Slavonian grebe prefer the offshore areas of the German Baltic Sea.
- The herring gull is the most abundant sea gull species found in the German Baltic Sea
- Herring gulls frequently concentrate in areas with fishing industry activities
- Terns almost exclusively utilise Bodden waters and inland lakes in search of food
- Terns appear rather sporadically in the offshore area

The previous findings in relation to the occurrence of resting birds and sea birds which are also found in the western Baltic Sea or in the German EEZ can be summarised as follows:

- The populations show species-specific, seasonal distribution patterns
- Abundance fluctuations appear on an intraannual as well as interannual basis
- Distribution patterns of populations are spatially and temporally not predictable

Endangered species or species particularly worthy of protection occur regionally in varying distributio

Changes of the populations of sea birds and resting birds are linked with changes in the entire ecosystem of the Baltic Sea. Endangerments for the populations of sea birds and resting birds originate from a series of anthropogenic activities:

- Fishing industry: directly through haul in the nets or indirectly through decimation of fish stocks
- Eutrophication: indirectly via the marine food chain
- Marine environmental pollution: indirectly via accumulations of organic and inorganic pollutants in the marine food chain
- Oil pollution represents a serious endangerment for resting birds and sea birds
- Shipping: disturbance mainly through speedboats and hydrofoils
- Getting caught in or swallowing waste
- Construction activities: directly through shipping and indirectly via disturbances of the marine food chain
- Structures such as wind energy facilities: directly through disturbance effect with loss of habitat and collision danger

Threats for the populations also originate from:

- Diseases (bacterial or viral origin)
- Climatic changes: indirectly via impact on the marine food chain

The previous findings in relation to the use and importance of the sub-areas of the German EEZ in the Baltic Sea for sea birds and resting birds can be summarised as follows:

SPA "Pomeranian Bight":

- High importance as a food, overwintering, moulting and permigration and rest habitat for the species found there according to Annexe I VRL, in particular the red-throated diver, black-throated diver, Slavonian grebe, little gull, common tern and arctic tern
- High importance for the regularly occurring migratory bird species, in particular for the red-necked grebe, long-tailed duck, common scoter, velvet scoter, common gull, herring gull, common guillemot, razorbill and black guillemot

Sub-area Adlergrund:

- Medium to high importance as a food and resting habitat for benthos-eating sea ducks
- High importance as a food and resting habitat for black guillemot and velvet scoters
- High importance as an escape-resting habitat for sea ducks in severe ice winters
- Frequent occurrence of endangered species and species particularly worth protecting
- Medium to intensive use of sub-areas through fishing industry and shipping
- The sea bird community is subject to the natural or anthropogenic-caused changes of the Baltic Sea.

Sub-area Westlich Adlergrund:

- Marginal to medium importance as a food and resting habitat for species living near the coast
- Medium importance as a food and resting habitat for ocean-going birds and scavenging sea birds
- Medium importance for diving sea ducks
- No importance as a food and resting habitat for brooding birds
- Medium occurrence of endangered species and species particularly worth protecting
- Medium use of sub-areas through fishing industry and shipping

The sea bird community is subject to the natural or anthropogenic-caused changes of the Baltic Sea.

Sub-area Kriegers Flak:

- Marginal importance as a food and resting habitat for ocean-going bird species and typical scavenging sea birds
- No importance as a food and resting habitat for species living near the coast
- Marginal occurrence of endangered species and species particularly worth protecting
- Medium use of the sub-areas through fishing industry and shipping
- The sea bird community is subject to the natural or anthropogenic-caused changes of the Baltic Sea.

9.2.8 Migratory birds

A bird migration is usually described as the periodic migrations between the breeding area and a separate out-of-breeding-season residence area in which birds of higher latitudes normally maintain the winter quarters. Since the bird migration takes place annually, it is also called annual migration.

Systematic studies of bird migration have a long tradition in the Baltic Sea region. Studies began as early as 1901 at the former Rossitten ornithological station on the Curonian Spit. In Falsterbo at the southern tip of Sweden, the bird migration has been observed and the banding of birds passing through has been performed since 1972. More than 1,000 publications on the bird migration in the western Baltic Sea have emerged as a result of many years of research activities. There is hardly any long-term data regarding migratory activities on the open sea. For a long time the lightship (a lighthouse on a ship) in the Fehmarn Belt – from which the migration of sea birds over the sea was systematically observed (from 1.9.1956 to 31.5.1957) represented an exception. Since 2002 the Institute for Applied Ecology Ltd. (IfAÖ) has been studying the visible bird migration in the German portion of the Baltic Sea within the scope of approval procedures for offshore wind farms and BMU research projects (FKZ 0329948). On a parallel basis, the bird migration up to an altitude of 1,000 metres has been quantified by means of vertical radar (in the meantime > 600 observation days).

About a billion birds annually pass through the western Baltic Sea in the autumn. In the spring, there are substantially fewer (200-300 million) on account of the high mortality of young birds in their first winter. More than 95 % of these birds are terrestrial small birds (Passeriformes). About 200 bird species are annually involved in bird migratory events in the western Baltic Sea. In addition, there are another 100 rare species and accidental species.

In view of the spatial distribution of migratory bird events over the Baltic Sea, a broad front migration is generally assumed with nocturnal migrants, whereby the main migratory direction in the autumn is southwest. Nocturnal migrants represent more than half of all migratory birds in the western Baltic Sea (long-range and short-range migrants). Amongst the distinct nocturnal migrants are above all insectivorous small birds such as typical warblers, leaf warblers, Old World flycatchers, northern wheatears (*Oenanthe oenanthe*) and European robins (*Erithacus rubecula*), but also threshes.
The migratory distribution of diurnal migrants is distinctly species-specific. For instance, most water bird species from west Siberia cross the region in an east-west direction (e.g. geese, sea ducks, stints and divers). Scandinavian populations migrate in a north-south direction (field geese, dabbling ducks, mergansers, sandpipers). There are three known main routes for diurnal migrating waterfowl through the western Baltic Sea:

- Along the Swedish coast (main route of most common eiders, barnacle and Brent geese)
- Along the German coast (main route of most common scoters, as well as many divers and terns)
- In a north-south direction (swans, field geese, dabbling ducks, mergansers)

The common cranes (*Grus grus*) of northern Europe utilise various migratory routes. In particular, the Scandinavian birds which cross the Baltic Sea on the migration are of interest for the western Baltic Sea. Scandinavian common cranes reach their resting areas in the region of the Western Pomeranian Bodden waters on two migratory routes: from Finland, partially along the southern Baltic Sea coast; and from Sweden, by means of a non-stop flight of 1-2 hours duration across the Arkona Basin.
The majority of diurnal migrating predatory birds of Swedish populations in the autumn follows the “bird flight path” via Falsterbo, thus one part crossing the Baltic Sea in a north-south direction (partially species-specific, e.g. rough-legged buzzard).
Many land bird species migrate in the day. In addition to the already described predatory birds, these are pigeons and songbirds. Amongst the songbirds, short-range migrants particularly belong to the diurnal migrants (especially granivores such as finches and buntings; but also pipits, wagtails, titmouse and crows). As pure diurnal migrants, swallows constitute an exception amongst the long-range migrants. In relation to the western Baltic Sea, the Swedish and partially also Finnish breeding birds are relevant in this connection.

The migration of diurnal migrating land birds in the western Baltic Sea follows two ground rules:

- Many diurnal migrants prefer the crossing of the Baltic Sea in the region of Danish islands.
- Diurnal migrants avoid the crossing of the Arkona Sea during the day in lower altitude (< 100 m). They either migrate in very great altitudes (e.g. chaffinch > 1,000 m; IfAÖ own observations) or partially also at night (e.g. skylark, starling, brambling).

The migratory altitudes differ amongst taxonomic groups, the time of day and the method-related ability to record the migratory event or migratory altitude. For instance, sea ducks frequently migrate in altitudes < 50 m. On the other hand, wading birds usually prefer to migrate at great altitudes, with a mean migratory altitude of ca. 2,000 m. Flight altitudes of 200 – 700 m have been measured with common cranes in the spring. But the migratory altitude distribution can differ strongly between individual nights, however, and is apparently strongly influenced by current weather situation, wind direction and strength as well as cloud altitude and stratification).

There are seasonal differences with regard to migratory intensity. High migratory intensities have been measured for land birds at Darßer Ort from March to May and in September/October by means of vertical radar. The migratory intensity varies quite strongly from day to day within the main migratory periods. The cause of these variations is differences in the weather conditions, whereby the wind conditions often play the decisive role.

For assessment of the status of bird migration, evaluation criteria will be applied, which have already been proven in the environmental impact assessments regarding offshore wind energy projects in the EEZ of the North Sea and Baltic Sea:

- Guidelines and concentration areas
- Migratory events and their intensity
- Number of species; the endangerment status of the involved species is to be included

In summary, the following is to be stated according to the current state of knowledge:

1. Guidelines and concentration areas
   The nocturnal migration occurs on a broad front, without determinable gradients of migratory intensities. Concentration areas and guidelines of bird migration are given with diurnal migrants in the western Baltic Sea. Thermal soaring birds (and other diurnal migrating land birds such as wood pigeons) preferably migrate along the “bird flight path”

(islands Fehmarn, Falster, Møn and Seeland; Falsterbo). East of this main route, these birds migrate in much lower density.

2. Migratory events and their intensity

- Up to a billion birds migrate annually across the Baltic Sea.
- For sea ducks and geese from northern Europe and Russia (up to western Siberia), the Baltic Sea is an important permigration area, whereby a majority of migratory events in the autumn occurs near the coast in an east-west direction.
- The western Baltic Sea has an above-average importance for the crane migration, since the majority of the biographic population inevitably has to cross the Baltic Sea on its way to the south.
- A total of up to 50,000 Scandinavian predatory birds migrate southward across the Baltic Sea via Falsterbo.
- The Baltic Sea is of above-average importance for the migration of land birds on account of the very high numerical abundances.

3. Number of species and endangerment status of involved species

- Anthropogenic factors contribute in a variety of ways towards endangerment of migratory birds. The substantial mortality of migratory birds results from active hunting and collisions with anthropogenic structures (especially high structures), which particularly applies to nocturnal migrants.
- The land migrants migrate with many species, whereby the endangered species have a high percentage.
- On the whole, the German Baltic Sea EEZ is of average to above-average importance for migrating waterfowl. This ensues from the fact that there are two main routes along the Swedish and German coast in the western Baltic Sea for the diurnal migrating waterfowl and the German EEZ lies at least on the boundary of the coastal migratory emphasis along the Mecklenburg coast. Furthermore, concentration areas lie in a north-south direction across the known migratory routes of the open Baltic Sea (e.g. “bird flight path” southern Sweden – Rügen). Additionally, there are concentration areas of the known migratory routes over the open Baltic Sea (e.g. “bird flight path”, South Sweden-Rügen) in north-south direction. In addition, the western Baltic Sea is flown over by several species particularly worthy of protection (e.g. barnacle goose, whooper swan, common eider, common scoter and velvet scoter) in partially high intensities.
- A consideration of migratory behaviour and thus a differentiated view is required with regard to crane migration. And so the known main migratory routes are undoubtedly of above-average importance. In dependency on wind strength and direction, the adjacent areas of these main migratory routes are presumably of average to above-average importance. The importance is probably marginal apart from these areas. Lastly, it is necessary to conduct studies of crane migration with regard to individual projects on the project level in order to make a status assessment of the affected migratory routes.
- On the whole, the German Baltic Sea EEZ has an above-average importance for predatory birds, especially the Scandinavian populations. However, there are also great local differences amongst them on account of their migratory behaviour, so that a differentiated view is required. And so the known main migratory routes are undoubtedly of above-average importance. In dependency on wind strength and direction, the adjacent areas of these main migratory routes are presumably of average to above-average importance. The importance is probably marginal apart from these areas. Lastly, it is necessary to conduct studies of predatory bird migration with regard to individual projects on the project level in order to make a status assessment of the affected area.

9.2.9 Bats and bat migration

In Germany, 23 bat species with completely different distribution areas and resting preferences are found. They also show varyingly strong populations. The state of knowledge concerning their population development is also variously characterised. Amongst these 23 species there are also a few long-range migrating species such as common noctule (*Nyctalus noctula*), Nathusius' pipistrelle (*Pipistrellus nathusii*), parti-coloured bat (*Vespertilio murinus*), common pipistrelle (*Pipistrellus pipistrellus*), northern bat (*Eptesicus nilssoni*), lesser noctule (*Nyctalus leislerii*) and soprano pipistrelle (*Pipistrellus pygmaeus*).

In addition to echolocation, bats have special visual and passive acoustic abilities for perception of the environment. It is assumed that visual perception plays an important role in the orientation and navigation with long-range migrations and migratory movements of bats. For instance, the visual perception of prominent landscape elements (rivers, forest edges and coastlines) seems to serve for orientation and navigation of bats along migratory routes. However, on account of the effective range restricted to only small distances (ca. 100 m), echolocation almost exclusively serves for foraging. The animals hibernate in the cold season or migrate in habitats with suitable overwintering possibilities.

The migration of bats across the sea is for the most part unexplored on account of the lack of suitable census methods or comprehensive monitoring programmes. The available data for the Baltic Sea region are sporadic and insufficient in order to be able to draw conclusions regarding migratory movements. It is not possible with the help of available data material to obtain concrete findings concerning migrating species, migratory directions, migratory altitudes, migratory corridors and possible concentration areas. A quantification of bat migration across the Baltic Sea is not possible at present.

In summary, the following can be stated for the bat populations of species relevant to the Baltic Sea:

- Populations and distribution of migrating species are not conclusively recorded, particularly on account of the high migratory dynamics
- There is a lack of monitoring programmes in order to be able to consistently record the population development
- There is a lack of adequate methods and monitoring programmes in order to be able to record and quantify migrations and migratory movements across the open sea

Based on previous findings concerning the potential bat migration across the Baltic Sea, the following can be stated:

- Observations and ring recoveries point out that several species migrate across the Baltic Sea, such as the common noctule, Nathusius' pipistrelle, parti-coloured bat, common pipistrelle and northern bat
- It is assumed that a broad front migration takes place along prominent landscape elements such as the coastlines.
- However, migratory directions, migratory altitudes, migratory periods and especially possible migratory corridors of bats in the Baltic Sea are for the most part unknown up until today.

9.2.10 Biological diversity

"Biological diversity" as defined by § 2 sec.1 No. 8 of the Federal Nature Conservation Act (BNatSchG) comprises the diversity of habitats and communities, of species as well as the genetic diversity with the species. Species diversity is the focus of public attention. Intensive marine research has taken place in the Baltic Sea since the middle of the 19th century, which has led to an increase of knowledge concerning its fauna and flora. Over 694 phytoplankton taxa have been registered within the scope of HELCOM monitoring in the Baltic Sea. About 30 zooplankton taxa are known. More than 700 macrozoobenthos species are known alone in the Kiel Bight. The fish fauna of the Baltic Sea currently consists of 176 fish and lamprey species. Three species of marine mammals are regularly found in the German EEZ. There are 38 sea bird and waterfowl species to be found in the German waters of the Baltic Sea, in coastal waters and in the EEZ. Of those, 20 species are also regularly found in the EEZ area in greater populations as resting birds.

In view of the current status of biological diversity in the Baltic Sea, it is to be stated that there are countless references to changes of biodiversity and species pattern in all systematic and trophic levels of the Baltic Sea. Endangered animal and plant species on the Red List have an important control and warning function in this connection, since they show the status of species populations and biotopes in a region. With the help of the Red List it is to be stated that over 17% of macrobenthos species and about 30% of the Cyclostomata and marine fishes constantly found in the Baltic Sea are endangered. All three species of marine mammals are endangered and protected. Several of the sea bird and resting bird species found are also endangered and protected. The changes are essentially attributed to human activities such as the fishing industry and marine pollution or climatic changes.

9.2.11 Interactions amongst the subjects of protection

The components of the marine ecosystem, from bacteria and plankton to marine mammals and birds, have an influence on each other via complex mechanisms. The so-called predators are amongst the uppermost components of the marine food chain. Included amongst the upper predators within the marine food chain are water and sea birds as well as marine mammals. In the food chain, producers and consumers are dependent on each other, and influence each other in various ways. In general, the availability of food regulates the growth and the distribution of species. The temporally adapted succession or sequence of growth amongst the various components of the marine food chain is of critical importance. Predator-prey relationships or trophic relations amongst the size and age groups of a species or between species also regulate the balance of the marine ecosystem. Natural or anthropogenic impacts on one of the components of the marine food chain, e.g. the species spectrum or the biomass of plankton, can influence the entire food chain and shift – and should the occasion arise – endanger the balance of the marine ecosystem. Examples of the very complex interactions and control mechanisms within the marine food chain have been comprehensively presented in the description of the individual subjects of protection.

Changes in the entire marine ecosystem of the Baltic Sea come about via the complex interactions of various components, as already presented in the example of the trophic interrelations between red-necked grebe, cod, sprat and zooplankton. Based on the depicted protection-related changes, the following can be summarised for the marine ecosystem of the Baltic Sea:

- There are slow changes of the animated marine environment.
- Erratic changes of the animated marine environment have been observed since 1987/88.

The following aspects or changes can have an influence on the interactions amongst the various components of the animated marine environment:

- Change of species composition (phytoplankton and zooplankton, benthos, fishes)
- Introduction and partial establishment of non-indigenous species (phytoplankton and zooplankton, benthos, fishes)
- Change of abundance relationships (phytoplankton and zooplankton)
- Change of dominance relationships (phytoplankton and zooplankton)
- Change of available biomass (phytoplankton)
- Decrease of many area-typical species (plankton, benthos, fishes)
- Decrease of food base for upper predators (sea bird).

9.2.12 Marine environmental pollution and accumulation of pollutants in biota

The accumulation of pollutants in the marine ecosystem occurs via the marine food chain, starting with the lowest component, phytoplankton. Then, via trophic interrelations amongst the components of the marine food chain, pollutants get into the benthic organisms, fishes, marine mammals, sea birds and waterfowl, and ultimately people through the consumption of fish and seafood. In addition to the concentration (quantity) of pollutants in organisms, the accumulation or magnification of the pollutants in the animated marine environment is of great importance. In the German coastal waters of the Baltic Sea, pollutants in benthos (predominantly in mussels) and fishes have been measured since the beginning of the 1980's within the scope of the national BLMP monitoring programme. As secondary consumers within the marine food chain, fishes accumulate pollutants in much greater concentrations than mussels. Unlike mussels, the mercury concentrations in the past years (measured values from 1999-2002) remained constant with fishes from the coastal waters. The concentrations of DDT derivatives in fishes from the coastal waters also remained constant. However, the concentrations of PCB and HCH decreased. The mercury concentrations of herrings and cods from the Arkona Basin are much lower (four times) than with concentrations in perches from the coastal waters.
The burden of fishes with pollutants contributes towards debilitation of the immunological competence of fishes, and stimulates the outbreak of fish diseases and parasitisation. Skin ulcerations and skeletal deformations are amongst the most frequently observed external diseases of cods in the western Baltic Sea. In the south-eastern areas, an increase of the infestation rate with skin ulcerations was even observed in the past years. Marine mammals in the Baltic Sea have a high load of organic and inorganic pollutants. Alarming concentrations of pollutants in marine mammals have been verified particularly with regard to lipophilic, persistent and bioaccumulative substances such as PCBs or DDT.

As consumers in the upper range of the marine food chain, the danger of an accumulation of pollutants in the body tissue exists with all species of sea birds and waterfowl. On the whole, previous findings indicate continuing to maintain and strengthen measures for reduction of pollutant discharges. In particular, effects of organic pollutants within the food chain are still insufficiently known or for the most part unknown in substance-specific terms.

9.2.13 Natural scenery

The marine landscape is characterised by an extensive free-space structure. The natural scenery is to a great extent uninfluenced by disturbances. At the moment there are very few high

structures in the Baltic Sea EEZ. These concern measuring masts for research purposes. But these are not visible from land because of the long distances.

9.2.14 Tangible assets, cultural heritage (archaeology)

References to possible tangible assets or cultural heritage are at hand insofar as that the spatial location of a vast number of wrecks is known and is recorded in the BSH nautical charts.

9.3 Prospective development in case of non-implementation of plan

At present, numerous uses are being pursued or planned in the EEZ, which:

- …are authorised, approved or planned, as particularly in the realm of exploitation of non-living resources or wind energy use
- …enjoy special rights according to UNCLOS, such as shipping, laying and operation of pipelines as well as research
- …fall under the regulatory authority of the EU (fishing industry)
- …or for which § 18a ROG (*cf*. § 17 sec. 3 ROG) makes no provisions (military exercises)

In the event of non-implementation of the plan, these uses would continue to be pursued in accordance with the respective legal grounds. The respective effects of the mentioned uses on the subjects of protection are presented in the corresponding subchapters and correspond to those with non-implementation of plan.

9.3.1 Presentation of uses in the EEZ

9.3.1.1 Shipping

Shipping takes place on an exhaustive basis throughout the entire Baltic Sea. Shipping and harbours plan an important role in international trade: 90% of foreign trade and over 40% of internal trade within the EU occur via the sea route. Roughly 8% of worldwide trade will be conducted via the shipping routes in the Baltic Sea.

According to HELCOM AIS (Automatic Identification System) evaluations, more than 50,000 ships annually pass through the Skagerrak into the Baltic Sea. 60-70% of the ships sailing in the Baltic Sea are freighters; 17-25% concern tankers. It is estimated that 1,800 to 2,000 ships are located in the Baltic Sea at any point in time. Moreover, based on the data recordings of the past years, it emerges that not merely the number, but also the size of the ships sailing in the Baltic Sea has increased. In particular, tankers with a capacity of up to 15,000 tonnes of oil increasingly use the Baltic Sea.

The main shipping routes in the western Baltic Sea are predetermined through deepwater routes and traffic separation areas. Shipping takes place mainly in an east-west direction (and vice versa), parallel to coastal waters. In this connection the shipping concentrates on deepwater routes such as the Cadet Channel. In addition to the Cadet Channel, the Kiel-Baltic Sea route, the Lübeck-Gedser route, the maritime channel to Rostock harbour and the shipping route to Swinemünde through the Pomeranian Bight are amongst the most important shipping routes in the western Baltic Sea.
Emission of nitrogen oxides, sulphur dioxides, carbon dioxide and soot particles come about through the shipping traffic; nitrogen oxides are regarded as the most critical emission constituents in this connection. The nitrogen compounds emitted by shipping can to a great

extent be introduced into the sea as atmospheric precipitation. In addition, the emission of heavy metals – but for which no exact details are available – is not to be ruled out.

Oil and pollutants enter directly into the sea through shipping traffic. The discharge of oil into the Baltic Sea is absolutely prohibited. Only the discharge from the engine room bilge with a dilution of 15 ppm and under application of additional control mechanisms is permissible.

Amongst other things, dealing with oily residues, chemicals, wastewater and ship's waste will be governed through the international MARPOL conventions. International provisions contribute towards protecting the sea from environmental pollutions through shipping. The international environmental provisions will be continually further developed and new requirements will be adapted.
In particular, organic tin compounds (TBT) will be released into the water column from older ship's paints (SRU, 2004). TBT is particularly applied in so-called antifouling paints onto ship's hulls and underwater surfaces. There the biocide prevents the marine growth of epibionts (e.g. algae, mussels, anthozoa and tunicate, diantennata and annelida). The mode of action of most conventional antifouling paints is based on a continual output (leaching) of TBT or other toxic compounds to the surrounding aquatic environment.

Pursuant to Regulation (EC) No. 782/2003 of the European Parliament and the Council from 14 April 2003 on the Prohibition of Organotin Compounds on Ships, organotin compounds which act as biocides in anti-fouling systems may no longer be applied on ships sailing under the flag of a Member State. As of 1 January 2008, ships which enter a port of a Member State shall not bear organotin compounds which act as biocides in anti-fouling systems, unless they bear a coating that prevents the exudation of these compounds from the underling non-compliant anti-fouling system.

Non-indigenous species enter into the Baltic Sea through the exchange of ballast water as well as through the organisms adhering to the ship's hull. The Ballast Water Convention is currently being implemented: the propagation of non-indigenous species shall be prevented through the development of suitable technical solutions for treatment of ballast water which shall be employed on ships after 2009.

As a result of operation, shipping contributes towards the increase of background noise level in the sea. Depending on the ship's type and size, the intensity and frequency of noise input varies from ca. 158 dB re 1µPa (source level) and 0.1 kHz with fishing industry vehicles up to 169-190 dB re 1µPa (source level) and 0.06 to 0.43 kHz with tankers and freighters.

9.3.1.2 Exploitation of non-living resources

No raw material extraction is taking place at present in the German EEZ in the Baltic Sea. A resumption of use is not anticipated in the foreseeable future.

9.3.1.3 Pipelines and submarine cables

Pipelines

No pipelines are currently in operation in the Baltic Sea. The planning of two pipelines through the German EEZ in the Baltic Sea is currently being pursued (BGI natural gas pipeline between Germany and Denmark as well as the NordStream pipeline, a natural gas pipeline from Russia to Germany).

As a rule, pipelines in the German EEZ in the Baltic Sea shall be laid on the seabed. Crossings with other existing or planned pipelines will be secured with rock fills (coarse gravel, rubble). With sufficient supply of loose sediments, pipelines even burrow into the seabed itself as a consequence of natural sand movement. As a result of the natural sedimentary dynamics, they can be either completely covered with sand or exposed. In sections in which no self-burrowing is possible according to the results of foundation exploration, either a ca. 0.5 m deep trench will be generally ploughed before the laying ("pre-trenching") or the pipeline will be laid on the seabed and secured through a rock fill.

In the event of "pre-trenching", sediment – which is cleared away and levelled out through hydrodynamic forces after laying – will be piled up wall-like a few decimetres high along the trench. During the ploughing of the trench, the portion of silt and clay in the bottom water will be introduced and, depending on the prevailing current conditions (velocity and directional stability), will be dispersed in the bottom water. The whirled up (resuspended) sediments in the environment of the pipeline will be varyingly widely dislocated and deposited, depending on the grain size: the distances in this connection lie clearly below those which will be determined for the sedimentation of turbidity vanes in the course of sand and gravel extraction. The concentrations of resuspended particulate material lie on a comparable scale with natural resuspensions of sediments which will be caused by storms.

The "post-trenching" procedure, i.e. laying of pipeline on sandy seabed and subsequent pile-jetting (filling), is more rarely employed.

Hydraulic pressure tests with sea water will be conducted in order to test the impermeability of the pipeline. Sea water is generally treated with biocide (as an anti-fouling agent) and oxygen reducing agent (so-called "scavenger") for this purpose. After the treated water has been blown out of the pipeline, a drying agent will be employed to remove the residual sea water from the pipeline. Treated sea water and drying agent will normally be introduced with appropriate dilution into the sea near the coastline. In cases of exceptions (e.g. laying of a pipeline bypass), this can also occur in the EEZ, whereby in these cases much lesser volumes of treated sea water accumulate due to the shorter affected pipeline segments.

Increased shipping traffic comes about during the laying, maintenance and repair of damages as well as during renaturation of pipelines. Moreover, sedimentary vanes emerge along the laying trench. At the same time, the whirling up of sediments can lead to resuspension of sediment-bound pollutants. Acoustic emissions and possible pollutant discharge can also occur as a consequence of works. Works within the framework of laying, renaturation as well as maintenance and repair take place on a local and temporary basis.

Submarine cables

For one thing, submarine cables serve the purpose of telecommunications and for another thing the transfer of electrical energy.

The German Baltic Sea EEZ is traversed by a number of telecommunications cables. Moreover, a series of telecommunications cables have been put out of service in the meantime.

In addition, there are two operational power cables which traverse the German EEZ (Baltic Cable between Malmö and Lübeck as well as the Kontek Cable between Seeland and Bentwisch near Rostock).

Furthermore, a series of submarine electricity cables are being planned, which will link the planned offshore wind farms in the EEZ with the network feedin points on land.

As a rule, submarine cables are laid in the sediment with a flushing blade if material capable of being flushed (sands) is encountered on the route. In sections in which this laying method fails for reasons of geological structure and foundation relationships, the cable system will be laid on the seabed as in the case of pipelines and secured with a rock fill.

Increased shipping traffic comes about during the laying, maintenance and repair of damages as well as during renaturation of pipelines. Moreover, sedimentary vanes emerge along the laying trench. The whirling up of sediments leads to resuspension of sediment-bound pollutants. Acoustic emissions and possible pollutant discharge can also occur. The works for laying or for renaturation take place on a local and temporary basis. The same applies to maintenance work and repairs.

9.3.1.4 Scientific marine research

Basic research as well as applied research within the scope of monitoring measures takes place in the Baltic Sea EEZ. Up until a few years ago, fishing aspects were the focus of research activities in the EEZ. However, in the past years research projects have been increasingly carried out in connection with future EEZ uses, such as offshore wind energy and cable laying. Amongst other things, effects of offshore wind energy facilities on mammals and birds have been researched within the scope of the MINOS and MINOS+ projects. Extensive mappings have been undertaken within the scope of research projects for stipulation of marine protected areas according to EU-VRL and FFH-RL. Furthermore, biological data in the planning areas will be surveyed by applicants within the scope of projects proposed and subject to approval according to UVPG [Environmental Impacts Assessment Act].

Research activities are currently being conducted by the universities of coastal cities as well as numerous other institutions.
Additional shipping traffic is generally anticipated within the scope of research activities. In particular, fishing research activities occur on an extensive basis. Ground trawling nets which generally penetrate a few centimetres to decimetres deep into the sandy to silty seabed of the Baltic Sea will be employed on sandy to silty bottoms of fishing research areas.

Regular water and sedimentary samples will be taken in the EEZ within the scope of monitoring (BLMP and HELCOM) nutrients and pollutants. Hydrographical parameters (amongst other things, temperature and salt content) will be measured with the help of probes. In the Baltic Sea, biological parameters have also been studied for years within the scope of HELCOM monitoring: chlorophyll-a, phytoplankton, zooplankton and benthos. Moreover, the IOW together with the BSH operates three automatic monitoring stations (MARNET). The research platform FINO 2 (research platforms in the North Sea and Baltic Sea) is currently being set up and equipped with measuring devices in the sea area of “Kriegers Flak” with resources of the BMU and the State of Mecklenburg-Western Pomerania. The FINO 2 research project shall ascertain the conditions for long-term wind energy use, the effects of offshore wind energy facilities on the marine flora and fauna as well as the optimal traffic-technical arrangement.

Marine mammals, sea birds and migratory birds have only been studied up to now within the scope of research projects. The logging of sea birds and migratory birds as well as marine mammals also occurs only within the framework of research projects by means of ship and

aircraft-supported counts. A network of automatic click detectors – so-called TPODs – will be employed for research of habitat use through harbour porpoises.

As a rule, the soil characteristics will be extensively researched with hydroacoustic methods (side-scan sonar, multi-beam echo sounder and seismic methods). Sedimentary samples will also be taken punctually by means of gripping devices or soil cores for determination of sedimentary characteristics.

9.3.1.5 Offshore wind energy use

Offshore wind energy production is a newly developing form of use in the EEZ. Up until July 2007, three offshore wind farms with 240 turbines have been approved in the German Baltic Sea EEZ, none of which has been realised at present. With a number of 80 OWEF – which at present represents the maximum number of facilities in an offshore wind farm – the areas of the approved projects range from ca. 30 to ca. 40 km². Depending on the foundation type, the area taken up by a single turbine lies between ca. 50 m² and 2000 m². The distance between the individual turbines amounts to 750 to 1,000 metres. The configuration of a wind farm is selected on a project & site-specific basis so that the efficiency will be consistent with matters of shipping safety and the animated environment.

Pile foundations in the form of monopile or multi-leg constructions are being preferred as foundation types for the turbines. So-called tripod, tripile or jacket constructions come into question amongst the multi-leg constructions. In addition, further developments of foundation variations – such as guyed foundations (“tension leg”) – are basically conceivable. The employment of gravity foundations – which stand firmly on the seabed through their own weight – is also imaginable. The foundation elements will be protected against scouring, in which case either appropriate scour protection will be put down in the form of rock fills around the respective elements, or the foundation piles will be placed appropriately deeper in the ground. Steel foundation piles will be generally rammed into the ground. In the event of special underground conditions (e.g. occurrence of boulders) or with utilisation of concrete pillars, the foundations will be installed by using bores in the foundation soil. The so-called weighted or suspension foundations – which manage without ramming or drilling, but therefore require larger areas – are an additional variation.

The turbine and the foundation are to be considered as a unit. The installations will be provided with towers, hubs and rotors with three blades each, and horizontal axial turbines with uniform rotational direction. Moreover, there will be supply equipment on the facilities (amongst other things, equipment and material storage, emergency gear). Oil separation systems are also planned for the turbines in order to prevent contaminations. OWEF types with a rated power between three and six MW are in the development stage. The rotor diameter and the hub height vary depending on the OWEF type. In particular, the utilisation of 5 MW facilities is currently planned. According to manufacturer’s statements, these have a hub height of ca. 100 m and a rotor diameter of ca. 125 m. The foundation height usually lies ca. 15 m and the tower ca. 95 m above sea level.

In the construction phase, increased shipping traffic is to be regionally anticipated through supply, erection and laying ships. Acoustic emissions, of which the duration and intensity vary depending on the procedure, are to be expected through the pile driving of the foundation piles. However, the individual wind energy facilities will be successively arranged so that the pile driving will take place on a local and temporary basis.

During the erection of OWEF, the soil will be stressed through the introduction of foundation elements and the internal farm cabling, and will be sealed locally on a long-term basis. Moreover, the current will be influenced on a small scale through the facilities, and thus also the cratering. On the whole, changes of the substrate around the facilities are to be expected. Moreover, the facilities alter the natural scenery as towering structures.

Operation-related acoustic emissions and vibrations come about the wind energy facilities. But in comparison with the construction phase these come about by far on a lesser scale. Light reflections and shadows cast through the rotating blades of facilities are possible. The wind energy facilities as well as the transformer stations will be marked during the day through a special colour scheme in order to be easily visible for shipping and aviation. The facilities will be marked with beacons in the dark phase. Sonar transponders and AIS marking are also planned for the safety of shipping.

When describing the likely significant effects of the designation as priority areas for wind energy, the assessment presented here - before the Spatial Plan comes into force - must be taken into consideration.

9.3.1.6 Fisheries and mariculture

Fisheries

In addition to the shipping in the Baltic Sea, the fishing industry represents the most traditional use. The fishing haul has become increasingly larger over the course of time through the development of special fishing vehicles and fishing techniques. The most important commercial species in the Baltic Sea are cod, herring and sprat. Flatfish species such as flounder, plaice and turbot play a subordinate role in the fishing industry of the Baltic Sea. But in the meantime the yields are declining due to the decline of fish stocks and the regulative measures. At the same time, the cod population in the western Baltic Sea was always smaller than the population of the eastern Baltic Sea. According to estimates by ICES (International Council for Exploration of the Sea), the biomass of the spawn-mature cods in the western Baltic Sea is currently at the level of 2002 or lies even a bit below.

In order to protect the fish stock or to enable the regenerative processes, the EU has meanwhile established the annually permissible highest catch quantities (so-called “Total Allowable Catches”) within the scope of the common fisheries policy. These will then be allocated amongst the member states so that every country has a predetermined catch quota.

Amongst other things, ground trawling nets, gillnets, weirs and longlines will be employed to catch benthic fish species in the German EEZ in the Baltic Sea. On the other hand, pelagic fishes will be caught with pelagic gillnets or drift nets. In the commercial fishing industry, uninteresting fish species – which will be sorted after the catch and thrown overboard – will also be by-caught in considerable quantities. This share of the catch is generally described as discard. An estimated 11,000 tonnes of by-catch annually accumulate through the fishing industry in the Baltic Sea, whereby a majority of this concentrates in the south-western Baltic Sea.

Mariculture

Mariculture comprises the production of fishes, crustaceans (prawns), molluscs (mussels) and algae under controlled conditions in special facilities in salt water or brackish water. Mariculture is a globally growing market.

At present there is still no mariculture in the German EEZ in the Baltic Sea. Individual facilities are currently available only in the coastal waters of the Baltic Sea.
Greater quantities of nutrients can be released from the mariculture facilities, since not all nutrients fed in fish cultures will be converted into biomass. In addition to the soluble excretory products of breeding, solid matter will be distributed in the water column and lead to a constant increase of nutrient concentrations in the proximity of the cage facilities. Since microalgae are not able to convert the nutrient supply in due time, excreted solid matter and uneaten feed pellets accumulate under the cages (depending on current), through which local eutrophication effects are to be recorded. The danger of oxygen deficiency situations exists through the microbial degradation of the substances. Intensive farming in maricultures necessitates the use of medicaments for prevention and treatment of diseases for which the mass cultures are particularly susceptible. In addition to veterinary medical substances, disinfectants and anti-fouling agents will also be employed in mariculture. The substances introduced into the system can lead to pollutant burden for the water.

The species bred in mariculture are frequently not indigenous species. If such cultivated organisms escape, there is a danger that these will propagate. One example for this is the Pacific oyster introduced through mariculture in the German waters of the North Sea.
But the escape of indigenous species from breeding facilities also possibly endangers the environment. Moreover, parasites from mariculture facilities can also enter into the marine environment.

9.3.2 Seabed and water

9.3.2.1 Effects of uses on the subjects of protection seabed and water

Effects of shipping on the subjects of protection seabed and water

Diffuse input of pollutants comes about as a result of shipping traffic. Nitrogen compounds, which mainly appear in the coastal waters through excessive nutrient inputs from land, contribute substantially towards eutrophication of the Baltic Sea.

Effects of pipelines and submarine cables on the subjects of protection seabed and water

As a rule, pipelines will be laid on the seabed, whereas power cables will be laid a few decimetres deep into the seabed with a flushing blade. With sufficient supply of loose sediments, pipelines burrow into the seabed itself as a consequence of natural sand movement. As a result of the natural sedimentary dynamics, they can be either completely covered with sand or exposed.

In sections in which no self-burrowing is possible on account of soil conditions, either a ca. 0.5 m deep trench will be generally ploughed or the conduit (pipeline or submarine cable) will be laid on the seabed and secured through a rock fill. The ground-proximate formation of turbidity vanes is restricted to an area which clearly lies below those which will be determined for the sedimentation of turbidity vanes in the course of sand and gravel extraction. The concentrations of resuspended particulate material lie on a comparable scale with natural resuspensions of sediments which will be caused by storms.

Hydraulic pressure tests with sea water will be conducted in order to test the impermeability of the pipeline. The treated sea water will normally be introduced with appropriately high dilution into the sea near the coastline.

Effects of scientific research on the subjects of protection seabed and water

Ground trawling nets which generally penetrate a few millimetres to centimetres deep into the seabed of the Baltic Sea will be employed on the sandy bottoms of fishing research areas. Ground-proximate formation of a turbidity vane occurs in this connection as a consequence of the whirling up of predominantly sandy surface sediments. As a result of the natural sedimentary dynamics, this leads to the fact that trawling tracks are generally not lastingly observable on the predominantly sandy seabeds of the EEZ. In greater water depths, particularly in the Baltic Sea basin, the relatively deep trawling tracks remain over long periods because of the marginal sedimentary dynamics.

The ground-proximate formation of turbidity vanes and possible release of pollutants from the sediment is negligible on account of the relatively marginal fine grain portion (silt and clay), the marginal heavy metal concentrations and the prevailing current conditions.

Effects of offshore wind energy production on the subjects of protection seabed and water

During the erection of offshore wind energy facilities, the soil will be stressed through the introduction of foundation elements and the internal farm cabling, and will be sealed locally on a long-term basis. Short-term whirling up of sediments and formation of turbidity vanes come about during the establishment of offshore wind energy facilities and technical platforms as well as during the cabling of facilities amongst each other and the land-side connection. Increased turbulence through eddy formation and intensified vertical mixing come about downstream in the vicinity of facilities through the streaming of piles. According to previous findings, current-conditioned, lasting sedimentary rearrangements will only emerge around the respective individual facility and will not entail any extensive changes and effects with the planned distances between the facilities.

Monitoring results for the Danish offshore wind farm “Horns Rev” show that two years after erection of offshore wind energy facilities, no changes in the sedimentary characteristics in connection with the facilities were able to be verified. On the contrary, the grain-size distributions of the years 2001 to 2003 reflect the natural sedimentary dynamics of the North Sea. Temperature measurements on a farm-internal cable of the Danish offshore wind farm “Nystedt” show that the sedimentary warming remained below the anticipated temperatures.

Effects of fisheries and mariculture on the subjects of protection seabed and water

Trawling nets and gillnets will be employed in the German EEZ in the Baltic Sea for fishing purposes. Ground trawling nets which generally penetrate a few millimetres to centimetres deep into the seabed will be utilised on the sandy bottoms. A ground-proximate formation of a turbidity vane thus comes about as a consequence of the whirling up of predominantly sand surface sediments. As a result of the natural sedimentary dynamics, this leads to the fact that trawling tracks are generally not lastingly observable on the predominantly sandy seabeds of the EEZ. In greater water depths, particularly in the Baltic Sea basin, the relatively deep trawling tracks remain over long periods because of the marginal sedimentary dynamics.

Mariculture comprises the production of fishes, crustaceans, molluscs and algae under controlled conditions in special facilities in salt water or brackish water. At present there is still no mariculture in the German EEZ in the Baltic Sea. The use of maricultures, for instance in the form of mussel farms, will lead to an excretion of faecal matter within the breeding facilities.

9.3.2.2 Development of the subjects of protection seabed and water in case of non-implementation of plan

As described, the subjects of protection seabed and water would in parts continue to be strongly affected in case of the implementation as well as in case of the non-implementation of plan through various already approved uses or uses not subject to approval, such as raw material extraction or shipping. The developments which exclusively refer to the non-implementation of plan will be subsequently described.

Temporally and spatially uncoordinated laying of submarine cables for diversion of energy obtained in the EEZ would be anticipated upon non-implementation of plan. This could lead to comparably high area usage, increased sedimentary rearrangements and thus to increased negative effects on the subject of protection vis-à-vis a temporally coordinated laying. Moreover, an increase in the number of cable crossings would be anticipated, which would necessitate the introduction of hard substrate. For instance, rock fills could also be necessary in areas with a predominantly homogeneous, sandy seabed.

With non-implementation of plan, the development of further projects also beyond the special suitability areas would be anticipated for the use of offshore wind energy. A concentration of wind energy production to locations suitable from an ecological viewpoint would not be possible.

The development of additional projects, according to the SeeAnlV, for the use of offshore wind energy could not be excluded in the NATURA2000 areas, if the plan is not implemented. The controlled and alleviated authorisation for projects at ecologically suitable locations, which are indended by the wind energy priority areas, would be ommited.

In the realm of mariculture, the unregulated settlement of mussel cultures in the EEZ would be conceivable with non-implementation of plan. Local effects on the subject of protection could come about through nutrient and pollutant inputs.

Since the plan makes numerous source-related stipulations regarding the protection of the marine environment, which refer to an optimally compatible development of uses, the protection of the seabed as well as the water would be much more difficult to ensure with non-implementation of the plan than with implementation of the plan.

In addition, it is to be anticipated that warming of water already initiated through the climate change will also continue in the future. This also leads to changes with regard to the other subjects of protection. On the whole, however, this development is independent of the non-implementation or implementation of the plan.

9.3.3 Phytoplankton and zooplankton

9.3.3.1 Effects of uses on the subjects of protection phytoplankton and zooplankton

Effects of shipping on the subjects of protection phytoplankton and zooplankton

Effects of shipping on phytoplankton and zooplankton can be summarised as follows:
Direct effects:

- Supra-regional, permanent effects through pollutant discharge, especially oil residues, in the normal operation
- Regional to supra-regional, permanent effects through introduction of non-indigenous species with the ballast water

Indirect effects:

- Accumulation of pollutants from normal shipping operation in phytoplankton and zooplankton, and passing on to other components of the food chain to the upper predators and humans
- Changes of species composition through displacement of indigenous species, and propagation of non-indigenous species
- Changes of available biomass, abundance and primary production of the ecosystem
- Changes of the marine food chain through non-indigenous plankton species and altered food quality
- Effects through accumulation in the marine food chain via the plankton on account of oil inputs or pollutant discharge can come about regionally to supra-regionally and on a temporary to permanent basis.

Effects of pipelines and submarine cables on the subjects of protection phytoplankton and zooplankton

According to the current state of knowledge, the laying, the operation as well as the dismantling of pipelines and submarine cables have no significant effects on the development of phytoplankton and zooplankton.

Effects of scientific marine research on the subjects of protection phytoplankton and zooplankton

See below with regard to the effects of fishing research on phytoplankton and zooplankton. Furthermore, according to the current state of knowledge, scientific marine research has no significant effects on the development of phytoplankton and zooplankton.

Effects of offshore wind energy use on the subjects of protection phytoplankton and zooplankton

According to the current state of knowledge, offshore wind energy has no significant effects on the development of phytoplankton and zooplankton.

Effects of fisheries and mariculture on the subjects of protection phytoplankton and zooplankton

The fisheries exert a strong influence on the entire marine food chain. The effects of overfishing proceeds almost unnoticed on the lower realm of the marine food chain with phytoplankton and zooplankton, and can only be recorded and quantified with difficulty. But these indirect effects in the lower realm of the marine food chain particularly lead to changes in the entire marine ecosystem, the more so if these changes have an impact on the distribution and abundance of primary production. The removal of important components from the ecosystem through overfishing or uncontrolled fishing leads to cascade reactions via the interruption of trophic interrelations within the marine food chain.

The settlement of maricultures can have an indirect effect on phytoplankton and zooplankton via a deterioration of water quality: pollutants, especially growth hormone preparations and antibiotics, could accumulate in the plankton and also impair upper predators such as benthos, fishes, marine mammals and sea birds via the marine food chain.

9.3.3.2 Development of the subject of protection phytoplankton and zooplankton in case of the non-implementation of plan

As described, the subject of protection phytoplankton and zooplankton would in parts also continue to be affected in case of the non-implementation of plan through various already approved uses or uses not subject to approval, such as fisheries or shipping. The developments which exclusively refer to the non-implementation of plan will be subsequently described.

In the event of unregulated settlement of maricultures, negative effects on the phytoplankton and zooplankton could come about with non-implementation of plan: pollutants, especially growth hormone preparations and antibiotics, could accumulate in the plankton and also impair upper predators such as benthos, fishes, marine mammals and sea birds via the marine food chain.

Since the plan makes numerous source-related regulations regarding protection of the marine environment, which refer to an optimally compatible development of uses, the protection of the phytoplankton and zooplankton would be much more difficult to ensure in case of non-implementation of plan.

In the meantime, effects of climatic changes on phytoplankton and zooplankton are also clearly noticeable. In the future, phytoplankton and zooplankton species will be increasingly affected through possible effects of climatic changes, particularly through changes in temperature, salinity and current. On the whole, however, this development is independent of the non-implementation or implementation of plan.

9.3.4 Benthos and biotope types

9.3.4.1 Effects of uses on the subjects of protection benthos and biotope types

Biotopes are the habitats of a regularly recurring species community. Impairments of biotopes have direct effects on the communities. Insofar as that is concerned, the following remarks are limited to the effects of uses on benthos communities.

Effects of shipping on the subjects of protection benthos and biotope types

As a result of shipping, impairments of benthos can come about through oil disposal at sea, propulsion-related emissions, waste disposal, noise emissions, consequences of shipping accidents, input of toxic substances such as TBT and introduction of exotic species. The effects can be of supra-regional temporary or permanent nature. These can be summarised as follows:

- Supra-regional, temporary effect on account of oil input, emissions and introduction of toxic substances
- Supra-regional, permanent effect on account of the introduction of non-indigenous species

Effects of pipelines and submarine cables on the subjects of protection benthos and biotope types

Ground-proximate turbidity vanes can appear during the laying of pipelines and submarine cables, and local sedimentary rearrangements can occur, through which the benthos organisms can be affected. Since the pipelines in the Baltic Sea EEZ will be generally laid on the seabed and then burrow themselves in over the course of time, the pipes temporarily represent artificial hard substrate. However, the pipes will be secured in sections with a rock fill that represents a long-term artificial hard substrate. The artificial hard substrate offers the benthos organisms a new habitat.
During the operation of power cables, a warming of the uppermost sediment layer of the seabed can occur, which brings about a decrease in the winter mortality of infauna and can lead to a change of the species communities in the area of the cable routes. The same also applies to electrical fields. Electromagnetic effects do not appear in a significantly measurable manner with the planned power cables (triple-core rotary current cable or bipolar HVDC cable).

In summary, the essential effects of the laying of pipelines or submarine cables on the marine benthos can be stated as follows:

Direct effects:

- Small-scale and short-term habitat loss for the duration of the laying of pipelines and submarine cables due to sedimentary rearrangements and turbidity vanes
- Short-term and small-scale adverse impact on individuals, eggs and larvae of benthic organisms on account of turbidity vanes during the laying of pipelines and submarine cables
- Short-term and small-scale impairment of benthic organisms due to the remobilisation of chemical substances during the laying of pipelines and submarine cables
- Small-scale and short-term settlement area loss through the pipeline due to usage of the area
- Small-scale and lasting supply of artificial hard substrate due to the rock fills for pipelines
- Small-scale and lasting potential influence on the benthos organisms due to sedimentary warming through power cables

Indirect effects:

- Short-term and small-scale influence on the food supply for benthic organisms through impairments of primary production (phytoplankton and zooplankton) due to the remobilisation of chemical substances during the laying of pipelines and submarine cables

Effects of scientific marine research on the subjects of protection benthos and biotope types

Depending on the type of methods and equipment utilised, different marine research activities are associated with various environmental effects.

In summary, the essential effects of research actions on the marine macrozoobenthos can be stated as follows

- Local, temporary damage or loss of individuals due to sampling

Effects of offshore wind energy use on the subjects of protection benthos and biotope types

Construction and operation of offshore wind energy farms may have construction-, facility- and operation-related effects on the macrozoobenthos.

Construction-related: Seabed disturbances, sedimentary whirl ups and formation of turbidity vanes can come about during the foundation of OWEF and technical platforms as well as during the laying of farm-internal cables.

Facility-related: Benthic habitats will be encroached upon, and soil organisms will be negatively affected or destroyed through the erection of the foundations of OWEF and technical platforms as well as scour protection. Furthermore, lasting changes of the current conditions in the environment of the OWEF foundations are to be anticipated, which can lead to a change of the sedimentary parameter, which in turn leads to an alteration of the benthic fauna (KNUST et al., 2003). In addition, the introduction of foundation components offers a new habitat – above all pollutant-free (particularly TBT-free) – to benthos organisms, which also makes it possible for species and communities to settle in areas in which they were not previously found, so that their distribution ranges can expand.

Operation-related: Due to the internal wind farm cabling, a warming of the seabed's uppermost sediment layer can occur with the utilisation of rotary current cables, which brings about a decrease of winter mortality and can lead to a change of the species communities in the area of the cable routes. However, the resistance-related loss of power will be very slight due to the short routes to transformer stations; and for another thing, will also not nearly achieve the capacity through the amalgamation of only a few OWEF into (cable) groups as through power-discharging cables for a wind farm. In view of the warming of sediment through power-discharging cables, a precautionary value of less than 2 K in the 20 cm depth of the sediment is favoured by the Federal Agency for Nature Conservation (BfN). Due to a sufficient laying depth and under consideration of the fact that the effects will occur on a small-scale, i.e. a few metres on both sides of the cable, effects on the benthos communities are not anticipated according to the current state of knowledge.

The same also applies to electrical fields. Electromagnetic effects do not appear in a significantly measurable manner with the aforementioned variation.

In summary, the essential effects of OWEF on the marine macrobenthos can be stated as follows:

Direct effects:

- Small-scale and short-term habitat loss for the duration of the installation of foundations and laying of cables due to sedimentary whirl ups and turbidity vanes
- Small-scale and permanent settlement area loss through the foundations of OWEF, transformer station and scour protection as well as cable laying (in the event of laying on the seabed) due to the area demand
- Small-scale and permanent supply of artificial hard substrate due to the OWEF foundations
- Small-scale and permanent change of sedimentary parameter due to the OWEF foundations.

Indirect effects:

- Small-scale and permanent changes of the benthos communities through attraction of mobile predators due to increase of food supply

Effects of fisheries and mariculture on the subjects of protection benthos and biotope types

The entire German Baltic Sea EEZ is utilised by the fishing industry. Changes on the seabed in the Baltic Sea through fishing gear will be nearly exclusively brought about through otter board fishing, which leaves behind visible tracks. On the whole, the influences of ground trawling net fishing by means of otter boards on the seabed and its living inhabitants have not yet been studied much. As a result of fishing industry activities, organisms of the epibenthos and endobenthos could ultimately be destroyed through the mechanical burden, or they will be removed from the sea and usually thrown back in the sea in a damaged state.

The effects of fishing gear on the benthic communities can be separated into short-term and long-term effects:

- *Short-term effects*: The animals uncovered by fishing gear are partially injured or killed. The larger and hard-shelled representatives, such as sea urchins and swimming crabs, are particularly susceptible for this. The exposed and affected animals are welcome nourishment for the fishes from the immediate vicinity. observed that the dabs in the trawling track seem to be more numerous and feeding-active than in the surroundings.
- *Long-term effects*: As a result of fishing industry activities, the mortality of sensitive species increases until only the opportunists are able to exist. The diversity, a measure for the species diversity, diminishes at the same time. The abundance for the species which are not affected by fishing gear increases to the extent to which the sensitive species disappear from the biotope. The production of organic substance could initially increase, since the older, slow-growing specimens will be replaced through fast-growing, young specimens. Then, with increasing trawling activity, the younger animals will also die, so that the production declines.

In summary, the essential effects of the fishing industry on the marine macrozoobenthos can be stated as follows:

- Loss of individuals, especially more long-living and sensitive species, through the fishing gear
- Reduction of more sessile epifauna
- Decrease of species diversity
- Shift of the size spectrum of soil fauna
- Habitat levelling through the “fishing” of stones

9.3.4.2 Development of the subjects of protection benthos and biotope types in case of non-implementation of plan

As described, the subject of protection benthos and biotope types would in parts continue to be affected in case of non-implementation of plan through the effects of various already approved uses or uses not subject to approval, such as raw material extraction and the fishing industry. The developments which exclusively refer to the non-implementation of plan will be subsequently described.

A temporally and spatially uncoordinated laying of submarine cables for diversion of energy generated in the EEZ would be anticipated upon non-implementation of plan. This could lead to a comparably high area consumption, increased sedimentary rearrangements and thus to increased negative effects on the subject of protection benthos and biotope types vis-à-vis a temporally coordinated laying. Moreover, an increase in the number of cable crossings would be

anticipated, which would necessitate the introduction of hard substrate. In turn, a shift or change of the species spectrum could come about because of this.

With regard to offshore wind energy, in the event of non-implementation of plan it would be assumed that further projects are also developed beyond the special suitability areas. A concentration of wind energy extraction to a few suitable locations would not be possible. The danger of small-scale destruction of habitats worthy of protection would increase as a result.

The development of additional projects, according to the SeeAnlV, for the use of offshore wind energy could not be excluded in the NATURA2000 areas, if the plan is not implemented. The controlled and alleviated authorisation for projects at ecologically suitable locations, which are intended by the wind energy priority areas, would be omitted.

In the realm of mariculture, the unregulated settlement of mussel cultures in the EEZ would be conceivable in case of non-implementation of plan. Local effects on the subject of protection could come about through nutrient and pollutant inputs.

Since the plan makes numerous source-related stipulations regarding protection of the marine environment, which refer to an optimally compatible development of uses, the protection of the benthos and biotope types would be much more difficult to ensure with non-implementation of plan than with implementation of plan.

In addition, it is to be anticipated that warming of water already initiated through the climate change will also continue in the future. This also has effects on the benthos. For instance, a settlement of new species or a total shift of the species spectrum may come about. On the whole, however, this development is independent of the non-implementation or implementation of plan.

9.3.5 Fishes

9.3.5.1 Effects of uses on the subject of protection fishes

Effects of shipping on the subject of protection fishes

The effects of shipping on fishes come about through oil disposal at sea, propulsion-related emissions, waste disposal, noise emissions, consequences of shipping accidents, input of toxic substances such as TBT and introduction of non-indigenous species. The effects can be summarised as follows:

Direct effects:

- Small-scale, short-term effect due to visual disturbance
- Small-scale, short-term adverse impacts including loss of individuals due to oil inputs
- Regional, short-term impairment due to oxygen deficiency situations
- Supra-regional, long-term effect due to the introduction of toxic substances (especially TBT)
- Supra-regional, lasting effect due to the introduction of alien species

Indirect effects:

- Supra-regional, lasting effect due to the biomass increase of benthic organisms

Effects of pipelines and submarine cables on the subject of protection fishes

Ground-proximate turbidity vanes can appear during the laying of pipelines and submarine cables, and local sedimenta shifting can occur, through which the fishes can be affected. The generation of magnetic and electrical fields, which can have effects on individual fish species, is not to be ruled out during the operation of submarine cables. However, with the utilisation of triple-core rotary current cables and bipolar DC cables, magnetic effects during the operation can be disregarded or ruled out, since the magnetic fields virtually cancel each other out.
In summary, the essential effects of the laying of pipelines and submarine cables on the subject of protection fishes can be stated as follows:
Direct effects:

- Small-scale and short-term habitat loss through the scare effect due to the noise emissions of construction machinery (ships, cranes, other vehicles)
- Small-scale and short-term loss of individuals through pollutant emissions
- Short-term and small-scale adverse impact on individuals, eggs and larvae of fishes on account of turbidity vanes
- Small-scale and lasting habitat loss through area encroachment
- Small-scale and lasting shift/expansion of the species spectrum through settlement with species living in the hard substrate
- Small-scale and lasting potential migratory influence on several smaller fish species due to the submarine cable operation

Indirect effects:

- Small-scale and lasting expansion of the food spectrum and the food availability for individual species

Effects of scientific marine research on the subject of protection fishes

Depending on the type of methods and equipment utilised, different marine research activities are associated with various environmental effects.

In summary, the essential effects of research actions on fishes can be stated as follows:

- Local, temporary damage or loss of individuals due to sampling
- Local, temporary effect due to the increase of pollutant inputs
- Local, temporary habitat loss through noise emissions

Effects of offshore wind energy use on the subject of protection fishes

Construction and operation of offshore wind energy farms can have construction-, facility- and operation-related effects on fish.

Construction-related: Construction activities lead to noise emissions which display scare effects on fish, but can also lead to physiological damages of the hearing apparatus or other organs, with lethal consequences, if the intensity is correspondingly high. This particularly applies to explosive noises, as they are possibly to be anticipated with pile driving. Moreover, sedimentary whirl ups and turbidity vanes develop through the construction activities, which – even if they are temporary and species-specific different – can cause physiological impairments as well as scare effects. Furthermore, an adverse impact on fish roe or larvae can occur through covering with sediment.

Facility-related: Habitats will be encroached upon through the erection of the foundations of OWEF and technical platforms as well as scour protection. As a result, the habitats of demersal

fish will be permanently lost. But this habitat loss is limited to the immediate, relatively small location of the individual OWEF and platforms.

Operation-related: Scare effects, but also attraction effects, may also be displayed on fishes because of the noise emissions and vibrations emanating from the OWEF in operation. The effects will probably be different, depending on the species. In addition, electromagnetic fields originating from the cable connections can disturb the orientation of bottom-dwelling fishes., This possibly concerns migratory fish species in particular, including the freshwater eel.
In summary, the essential effects of OWEF on the fish macrobenthos can be stated as follows:

Direct effects:

- Local and short-term habitat loss through the scare effect due to the noise emissions of construction machinery (ships, cranes, other vehicles)
- Local and short-term loss of individuals through pollutant emissions
- Local and short-term habitat loss for the duration of the installation of foundations due to sedimentary whirl ups and turbidity vanes
- Short-term and local adverse impact on individuals, eggs and larvae of fishes on account of turbidity vanes
- Local and permanent habitat loss through area encroachment
- Local and permanent shift/expansion of the species spectrum through settlement with species living in the hard substrate

Indirect effects:

- Small-scale and lasting expansion of the food spectrum and the food availability for individual species

Effects of fisheries and mariculture on the subject of protection fishes

The environmental effects resulting from fisheries are varied and partially substantial in their effects. Overfishing through excessive fishing with fleets that are too large and excessive catch quotas are a fundamental problem. The by-catch of young fish additionally deprives the populations of the potential for reproduction, as almost the entire by-catch is thrown overboard as discard and the majority dies.

In summary, the essential effects of mariculture on fishes can be stated as follows:

- Supra-regional, permanent effect due to the introduction of alien species
- Regional, permanent effect due to the increase of nutrient concentrations
- Regional, permanent effect due to the increase of pollutant inputs
- Supra-regional, permanent effect due to the increased density of parasites and pathogens

9.3.5.2 Development of the subject of protection fishes in case of non-implementation of plan

The subject of protection fishes would continue to be affected by the implementation as well as by the non-implementation of plan, particularly through the effects of fisheries, since influence cannot be exerted on catch quotas or possible fishing prohibitions because of the EU's regulatory competence.

A fundamental change of the present structure of the fish communities found in the Baltic Sea is not to be anticipated in case of non-implementation of plan.

In the realm of mariculture, the unregulated settlement of fish cultures in the EEZ would be conceivable in case of non-implementation of plan. With outbreaks of diseases, an increased density of parasites and pathogens could also lead to an increased risk for the transmission to natural populations in the ambient water near the facility. The escape of cultivated organisms could also be problematic if these mingled with natural conspecifics and took part in the propagation. This could endanger genetic diversity. If non-indigenous fish species escape and are able to establish themselves, indigenous fish species could be displaced.

Since the plan involves numerous source-related regulations regarding protection of the marine environment, which refer to an optimally compatible development of uses, the protection of the subject of protection fishes would be much more difficult to ensure in case of non-implementation of plan than with implementation of plan.

In addition, it is to be anticipated that warming of water already initiated through the climate change will also continue in the future. This also affects the subject of protection fishes. For instance, immigration of new species and the displacement of indigenous fish species can come about. On the whole, however, this development is independent of whether the plan is implemented or not.

9.3.6 Marine mammals

9.3.6.1 Effects of uses on the subject of protection marine mammals

Effects of shipping on the subject of protection marine mammals

- Shipping can bring about effects on marine mammals, in particular through acoustic emissions, inputs of pollutants during operation as well as the danger of animals colliding with ships. In the extreme case, underwater sound from anthropogenic sources like shipping can lead to physical injuries, but also disturb communication or lead to behavioural changes such as disrupting social behaviour and prey-catching behaviour or triggering flight behaviour.

In summary, the essential effects of shipping on marine mammals can be stated as follows:

Direct effects:

- Regional, almost continuous stress along very busy shipping routes due to acoustic emissions of varying intensity, depending on type of ship
- Regional, but temporary stress due to acoustic emissions of varying intensity on various shipping routes
- Collisions with ships, selectively and accidentally

Indirect effects:

- Contamination with pollutants which partially also enter into the marine environment and the marine food chain as a result of shipping
- Stress via the marine food chain due to accumulation of pollutants, oil and waste from normal shipping operation – is to be classified as extensive and continuous

Direct as well as indirect effects of shipping come about differently depending on the specific marine mammal species. According to the current state of knowledge, effects of shipping on marine mammals can only be partially estimated:

- Substantial direct and indirect effects on the level of individuals are possible through shipping.

Effects of shipping on the population level of marine mammals are for the most part unknown and can hardly be estimated or predicted.

Effects of pipelines and submarine cables on the subject of protection marine mammals

Marine mammals

The laying and partially also the dismantling of pipelines and submarine cables can have effects on marine mammals, especially with regard to shipping, acoustic emissions and turbidity vanes. Possible operation-related effects of submarine cables on marine mammals depend on the type of respective cable.

Direct effects:

- Regional, temporary average effects due to acoustic emissions during the laying
- Regional, temporary average effects due to shipping traffic during the laying
- Regional, temporary marginal effects due to sedimentary vanes during the laying
- Regional, temporary marginal to average effects during maintenance and repair works

Indirect effects:

- Regional, marginal effects over the marine food chain due to sediment and benthos changes

Based on previous findings, the following conclusions can also be :

- Based on the linear, narrow course of pipelines and cables, effects on feeding grounds and also on breeding grounds of marine mammals can be ruled out with considerable certainty.
- During normal operation, effects of pipelines and submarine cables on marine mammals can be ruled out.

According to the current state of knowledge, significant effects of power-discharging cables on marine mammals can be ruled out with considerable certainty:

- Marginal effects during laying, maintenance and dismantling cannot be fully ruled out on the *level of individuals*
- No effects through current carrying cables are to be anticipated on the *population level* of marine mammals.

Effects of scientific marine research on the subject of protection marine mammals

The various activities of marine research are not anticipated to have any effects on marine mammals. At most, local, temporary effects from fishing vessels or through seismic and other high- sonic research activities are possible.

Effects of offshore wind energy use on the subject of protection marine mammals

Effects through the offshore wind energy facilities on harbour porpoises, seals and common seals can be particularly caused through acoustic emissions during the installation of foundations, if no reduction or preventive measures are taken.

In summary, the essential effects of offshore wind energy facilities on marine mammals can be stated as follows:

Direct effects:

- Regional, high intensity effects for the duration of the installation of foundations due to acoustic emissions
- Marginal, regional and temporary effects due to sedimentary vanes
- Regional, but temporary average effects due to shipping traffic in the area of the construction site
- Regional, temporary habitat loss through avoidance of the construction area for the duration of pile driving.

Indirect effects:

- Regional, temporary effects of at most marginal intensity on the marine food chain during the construction phase due to sediment and benthos changes
- Regional, permanent effects of marginal to average intensity on the marine food chain through the facilities due to sediment and benthos changes and increase of available biomass (attraction effects)

According to the current state of knowledge, effects of OWEF on marine mammals in relation to the reference level can be estimated as follows:

- Direct and indirect effects through acoustic emissions during the erection of foundations are possible on the *level of individuals*.
- Effects through offshore wind energy facilities on the *population level* of marine mammals up to now are not known, but rather to be ruled out due to the results at hand from existing offshore wind farms.

Effects of fisheries and mariculture on the subject of protection marine mammals

Effects on marine mammals through fisheries can be particularly caused through by-catch of animals in nets or through food limitation due to overfishing of important fish stocks.

In summary, the essential effects caused by the fishing industry on marine mammals can be stated as follows:

Direct effects:

- Large-scale, significant and permanent effects through by-catch
- Regional and temporary effects through fishing vessels

Indirect effects:

- Large-scale, significant and permanent effects through the impact of the fisheries on the marine food chain
- Regional food limitation through catching fish prey preferred by marine mammals

Direct as well as indirect effects of fisheries on marine mammals come about differently according to the specific species. According to the current state of knowledge, effects of fisheries on marine mammals can only be partially estimated:

- Substantial direct and indirect effects on the level of individuals are possible fisheries.
- There are references to significant effects of fisheries on the population level of marine mammals.

9.3.6.2 Development of the subject of protection marine mammals in case of non-implementation of plan

As described, the subject of protection marine mammals would also in parts continue to be affected by non-implementation of plan through the effects of various uses or uses not subject to approval, such as shipping and fisheries. The developments which exclusively refer to the non-implementation of plan will be subsequently described.

The development of additional projects, according to the SeeAnlV, for the use of offshore wind energy could not be excluded in the NATURA2000 areas, if the plan is not implemented. The controlled and alleviated authorisation for projects at ecologically suitable locations, which are intended by the wind energy priority areas, would be omitted. A concentration of wind energy use in suitable locations would not be possible. Threats of harbour porpoises in important feeding and breeding grounds could also possibly come about as a result.

In the event of non-implementation of plan, substance input could come about with regard to maricultures. Pollutants, especially growth hormone preparations and antibiotics, could impair the immune system of marine mammals. Changes at the bottom end of the food chain could influence the entire food chain and thus also higher predators such as marine mammals.

Since the plan involves numerous source-related regulations regarding protection of the marine environment, which refer to an optimally compatible development of uses, the protection of the subject of protection marine mammals would be much more difficult to ensure in case of non-implementation of plan than with implementation of plan.

The effects of climate changes on marine mammals are complex and difficult to predict. All species will be indirectly affected through possible effects of climate change on their food organisms, especially fish. The already addressed possible displacement of harbour porpoise populations could be connected with climatic changes. On the whole, however, this development is independent of the non-implementation or implementation of plan.

9.3.7 Seabirds

9.3.7.1 Effects of uses on the subjects of protection seabirds and resting birds

Effects of shipping on the subject of protection seabirds

The important effects of shipping on sea and resting birds are: visual disturbances with sensitive species , pollution during the operation; furthermore attraction effects, especially to fishing vessels. The effects are area-specific and of various intensity and duration. In summary, the essential effects of shipping on sea and resting birds can be stated as follows:

Direct effects:

- Regional, almost continuous scare effects through shipping with regard to species sensitive to disturbance, such as the diver
- Regional, but temporary effects through attraction effects with regard to scavenging sea birds, such as various sea gull species
- Regional to supra-regional, permanent effects of marginal to average intensity during operation due to pollution (waste, plastic components)
- Contamination with pollutants, particularly oil residue, which partially enter into the marine environment through shipping

Indirect effects:

- Effects via the marine food chain due to the accumulation of pollutants, particularly oil and oil residues from normal operation, are to be classified as extensive and continuous.
- Effects of contamination via accumulation in the food chain or change of the food chain with consequences for the survival and reproduction rate of seabirds and resting birds

Direct as well as indirect effects of shipping are different for the specific seabird and resting bird species. According to the current state of knowledge, effects of shipping on seabirds and resting birds can only be partially estimated:

- Direct and indirect effects on the *level of individuals* are possible through shipping.
- Effects of shipping on the population level of sea bird species are for the most part unknown and can only be estimated or predicted with difficulty.

Effects of pipelines and submarine cables on the subjects of protection seabirds

Effects on seabirds and resting birds can come about during laying, operation, maintenance and dismantling of pipelines and submarine cables in the sea. To be mentioned are: shipping traffic, sedimentary vanes and pollution. Increased shipping traffic and pollution are possible during maintenance and repair works. In summary, the essential effects of pipelines and submarine cables on seabirds and resting birds can be stated as follows:

Direct effects:

- Regional, temporary average effects due to laying works or dismantling
- Regional, temporary average effects due to shipping traffic during the laying and during maintenance

Indirect effects:

- Regional, temporary marginal effects due to sedimentary vanes during the laying and the dismantling
- Regional, marginal effects on the marine food chain due to sediment and benthos changes

According to the current state of knowledge, significant effects of pipelines and submarine cables on sea and resting birds can be ruled out with considerable certainty:

- Marginal effects during the laying, maintenance and renaturation cannot be completely ruled out on the *level of individuals*.
- No effects are to be anticipated on the *population level* of sea birds.

Effects of scientific marine research on the subjects of protection seabirds

According to the current state of knowledge, effects of scientific research on seabirds and resting birds can only be partially estimated:

- Small-scale, temporary effects through by-catch during fishing research activities
- Regional, temporary effect through throw-back (discards) during fishing research activities
- Regional, temporary effects through research ships (visual disturbance stimulus) on species sensitive to disturbance
- Regional effects through impact of fishing research on the marine food chain

Regional food limitation through fishing of the fish prey preferred by seabirds and resting birds

Effects of offshore wind energy use on the subjects of protection seabirds

The construction and operation of offshore wind farms can endanger seabirds and resting birds particularly through habitat loss in the construction phase or facility-related habitat loss in the operational phase. In summary, it can be stated that sufficient observations and results concerning negative or positive effects on seabirds and resting birds on the individual or population level are still lacking. There are references of adverse effects through habitat loss for species sensitive to disturbance through the studies in the “Horns Rev” wind farm. Other effects of OWEF on sea and resting birds through prohibition or reduction of ship traffic and the fishing activities in the wind farm are for the most part unexplored. In summary, the essential effects of OWEF on seabirds and resting birds can be stated as follows:

Direct effects:

- Regional, but temporary effects on species sensitive to disturbance through habitat loss due to ship traffic in the area of the construction site
- Marginal regional and temporary effects due to impairment of food supply through sedimentary vanes in the construction phase
- Regional habitat loss limited to the construction phase due to avoidance of the construction area
- Regional, permanent effects for species sensitive to disturbance through habitat loss caused by avoidance of the facilities
- Regional, permanent attraction effects through enrichment of food supply and the resting opportunities on the facilities

Indirect effects:

- Regional effects –limited to the construction phase – of at most marginal intensity on the marine food chain due to sediment and benthos changes
- Regional, permanent effects of marginal to average intensity on the marine food chain through the facilities due to sediment and benthos changes and increase of available biomass (attraction effects)

According to the current state of knowledge, effects of OWEF on seabirds and resting birds in relation to individual and population level can be estimated as follows:

- Direct and indirect effects on the *level of individuals* are possible through shipping traffic and construction works during the erection of OWEF.
- Lasting, species-specific also permanent, direct and indirect effects are possible on the *level of individuals*, particularly habitat loss through avoidance behaviour with species sensitive to disturbance.
- Effects through OWEF on the *population level* of seabirds and resting bird species are not known up to now, but rather to be ruled out due to the results at hand from existing offshore wind farms.

The above-listed effects on sea and resting birds in the North Sea EEZ through the erection and the operation of offshore wind energy facilities can ultimately lead to habitat loss, and can be recorded and quantified or predicted in the field. The assessment is based on previous results from existing offshore wind farms (Horns Rev and Nysted) and predictions made for concrete plans in the German North Sea EEZ.

Effects of the fisheries and mariculture on the subject of protection seabirds

The following effects of the fishing industry on seabirds and resting birds can be essentially anticipated:

Direct effects:

- Regional, temporary effects through avoidance behaviour of species sensitive to disturbance by fishing vessels
- Regional, temporary effects through attraction effects during fisheries activities (discards)
- Large-scale, significant permanent effects through by-catch in nets
- Large-scale, significant permanent effects through food limitation or reduction of food quality as a consequence of overfishing

Indirect effects:

- Large-scale, lasting significant effects through the impact of fisheries on the marine food chain

Direct as well as indirect effects of fisheries come about differently with seabirds and resting birds depending on the specific species. According to the current state of knowledge, effects of fisheries on seabirds and resting birds can only be partially estimated:

- Substantial direct and indirect effects on the *level of individuals* through fisheries are known.
- There are also references to significant effects of the fishing industry on the *population level* of sea birds through impairment of survival and reproductive success.

Moreover, sea birds could be indirectly affected in the event of settlement of maricultures via deterioration of water quality and via the food chain.

9.3.7.2 Development of the subject of protection seabirds in case of non-implementation of plan

As described, the subject of protection seabirds and resting birds would in parts also continue to be affected with non-implementation of plan through the effects of various approved uses or uses not subject to approval, such as shipping and the fisheries. The developments which exclusively refer to the non-implementation of plan will be subsequently described.

The development of additional projects, according to the SeeAnlV, for the use of offshore wind energy could not be excluded in the NATURA2000 areas, if the plan is not implemented. The controlled and alleviated authorisation for projects at ecologically suitable locations, which are intended by the wind energy priority areas, would be omitted.

Concentration of wind energy use in suitable locations would not be given. As a result of unregulated expansion of wind farms also into sensitive areas, significant effects would be anticipated on the populations − above all the divers, which are particularly sensitive to disturbance. Important feeding and rest habitats of seabirds and resting birds could be endangered.

In the event of non-implementation of plan, maricultures could lead to substance. Pollutants, especially growth hormones and antibiotics, could impair the immune system. Changes at the bottom end of the food chain could influence the entire food chain and thus also upper predators such as seabirds.

Since the plan involves numerous source-related regulations regarding protection of the marine environment, which refer to the most compatible development of uses possible, the protection of the subject of protection seabirds and resting birds would be much more difficult to ensure with non-implementation of plan than with implementation of plan.

The effects of climate change on the species concerned are complex and difficult to predict. All species will be indirectly affected by possible effects of climate change on their food organisms, especially fish. The divers nesting in the Arctic or Subarctic are probably also affected at their nesting places, since according to prediction models the temperature increase in the Arctic will be particularly strong and loss of brooding habitats could come about on a large scale. On the whole, however, this development is independent of the non-implementation or implementation of plan.

9.3.8 Migratory birds

9.3.8.1 Effects of the uses on the subject of protection migratory birds

Effect of shipping on the subject of protection migratory birds

The effects of shipping on migratory birds come about through oil disposal at sea, propulsion-related emissions, waste disposal, noise emissions, consequences of shipping accidents, input of toxic substances such as TBT and introduction of non-indigenous. The effects can be summarised as follows:

Direct effects:

- Small-scale, short-term effect due to visual and acoustic disturbance, which can lead to an increased risk of collision, particularly during nights under poor visibility conditions through the illumination of ships and the subsequently related attraction.
- Small-scale, short-term effect due to oil inputs, which can lead to an endangerment of aquatic migratory birds.

Effects of pipelines and submarine cables on the subject of protection migratory birds

Possible effects of pipelines and submarine cable are mainly limited to the construction phase. There is a risk of collision with the illuminated construction vehicles during nights with poor visibility conditions.

Effects of scientific marine research on the subject of protection migratory birds

Depending on the type of methods and equipment utilised, different marine research activities are associated with various environmental effects. Short-term and small-scale visual and acoustic disturbance effects can be relevant for the migratory birds.

Research activities can also be associated with the installation of high structures. Effects through such structures are conceivable during nights with poor weather conditions, when migratory birds are attracted by the illuminated platform and collide with the platform structures.

Effects of offshore wind energy use on the subject of protection migratory birds

Construction and operation of offshore wind energy farms can have construction, facility and operation-related effects on migratory birds.

Construction-related: Construction activities bring about prospective scare and barrier effects on migratory birds. Bird strike can occur on the structures under construction as well as on all wind farm facilities in the subsequent operational phase. Additional attraction and blinding effects which increase the risk of bird strike can possibly emerge through any nocturnal illumination.

Facility and operation-related: The operation of OWEF can lead to scare and barrier effects. Flying around or other irritations of flight behaviour leads to increased energy consumption, which can have an effect on the fitness of birds and subsequently on their survival rate or breeding success. How possible barrier effects of larger wind farm areas or repeated evasion of OWEF affects migratory birds cannot be safely predicted according to the current state of knowledge. But it is to be assumed that sensitivity and reactions occur to different degrees specific for the different species. Bird strike events can occur on the rotors and piles of OWEF. Poor weather conditions – particularly at night and with strong wind – as well as high migratory intensities increase the risk of bird strike. On top of that are possible blinding or attraction effects through safety lighting or marking the facilities with beacons, which can lead to disorientation of birds. Furthermore, birds which get caught on the rotors in follow currents and air turbulences could be strongly impaired in their manoeuvrability. Just like the scare and barrier effects, for the aforementioned factors it is to be assumed that the sensitivities and risks are differently characterised on a species-specific basis.

The assessment of the conflict potential was made – differentiated according to species groups – on the basis of different habits, navigation ability and migratory behaviour (diurnal/nocturnal migrants) of the individual species. The aforementioned points can influence the risk of collision. The rarity, the threat status of a species and a possibly low reproductive rate has been included within the scope of the implemented sensitivity evaluation.

The species-specific individual consideration revealed that there is no threat for the majority of the migratory bird species or their biogeographical populations found in the Baltic Sea through the construction and operation of offshore wind energy facilities.

Special migratory corridors are not discernible for nocturnal migrating birds in the region of the Baltic Sea. Under normal migratory conditions preferred by most bird species, no references can be found up to now for any species that the birds pass through and/or do not recognise and avoid these obstacles in their typical migration in the danger area of facilities, including the rotors of OWEF. Special dangers emerge for the migratory bird with unexpectedly arising weather conditions.

The available findings on the migratory behavioural patterns of various bird species, the customary flight altitudes and the daytime distribution of bird migrations allows the conclusion that a majority of migratory birds will not be affected at all through the projects in the priority areas.

Effects of the fishing industry and mariculture on the subject of protection migratory birds

Visual and acoustical disturbance and scare effects, which are dependent on the frequenting of sea areas through the fishing industry, emanate for migratory birds as a result of the fishing industry. For aquatic migratory birds which interrupt their migration for feeding there is also the risk of getting caught in the fishing nets and drowning. For instance, on the Rönne Bank in the Pomeranian Bight, a large number of divers, auks and sea ducks drown in the.

The management of mariculture facilities is linked with ship transports and various offshore activities in the facilities, which bring about small-scale visual and acoustical disturbance and scare effects.

9.3.8.2 Development of the subject of protection migratory birds in case of non-implementation of plan

The subject of protection migratory birds would in parts also continue to be affected with non-implementation of plan through the effects of various unapproved uses or uses not subject to approval, such as existing high structures and fisheries. The developments which exclusively refer to the non-implementation of plan will be subsequently described.

The development of additional projects, according to the SeeAnlV, for the use of offshore wind energy could not be excluded in the NATURA2000 areas, if the plan is not implemented. The controlled and alleviated authorisation for projects at ecologically suitable locations, which are intended by the wind energy priority areas, would be omitted.

A concentration of wind energy extraction to suitable locations would not be given. The risk of a barrier effect for migratory birds would be increased through an unregulated expansion of wind farms.

In the event of non-implementation of plan, substance inputs could come about with regard to maricultures. Pollutants, especially growth hormones and antibiotics, could impair the immune system. Changes at the bottom end of the food chain could influence the entire food chain and thus also upper predators such as migratory birds.

Since the plan involves numerous source-related regulations regarding protection of the marine environment, which refer to an optimally compatible development of uses, the protection of the subject of protection migratory birds would be much more difficult to ensure with non-implementation of plan than with implementation of plan.

The effects of climate changes on the affected species are complex and hard to predict. All species will be indirectly affected through possible effects of climate change on their food organisms, especially fish. On the whole, however, this development is independent of the non-implementation or implementation of plan.

9.3.9 Bats

9.3.9.1 Effects of the uses on the subject of protection bats

Effects of shipping on the subject of protection bats

Effects of shipping on bats are for the most part unknown. There are merely isolated reports of bat findings on ships (see Chapter 2). Accordingly it is assumed that attraction effects through ships can emerge. There is a possible danger of bats colliding with ships in adverse weather conditions.

According to the current state of knowledge, however, effects of shipping on bats are insignificant on the individual as well as the population level.

Effects of pipelines and submarine cables on the subject of protection bats

Substantial effects on the individual level as well as on the population level of bats through the laying, operation and renaturation of pipelines and submarine cables can be ruled out with certainty.

Effects of scientific marine research on the subject of protection bats

According to the current state of knowledge, effects of marine research on bats can be ruled out with certainty.

Effects of offshore wind energy use on the subject of protection bats

Threats for bats can be caused through the construction and operation of offshore wind farms, particularly through collisions. Initial information regarding the risk of collision has been gathered from first studies in Sweden on the possible threat of bats through onshore and offshore wind energy facilities. It has been determined that migratory as well as non-migratory species are occasionally affected through collisions. Most bats in the area of offshore wind energy facilities were observed at night in search of food, hunting for the insects to be found here. However, the reasons for the aggregation of insects at the OWEF remained largely unclear. In addition to the illumination of facilities and the heat development on turbines and rotor blades, so-called “hill topping” (seeking elevated, protruding sites) also comes into question.

Based on previous observations it is assumed that bats more likely migrate in concentrations (swarms) across the sea, probably at substantial flight altitudes and on regularly used migratory routes. In summary, it can be stated that sufficient observations and results concerning negative or also positive effects on bats on the individual as well as on the population level through the erection of offshore wind farms is still lacking to this day. There are references concerning adverse effects through collisions of bats with wind power facilities on land. But at present there is a lack of suitable census methods for studies on the occurrence of bats in the marine area (see Chapter 2). As a result, concrete information concerning migratory species, migratory corridors, migratory altitudes and migratory concentrations is also lacking. Therefore, an assessment of possible effects is not possible at the present time.

Effects of the fishing industry and mariculture on the subject of protection bats

According to the current state of knowledge, effects of fisheries on bats can be ruled out with certainty.

9.3.9.2 Development of the subject of protection bats in case of non-implementation of plan

Populations and distribution of the bat species possibly migrating across the Baltic Sea are not conclusively recorded, particularly on account of the high migratory dynamics. Migratory patterns are also largely unknown. The population development cannot be estimated or predicted with the current state of knowledge. Relatively little is also known about possible effects of the uses on the subject of protection bats.

Based on this background, an assessment of the prospective development of the subject of protection bats in case of non-implementation of plan is only possible on a very limited basis.

The effects of climate change on bat species are also complex and hard to predict. All species will be indirectly affected through possible effects of climate change on their food organisms, in

this case insects. On the whole, however, this development is independent of the non-implementation or implementation of plan.

9.3.10 Air

9.3.10.1 Effects of the uses on the subject of protection air

Effects of shipping on the subject of protection air

Pollutant emissions, especially of nitrogen oxides, sulphur dioxides, carbon dioxide and soot particles, comes about through shipping. These can negatively influence the air quality.

Effects of pipelines and submarine cables on the subject of protection air

The laying, maintenance and renaturation of pipelines and submarine cables are associated with shipping traffic. In turn, this leads to pollutant emissions which can influence the air quality. Substantial adverse effects on the air quality will not be anticipated.

Effects of scientific marine research on the subject of protection air

Due to the local, temporary activities of the scientific research, important effects on the subject of protectio air can be excluded.

Effects of offshore wind energy use on the subject of protection air

As a result of the construction and operation of offshore wind farms, pollutant emissions which can influence the air quality will come about through construction site and maintenance vehicles.

Effects of fisheries and mariculture on the subject of protection air

Fisheries as well as installation and operation of maricultures are associated with shipping traffic. In turn, this leads to pollutant emissions which can influence the air quality. Substantial adverse effects on the air quality are not anticipated.

9.3.10.2 Development of the subject of protection air in case of non-implementation of plan

The increased intensity of utilization and a general increase in traffic leads to an increase in ship traffic, which can lead to a detrimental impact on the air quality. On the whole, however, this development is independent of whether the plan is implemented or not.

9.3.11 Climate

9.3.11.1 Effects of the uses on the subject of protection climate

Effects of shipping on the subject of protection climate

Effects of shipping on the climate through emissions cannot be completely ruled out.

Effects of pipelines and submarine cables on the subject of protection climate

The substances emitted in connection with shipping traffic (e.g. nitrogen oxides, sulphur dioxides, carbon dioxide and soot particles) through the laying, maintenance and renaturation of pipelines and submarine cables are as such basically to be classified as climate relevant. However, substantial negative effects on the climate through the laying, maintenance and renaturation of pipelines are not anticipated.

Effects of scientific marine research on the subject of protection climate

Due to the local, temporary activities of the scientific research, any effects on the subject of protection climate can be excluded..

Effects of offshore wind energy use on the subject of protection climate

The substances emitted in connection with shipping traffic (e.g. nitrogen oxides, sulphur dioxides, carbon dioxide and soot particles) through the construction and operation of offshore wind farms are as such basically to be classified as climate relevant. However, substantial negative effects on the climate through the construction and operation of offshore wind farms are not anticipated.

Effects of fisheries and mariculture on the subject of protection climate

The substances emitted in connection with shipping traffic (e.g. nitrogen oxides, sulphur dioxides, carbon dioxide and soot particles) through fisheries as well as the installation and operation of mariculture facilities are as such basically to be classified as climate relevant. However, substantial negative effects on the climate through the fishing industry and mariculture are not anticipated.

9.3.11.2 Development of the subject of protection climate in case of non-implementation of plan

According to reports from the Intergovernmental Panel on Climate Change, the increase of sea surface temperature and the mean global sea level are to be anticipated as large-scale consequences of climatic changes on the oceans. Many marine ecosystems react sensitively to climatic changes. On the whole, however, this development is independent of the non-implementation or implementation of plan.

9.3.12 Natural scenery

9.3.12.1 Effects of the uses on the subject of protection natural scenery

Effects of scientific marine research on the subject of protection natural scenery

Scientific marine research can be associated with the erection of high structures in the form of research platforms, which can lead to visual changes of the natural scenery. But on account of the distance as well as the marginal number, substantial impairments of the natural scenery as it is perceived from land can be ruled out.

Effects of offshore wind energy use on the subject of protection natural scenery

Up to now, the landscape in the Baltic Sea EEZ has been characterised by the fact that with the exception of a few high structures, such as the FINO 2 research platform and the Arkona Basin

measuring mast, no structures project above the water column. Effects on the natural scenery will emerge through the realisation of offshore wind farms, since it will be changed through the erection of vertical structures. Moreover, the individual facilities must be marked with beacons at night or in the event of poor visibility. Optical impairments of the natural scenery can also come about as a result.

In addition to the sheer change of natural scenery, an impairment of the subjective landscape perception through the viewer on the coast can also come about. The actual visibility will be determined through the distance of the offshore wind farm to the coast or islands, the surface area size of the wind farm, the altitude of wind energy facilities, the visibility based on the specific weather conditions, the altitude of the viewer's location and the capability of the human eye.

Study results allow the conclusion that offshore wind farms planned in the Baltic Sea EEZ will only be perceptible on a very limited basis due to the distance of more than 30 km from the coast, and this also only with good visibility. The same also applies with regard to the nocturnal safety navigation lights.

9.3.12.2 Development of the subject of protection natural scenery in case of non-implementation of plan

The development of additional projects could not be excluded in the NATURA2000 areas, partly closer to coastal areas, if the plan is not implemented. The risk of visual adverse effects would possibly be marked up. It would also be considerably more difficult to regulate additional, possibly detrimental tall structures if the plan is not implemented.

A concentration of wind energy use to just a few suitable locations would not be given, so that the risk of possible visual impairments would be increased. The regulation of further possible encroaching high structures would be substantially more difficult with non-implementation of plan.

9.3.13 Tangible assets, cultural heritage (archaeology)

9.3.13.1 Effects of the uses on the subject of protection tangible assets, cultural heritage

With all uses which are associated with interventions in the sediment, a possible impairment of tangible assets or cultural heritage located on the seabed, which were not known in the run-up to the intervention, cannot be completely ruled out. In this connection, this concerns:

- Pipelines and submarine cables
- Scientific marine research
- Offshore wind energy use
- Fisheries

9.3.13.2 Development of the subject of protection tangible assets, cultural heritage with non-implementation of plan

References to possible tangible assets or cultural heritage are at hand insofar as the spatial locations of a vast number of wrecks are known and are recorded in the BSH nautical charts.

There is no information about memorials on the ground or leavings of settlements, yet. If the plan is not implemented, it would be difficult to factor the concerns of this subject of protection.

9.3.14 Biological diversity

Large-scale consequences of climatic changes also on the oceans are to be anticipated. This affects biological diversity, since many marine ecosystems react sensitively to climate changes. For example, it could lead to a shift in the species spectrum. A strong influence on the population density and dynamics is conceivable for example, which in turn would have significant consequences for the food chain. On the whole, however, this development is independent of the non-implementation or implementation of plan.

9.3.15 Interactions amongst the subjects of protection

The changes of individual components within the marine food chain are connected with the changes of the entire Baltic Sea ecosystem. In addition to natural variability, anthropogenic influences and climate change regulate the changes of the ecosystem.

In the event of non-implementation of the Maritime Spatial Plan, it cannot be ruled out that changes – particularly brought about through economic activities – could have a negative effect on the living marine environment.

9.4 Description and evaluation of prospective significant effects of implementation of the Maritime Spatial Plan on the marine environment

9.4.1 Shipping

In particular, the priority and reservation area designations for shipping are based on available shipping routes identified in the procedure for arrangement of the Maritime Spatial Plan. These specifications serve to keep important shipping routes free of incompatible uses, especially structural facilities, which contributes to the reduction of collisions, as well as the preclusive effect for wind energy constructions in the NATURA2000 areas does. The designation of priority and reservation areas for shipping does not have direct effect of the concentration and the control on ship traffic. In the future, shipping can also continue to use the entire sea region. As such, the area designations – in comparison with the actual status and the null variant – have no additional effects on the subjects of protection and the marine environment as a whole.

The Maritime Spatial Plan makes further statements regarding the targeted reduction of the burden on the marine environment through consideration of the respective state of technology as well as the best environmental practice commensurate with the HELCOM and OSPAR conventions. Negative effects on the subjects of protection are avoided because of this.

Based on the above statements and the presentations in Chapter 9.3 for the SEA (Strategic Environmental Assessment) it is to be stated in conclusion that no significant effects on the subjects of protection and the marine environment as a whole are to be anticipated through the designations for shipping in the Maritime Spatial Plan; but that in comparison with the non – implementation of the plan detrimental effects will be avoided, especially by reducing the risk of a collision.

9.4.2 Exploitation of non-living materials

No area designations will be made in the Maritime Spatial Plan for the Baltic Sea EEZ, since the framework operational plans required for the exploitation of sand and gravel have expired and therefore no extraction will take place. The framework operational plans regarding exploitation of non-living materials have not been reapplied for.

9.4.3 Pipelines and submarine cable

Protective distances of 500 metres on both sides in the area of planned pipelines are stipulated as reserve areas in the Maritime Spatial Plan, whereas it is pointed out that the laying of submarine pipelines is being granted freedom in accordance with UNCLOS. Therefore, the environmental effects of these area regulations do not exceed the effects of the null variant. On the contrary, possible negative effects can be reduced through the selection of a suitable route.

With regard to submarine cables for conduction of electricity extracted in the EEZ, target corridors are designated, through which the submarine cables are to be routed for conduction of electricity. Furthermore, it is a stipulated rule that cables shall be run parallel to one another and to existing infrastructures Possible interventions, especially through the laying of submarine cables, will thus be limited to a few areas, so that vast parts of the EEZ can be kept free of possible impairments. This leads to positive effects on the subjects of protection as well as the marine environment as in contrast to the null variant. In addition, laying works shall be temporally coordinated, to reduce cumulative effects.

Negative effects on the marine environment through interactions with greatest possible bunching and parallel routing to existing offshore facilities are not anticipated, since with minimum distances of 50 m between the respective cables a thermal decoupling is ensured and cumulative heat effects can be ruled out. The extensive avoidance of crossings of submarine cables amongst each other and with other existing or planned lines also positively effects the marine environment, especially the subjects of protection soil and benthos, since the introduction of artificial hard substrates in the form of rock fills (coarse gravel and rubble) – particularly in sea areas with predominantly homogenous sandy seabed – can be avoided. Amongst other things, the laying of submarine cables can be arranged as environmentally-friendly as possible by laying submarine cables only as deep as is necessary under consideration of shipping concerns . An increased demand on the sediment and extensive excavation will be avoided as a result. With the protection of the sediment, the settlement area of benthic communities will be protected at the same time.
When crossing sensitive habitats, possible detrimental impacts can be avoided by avoiding the periods in which specific species are particularly susceptible to disturbance. For instance, areas with major importance for resting birds will only be utilised in periods in which no resting bird occurrence is anticipated.

In principle, pipelines and submarine cable must be removed after abandonment of their use, insofar as a threat of life or health of individuals or of tangible assets or an impairment of predominant public interests is to be expected. Amongst other things, the latter encompass concerns of shipping as well as the marine environment. In the event of comparably greater environmental effects, a renaturation can be disregarded and the conduits can remain in or on the seabed.

The retreating working is even necessary if, as a consequence of this cables and pipelines, toxic substances of relevant manner or quantity remain in the marine environment. In case of disposition, suitable monitoring measures concerning possible threats should be arranged. Proliferation processes and widespread ecological interrelations of species and their habitats

should be considered with regard to the choice of location. The damaging or destruction of sand banks, reefs and submarine structures arising through gas discharges as well as definable areas with occurrence of benthos communities worthy of protection as particularly sensitive habitats shall be avoided during the laying and the operation of pipelines. Moreover, the concerns of cultural assets shall be taken into consideration. As a result of these regulations, positive effects on the subjects of protection and the marine environment as a whole are to be anticipated.

The Maritime Spatial Plan makes further statements regarding the targeted reduction of the burden on the marine environment through consideration of the respective state of technology as well as the best environmental practice commensurate with the HELCOM and OSPAR conventions on the laying, operation and the renaturation of pipelines and submarine cables. Adverse effects, especially on the benthos, can be reduced because of that.

Based on the above statements and the presentations in Chapter 9.3 for the SEA it is to be stated in conclusion that no significant effects on the subjects of protection and the marine environment as a whole are to be anticipated through the designations for pipelines and submarine cables in the Maritime Spatial Plan; but that in comparison with the non – implementation of the plan detrimental effects will be avoided.

9.4.4 Scientific marine research

Reservation areas will be designated for protection of long-term research series in the realm of fisheries research. As a result, these areas shall be kept free of uses which could devaluate the long-term research series. The area designations have no additional effects on the subjects of protection and marine environment as a whole when compared to the actual status and the null variant.

The Maritime Spatial Plan makes further statements regarding the targeted reduction of the burden on the marine environment through consideration of the respective state of technology as well as the best environmental practice commensurate with the HELCOM and OSPAR conventions on marine research. In addition, the results of scientific marine research shall be continually recorded for the best possible exhaustive explanation of ecosystem contexts and thus create a basis for a sustainable development of the EEZ. Moreover, the concerns of cultural assets shall be taken into consideration. Positive effects on the subjects of protection are to be anticipated because of this.

Moreover, positive aspects for the animated marine environment as a whole could emerge through the designation of reserve areas for scientific research in the Maritime Spatial Plan for the German Baltic Sea EEZ: interactions amongst the uses as well as cumulative effects on biological subjects of protection can be better assessed with existing and particularly with future plans.

Based on the above statements and the presentations in Chapter 9.3 for the SEA it is to be stated in conclusion that no significant effects on the subjects of protection and the marine environment as a whole are to be anticipated through the designations for scientific research in the Maritime Spatial Plan; but that in comparison with the non – implementation of the plan detrimental effects will be avoided.

9.4.5 Offshore wind energy

The 2005 designated special suitability areas “Western Adlergrund” and “Kriegers Flak” will be adopted as priority areas in the Maritime Spatial Plan. A complete development of the areas is taken as a starting point for the evaluation of the priority area designations; for this a minimum distance of 1,000 metres between the wind farms and a minimum distance of 800 metres between the single plants within the farms is assumed. At the same time, it is to be taken into consideration that the priority areas have already been approved before the Maritime Spatial Plan came into effect (see also Chapter 9.3.1.5).

Seabed and water
The designation of the Maritime Spatial Plan for offshore wind energy has a local environmental effect regarding the subjects of protection seabed and water. Whereas the soil (sediment) in the immediate vicinity is only affected permanently through the introduction of foundation elements and internal wind park cabling, the subject of protection “water” will be temporarily influenced in the environment of the facilities through relatively marginal current turbulence, attenuation of sea waves and formation of ground-proximate turbidity vanes. For the designation of these priority areas for offshore wind energy use., no other effects on the subjects of protection “water” and “sediment” are being expected in addition to the above presented marginal effects The dismantling of wind energy plants after the end of use will have positive effects particularly with regard to the subject of protection "water", because of the abolishment of local changes of flow fields and swell. Furthermore local consolidation of sediment caused by the foundation of structures will be undone.

Given the exclusion effect of the NATURA2000 areas designations, negative effects on water and seabed are minimized, in that the areas that come into question for constructing OWEFs are reduced.

Benthos
For both priority areas equally applies that no significant effects on the population level are to be anticipated through the construction, the plant, the operation and the dismantling of wind energy plants in the priority area, since a rapid resettlement is very likely because of the usually rapid regenerative capability of the occurring populations of benthos organisms with short generation cycles and their widespread distribution in the Baltic Sea.

A loss of further settlement areas is counteracted by the exclusion effect of the NATURA2000 areas and a possible area-saving arrangement of the individual OWEFs in the designations of offshore wind energy. However, new settlement area will also be created through the foundations and the scour protection, which can have small-scale effects on the naturally occurring benthos communities. This particularly applies to the soft-bed communities. Local and permanent effects of marginal intensity are to be taken into account on an operation-related basis.

Indirectly, the designation can also have positive effects on the benthos communities, since trawling will only be possible on a limited basis within the offshore wind energy farms. This can lead to a local improvement of the habitat conditions of benthic species which are sensitive to the influence of trawling. Special effects on long-living species are anticipated in this connection. A majority of Red List species could be positively influenced as a result.

Based on the above descriptions and evaluations for the SEA it is to be stated in conclusion that no significant effects on the subject of protection benthos are to be anticipated through the designations for wind energy in the Maritime Spatial Plan; but that in comparison with the non – implementation of the plan detrimental effects will be avoided.

Fishes
The habitat-typical pelagic and demersal fish community of the Baltic Sea was concurrently determined in both priority areas for wind energy use. For both priority areas equally applies that no significant effects on the population level are to be anticipated through the construction, the plant, the operation and the dismantling of wind energy plants in the priority area.

Given the exclusion effect within the NATURA2000 areas and the preferably space-saving arrangement of the individual OWEFs in the designations of Offshore windenergy, negative effects on the subject of protection fishes are minimised, in that the areas that come into question for windfarms are reduced.

Indirectly, the designation can also have positive effects on the fish communities, since trawling will only be possible on a limited basis within the offshore wind energy farms. And so the priority areas can become a refuge for fishes as long as the respective species will not be scared off through operational noises. In all previously known studies, an increase of local biomass, possibly associated with species diversity, is predicted through the assumed settlement of plants with marine growth of algae and mussels.

Based on the above made descriptions and evaluations, for the SEA it is to be stated in conclusion that no significant effects on the subject of protection fishes are to be anticipated through the designations for wind energy in the Maritime Spatial Plan; but that in comparison with the non – implementation of the plan detrimental effects will be avoided.

Marine mammals
The designations of the Maritime Spatial Plan for offshore wind energy do not lead to any significant effects on marine mammals. The regulations in favour of the state of technology as well as the best environmental practice commensurate with the HELCOM and OSPAR conventions shall be implemented on the approval level. For instance, regulations regarding noise reduction should also be made here, in accordance to general approval practice.

The designation of priority areas beyond the main feeding and breeding areas of harbour porpoises serves the protection of the species. At the same time, threats of harbour porpoises in important feeding and breeding grounds will be avoided under consideration of the regulations in favour of the application of the state of technology as well as the best environmental practice commensurate with the HELCOM and OSPAR conventions and through the exclusion of new plans for offshore wind energy within the NATURA2000 areas. The area designations also do not lead to any negative effects for common seals and grey seals.

Based on the descriptions and evaluations above, it is to be stated in conclusion for the SEA that no significant effects on the subject of protection marine mammals are to be anticipated through the designations for wind energy in the Maritime Spatial Plan; but that in comparison with the non – implementation of the plan detrimental effects will be avoided.

Seabirds and resting birds
The effects of offshore wind energy plants are assessed on the basis of the function and importance of sub-territories for seabirds and resting birds:

- During the *construction phase*, with average to high, but merely temporary burden, significant effects in areas with special characteristics and of outstanding importance would be anticipated for resting birds. In addition to main feeding and main resting habitats, overwintering habitats of unique importance and escape habitats of special

importance would be designated in critical situations. Due to the high mobility of the animals, no significant effects would be anticipated for sub-territories which have no outstanding importance.
- In the *operational phase*, with rather marginal burden through shipping traffic, plant-related significant effects could only be anticipated in areas which do not have any outstanding importance for valuable and endangered species. According to the current state of knowledge, however, significant effects can be ruled out in all other areas.

On the whole, the effects of wind farms on seabirds in the priority areas will probably be insignificant. As a result of the exclusion effect of the NATURA2000 areas and the designation of the two priority areas for offshore wind energy in, from en ecological point of view suitable, locations, significant effects on seabirds will be minimised as the loss of habitat will be reduced. At the same time, areas of special importance as feeding grounds will be excluded from further plans or constructions of offshore wind farms, respectively barrier effects will be avoided.
The priority areas do not lie in the route between breeding colonies and feeding grounds or between important feeding grounds. This will avoid barrier effects with regard to the foraging of birds.

The regulations in favour of the state of technology as well as the best environmental practice commensurate with the HELCOM and OSPAR conventions are targeted at the avoidance and reduction of negative effects on sea and resting birds through construction and operation of OWEF. This particularly applies in view of measures for minimisation of pollutant and light emissions, as it is also general approval practice to do so. Based on the above descriptions and evaluations for the SEA it is to be stated in conclusion that no significant effects on the subject of protection seabirds and resting birds are to be anticipated through the designations for wind energy in the Maritime Spatial Plan; but on the contrary, adverse effects will be avoided.

Migratory birds
The effects of offshore wind farms on migratory birds are such that no threat of bird migration by wind farms is to be anticipated.

The designation of priority areas for offshore wind energy as well as the exclusion effect within the NATURA2000 areas help to minimize effects on migratory birds, in that the areas that come into question for the construction of OWEFs and consequently any barrier effects will be reduced. As a result, negative effects on migratory birds will be reduced, in which case the areas coming into question for the construction of OWEF and any barrier effects will be reduced. Areas which might be of special importance for bird migration will thus be left out.

After expiration of the exclusion period, the Maritime Spatial Plan provides that wind farms shall be arranged spaciously so that barrier effects with regard to bird migration can also continue to be minimised.

The two main conflicts for migratory activities are risks of collision with the single plant and a barrier effect as a consequence of the extensive effect of an offshore wind energy farm.
The conflict potential of both aspects will be further reduced through a height restriction for OWEF, a hub height of 125 metres above mean sea level.

In summary, the following prognostic core statements can be made:
- Special migratory corridors are not discernible for any migratory bird species in the region of the Baltic Sea priority areas, since the bird migration proceeds along orientations lines near the coast or in a broad front migration across the Baltic Sea that is not definable in greater detail.

- Under normal migratory conditions in good weather conditions preferred by the migratory bird species, no has been found up to now for any species that the birds pass through and/or do not recognise and during their migration avoid these obstacles in the height of plants, including the rotors of OWEF. Threats potentially emerge when unexpected arising bad weather conditions arise.
- Possibly flying around the priority areas does not create any negative effects on the further development of populations.
- Possible danger potentials which emerge from project-related effects have to be considered on the approval level through effect-avoiding and/or effect-minimising measures and concepts so that no additional danger potential is created.

The consideration of the available findings on the migratory behavioural patterns of various bird species, the typical flight altitudes and the daytime distribution of bird migration allows the conclusion that a majority of migratory birds will not be affected in any way through the realisation of possible projects in the priority areas, and a threat of bird migration through the construction and operation of OWEF will not occur – even under cumulative consideration of the wind energy farms situated on the migratory route, already erected or consolidated according to plan . However, it is to be conceded that this prediction will be made according to the state of knowledge and technology under premises which are not yet suitable to safeguard the basis for the subject of protection in a satisfactory manner. This is to be regulated on the approval level. In this way, a threat of bird migration can be lastingly ruled out with the required certainty. Based on the above descriptions and evaluations for the SEA it is to be stated in conclusion that no significant effects on the subject of protection migrating birds are to be anticipated through the designations for wind energy in the Maritime Spatial Plan; but that in comparison with the non – implementation of the plan detrimental effects will be avoided.

Bats
The effects of OWEF in the priority areas on bats which possibly migrate across the sea cannot be assessed at the current time due to a lack of adequate survey methods and information.

However, the designation of priority areas in distances of more than 30 km from the mainland (coastline) allows the assumption that in large concentrations along the coast migratory bats remain out of danger. At the same time, threats to bats will be further reduced through the exclusion of new plans for offshore wind energy beyond the priority areas. However, threats of single individuals through collisions cannot be completely ruled out.

Climate
Negative effects on the climate through construction and operation of offshore wind farms in the priority areas for wind energy are be anticipated. On the contrary, substantial advantages for the climate ensue from the development of the regenerative source wind energy and the substitution of fossil energy source possible because of this. An important contribution can be provided towards achievement of the development objectives for offshore wind energy defined in the “Federal Government Strategy for Wind Energy Use at Sea”.

Natural scenery
Up to now, the seascape in the priority areas for wind energy has been characterised by the fact that with the exception of a few high structures, such as the FINO 2 research platform and the Arkona Basin measuring mast, no structures arise above the water column. Effects on the natural scenery will emerge through the realisation of offshore wind farms, since it will be changed through the erection of vertical structures. Moreover, the facilities must be marked with beacons at night or in the event of poor visibility. Optical impairments of the natural scenery can also come about as a result.

The extent of the impairment of natural scenery through wind energy plants is strongly dependent on the respective visibility conditions, but also on subjective perceptions as well as the viewer's basic attitude towards offshore wind energy as a form of renewable energies. The vertical structures atypical to the natural scenery on the coast can partially be perceived as disturbing, but also partially as technically interesting. However, they bring a change of the natural scenery. The character of the area will also be fundamentally modified because of this.

Given their distance from the coast, the farms will only be perceptible on a very limited basis, and this also only with good visibility. The same also applies with regard to the nocturnal safety navigation lights.

The detrimental impact on the natural scenery or its perceptibility associated with wind energy plants, which will be constructed in visual range of the coast and islands, will be reduced by the fact that the hub height of wind energy facilities is restricted to 125 metres above mean sea level in the Maritime Spatial Plan. Furthermore, the exclusion effect.

In conclusion, the impairment of natural scenery through the designation of priority areas is to be classified as marginal.

Tangible assets, cultural heritage
Based on the available hydroacoustic studies as well as following analysis of the underwater obstacle databank, no findings are available concerning tangible assets of cultural heritage in the priority areas.
If culturally significant findings or tangible assets are ascertained in the approval procedures for the construction of offshore wind farms in the prescribed environmental impact assessment (EIA) and foundation exploration, suitable measures for their preservation are to be implemented. A corresponding textual specification has been made for this purpose.

9.4.6 Fishing industry and mariculture

Area designations will not be made for fisheries and mariculture. This is why no changes of environmental effects whatsoever compared to the null alternative can come about.

However, the Maritime Spatial Plan includes statements regarding the targeted reduction of the burden on the marine environment through fisheries under consideration of the respective state of technology as well as the best environmental practice commensurate with the HELCOM and OSPAR conventions. In addition, the fish stocks shall be managed as much as possible on a sustainable basis for lasting safeguarding of fisheries use under consideration of the concept of greatest possible permanent yield developed by the EU Commission. Positive effects on the subjects of protection are to be anticipated because of this.

Furthermore, for minimisation of substance inputs into the marine environment, only maricultures whose organisms normally require no material supply are permissible. In addition, facilities preferred for mariculture in combination with already available installations shall follow. Moreover, the interests of cultural assets shall be taken into consideration. Negative effects on the subjects of protection are avoided as a result of this.

Based on the above statements and the presentations in Chapter 9.3 it is to be stated in conclusion for the SEA that no significant effects on the subjects of protection and the marine environment as a whole are to be anticipated through the designations for fisheries and

mariculture in the Maritime Spatial Plan; but that in comparison with the non – implementation of the plan detrimental effects will be avoided.

9.4.7 Marine environment

In the Maritime Spatial Plan designations regarding the marine environment will be made, which will also have effects on the subjects of protection and the marine environment as a whole. The textual principles regarding the marine environment target the protection and the development of marine nature as well as the safeguarding of the marine landscape or the preservation of the extensive open-space structure. In this way, the EEZ – as a natural region in its respectively typical, natural characteristics and with its exchange modalities and interactions for preservation of biological diversity – shall be secured and developed on a sustainable basis. At the same time, the natural resources shall be used economically and considerately in accordance with the general principle of sustainability. Impairments of natural balance shall be avoided and reduced under consideration of the precautionary principle as well as the ecosystem approach. In areas no longer used for a long time, the functions of the natural balance shall be restored in their original condition or be secured in its efficiency in state of new ecological balance in a condition adapted to the new living conditions.

In terms of the marine landscape, efforts will be targeted at securing this landscape in its natural characteristics, and to preserve its characteristic extensive open-space structure extensively. The EEZ shall be permanently preserved as an extensive, ecologically intact open space, and also be developed and secured in its importance for functional seabeds, for the water resources, the fauna and flora (biodiversity) and the climate. Moreover, the open space shall be kept free of uses, especially buildings and structures which would also be comparably possible on land. This not only encompasses the uses which are also basically possible on land, but benefit from special site characteristics at sea.

These principles pursue an integrative approach for protection and for development of the marine environment as well as for minimisation of possible negative impairments through specific uses. They take into consideration the idea of sustainability and the ecosystem approach with its holistic perspective as well as possible cumulative effects, interactions and exchange modalities.

Based on this background, positive effects on the marine environment due to the designations of the Maritime Spatial Plan regarding the marine environment are to be anticipated for the totality of the subjects of protection.

9.4.8 Interactions of uses with the marine environment and biological diversity

The Maritime Spatial Plan has effects on the marine environment and biological diversity, particularly for wind energy use as well as for the laying and the operation of submarine cables for conduction of the energy generated in the EEZ. The following effects are essentially to be anticipated through the construction and the operation of offshore wind energy plants submarine electricity cables:

- Sedimentary rearrangement and turbidity vanes during the construction phase of a wind farm or the laying electricity cables will influence the food conditions on a short-term basis.
- Noise emissions, whereby the strongest noise emissions will probably be caused through the pile-driving of foundations. This can likely lead to temporary flight reactions and

temporary avoidance of the area by some fish species, many sea bird species as well as marine mammals.
- The construction of foundations can bring about a deprivation of settlement area for the benthos coenosis, which can also result in changes of the food web.
- Introduction of artificial hard substrate through foundations, mast and transformer station leads to a local change of soil characteristics and sedimentary conditions. The food web at the site can be influenced through change of the species composition of the macrozoobenthos community.
- Prohibition of uses like navigation or fisheries in the area of offshore wind energy farms can lead to an increase in the biomass of fish species of commercial or non-commercial importance.

The implementation of the Maritime Spatial Plan in the German EEZ in the Baltic Sea makes it possible to arrange activities on an environmentally compatible basis. Based on the source-related regulations regarding protection of the marine environment with the aforementioned uses as well as spatial and temporal planning and coordination of activities, it is to be assumed that the status of the marine environment positively and the biological diversity will more likely develop positively the Maritime Spatial Plan is implemented. The designation of priority areas beyond areas with outstanding importance for protected and threatened species serves the protection of species. Possible threats of species to be protected shall be avoided through the exclusion of new plans for offshore wind energy beyond the priority areas. Therefore, valuable habitats for benthos with high occurrence of Red List species will be excluded from the plans. Important resting, feeding, moulting and overwintering habitats of sea and resting birds will also be excluded. The same also applies to important feeding and breeding habitats of marine mammals. The biological diversity be protected through the exclusion of ecologically important habitats from plans.
Long-term positive effects on global environmental protection and the preservation of biological diversity are to be anticipated through the operation of OWEF and the related CO_2 savings with electricity generation.

Positive aspects for the living marine environment as a whole could emerge through a holistic view in the Maritime Spatial Plan under consideration of any interactions amongst all already existing and planned uses for the German EEZ in the Baltic Sea: interactions amongst the uses as well as cumulative effects on biological subjects of protection can be better assessed – and if necessary, predicted – with existing and particularly with future plans.

Based on the above descriptions and evaluations for the SEA it is to be stated in conclusion that no significant effects on the marine environment and particularly on the biological diversity are to be anticipated through the designations with regard to shipping, exploitation of non-living materials, pipelines and submarine cables, offshore wind energy, fisheries and mariculture as well as scientific marine research in the Maritime Spatial Plan for the German EEZ in the Baltic Sea; but that in comparison with the non – implementation of the plan detrimental effects will be avoided.

9.5 Impact assessment regarding the areas of Community importance or regarding European bird sanctuaries

According to § 7 sec. 7 ROG1998 (cf. § 7 sec. 6 ROG), it is to be examined whether the objectives and targets for the areas of Community importance or for special protection areas according to the EU Bird Directive can be significantly impaired through the designations of the

Maritime Spatial Plan. The corresponding assessment complies with § 38 in conjunction with § 34 BNatSchG.
The Special Protection Area “Pomeranian Bight” (due to EU bird directive) designated by the regulation from 15 September 2005 as well as the five listed FFH areas “Fehmarn Belt”, “Cadet Channel”, “Western Rönne Bank”, “Adlergrund” and “Pomeranian Bight with Oder Bank” ” (according to the EU Habitat Directive) are located in the German EEZ in the Baltic Sea. These protected areas have been incorporated in the Community List by the EU Commission in 2007. Other special areas of concern or special protection areas have not been registered by Germany.
The preservation objectives of the respective areas are the criterion for an impact assessment.

9.5.1 Pipelines and submarine cables

Pipelines
There are no pipelines in the German EEZ in the Baltic Sea at present, but two projects are in the course of the approval procedure. The currently planned pipeline route for one of these gas pipelines will be secured as a reserve area within the framework of spatial planning. This has a range of 8 km². Possible significant impairments of the preservation objectives or the protection objectives of the areas of Community importance or the for special protection areas according to the EU Bird Directive can be ruled out. The examination was carried out with the help of the corresponding preservation objectives or protection objectives.

Designation area for the BGI project:

- The planned project proceeds at a distance of ca. 6 km to the FFH area “Cadet Channel” (ca. 6 km).
- Reefs and sandbanks / marine mammals: no long-range effects on the FFH area “Cadet Channel” with regard to the habitat type “reef” are to be anticipated through the laying and operation of the BGI pipeline due to the distance of ca. 6km. Significant impairments of marine mammals can be ruled out. The laying works which lead to noise emissions will only be carried out on a few days and on a small-scale basis. Consequently, possible significant impairments of the preservation objectives and the protection objectives for this FFH area cannot be assumed.

Submarine cables
In the Baltic Sea, a target corridor – so called gate - will be designated, through which the electricity cables of offshore wind energy farms in the “Western Adlergrund” priority area are to be conducted. This target corridor is located about ca. 1 km away from the FFH area “Western Rönne Bank”; therefore effects on the habitat type “reef” are ruled out.
With regard to the subject of protection marine mammals, it applies that possible effects of cables are normally limited to the laying phase, and are thus temporally and spatially limited. As a result, long-range effects on the protection and nature conservation objectives of the FFH area “Western Rönne Bank” can be ruled out.

9.5.2 Offshore wind energy

Two priority areas for wind energy will be designated in the Maritime Spatial Plan: “Kriegers Flak” and “Western Adlergrund”. Possible significant impairments of the preservation objectives or the protection objectives of the areas of Community importance (FFH) or the protected areas according to the EU Bird Directive can be ruled out. The examination was implemented within

the framework of the procedure regarding designation as special suitability areas with the help of the corresponding nature conservation objectives or protection objectives.

Priority area "Kriegers Flak"

- The special suitability area according to § 3a SeeAnlV "Kriegers Flak" (which was designated by BSH in December 2005) has been adopted as a wind energy priority area in the Maritime Spatial Plan. This priority area is located at a distance of about 52 km from the FFH area "Western Rönne Bank".
- The impact assessment comes to the conclusion that the construction of wind energy plants in this area – under consideration of effect-minimising and damage-limiting measures – will not have any significant effects on the protection and nature conservation objectives of the FFH area "Western Rönne Bank".

Priority area "Western Adlergrund"

- The special suitability area according to § 3a SeeAnlV "Western Adlergrund" (which was designated by BSH in December 2005) has been adopted as a wind energy priority area in the Maritime Spatial Plan. This priority area is located at a distance of ca. 100 m from the FFH area "Adlergrund" as well as the European bird protection area "Pomeranian Bight". Moreover, the FFH areas "Western Rönne Bank" and "Pomeranian Bight with Oder Bank" are situated at a distance of 2.3 km or 27 km, respectively, from the priority area. An impact assessment was implemented within the framework of the designation procedure according to § 34 BNatSchG with the help of the aforementioned provisional nature conservation objectives of the FFH area "Western Rönne Bank": This impact assessment applies analogous to the other FFH areas.
- The impact assessment comes to the conclusion that the construction of wind energy facilities in this area – under consideration of effect-minimising and damage-limiting measures – will not have any significant effects on the protection and nature conservation objectives of the FFH areas "Adlergrund", "Western Rönne Bank" and "Pomeranian Bight with Oder Bank" as well as the EU bird protection area "Pomeranian Bight".

9.6 Measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the marine environment through the implementation of the Maritime Spatial Plan

Basically an improvement in consideration of the marine environment concerns can be expected as a result of the Maritime Spatial Plan. Positive effects on the development of the environmental status are to be anticipated as a result of the implemented planning designations. This is particularly due to the fact that the investigated uses would also develop on at least the same scale without a Maritime Spatial Plan. In this case, however, this would occur without the control and mitigation effect of the Maritime Spatial Plan, in which the development of the marine environment concerns represented an important component of consideration. In addition designations underwent a continual optimisation process, since the continuously acquired findings from the SEA implemented parallel to the arrangement of the Maritime Spatial Plan have been taken into consideration (compare Chapter 9 of the Maritime Spatial Plan).

Specific spatial and textual regulations have been made in the Maritime Spatial Plan, whereas the corresponding environmental protection objectives presented in Chapter 1.3 of the

Environmental Report also serve to avoid and reduce significant negative effects of the implementation of the Maritime Spatial Plan on the marine environment. As a result of the specifications of the Maritime Spatial Plan, no significant negative effects, but rather positive effects on the marine environment are to be anticipated through the implementation of the Maritime Spatial Plan.

The following aspects have been particularly taken into consideration during the selection of regulations for avoidance and reduction of significant negative effects on the marine environment:

- Results of the SEA with regard to the importance of individual sub-areas for biological subjects of protection during the designation of priority and reserve areas for the single uses, particularly with offshore wind energy, including consideration of interactions amongst the biological subjects of protection during the site selection for the respective use
- Findings acquired on the project level, particularly results of project and site-related environmental impact studies (basic phase) as well as results from impact assessments regarding the areas of Community importance (FFH, SAC) or regarding SPAs
- Cumulative effects of a use in various sub-areas, protection-related, regional and/or over-regional

For one thing, source-related designations will also be made in the Maritime Spatial Plan, which shall ensure the most environmentally compatible arrangement with the individual uses. Also, further principles regarding protection and care of the marine environment and marine landscape – which also display a -mitigating effect – will be set forth in addition to the presented source-related designations. Regulations, which go even further, will be additionally adopted for the use of offshore wind energy.

It generally applies that designations of the Maritime Spatial Plan are to be further specified on the project level for the planning, construction and operational phase by the respectively responsible approval authority.

Particularly in view of an optimal environmentally compatible arrangement of possible updates of the Maritime Spatial Plan, the following measures will be targeted:

- Description and evaluation of the effects of uses on the marine environment within the scope of monitoring
- Evaluation of monitoring results with regard to cumulative effects of a use in various sub-areas
- Evaluation of monitoring results with regard to cumulative effects or interactions of various uses
- Consideration of the monitoring results and, if necessary, adaptation of the use strategy

9.7 Examination of possible alternatives and description of the environmental assessment implementation

9.7.1 Examination of possible alternatives

Shipping

In order to meet the freedom of shipping anchored in Art. 58 Para. 1 UNCLOS and recognised as defined by Art. 60 Para. 7 UNCLOS, and also to consider the shipping routes which are important for international shipping in terms of spatial planning, a basic network of shipping

routes will be secured, above all as grounds for defence against uses which are incompatible with shipping. Therefore a null variant, i.e. a renunciation of area designations for shipping, does not represent an alternative. Moreover, this null variant would not lead to any changes with regard to environmental effects, since nothing in shipping traffic would change.

Exploitation of non-living materials
In the Baltic Sea, no area designations for the exploitation of non-living materials have been made. No extraction of sand or gravel is taking place at present, since the framework operational plans have expired. It would be conceivable to make area designations for authorisation fields according to the Federal Mining Act (BBergG). But since the framework operational plans required for extraction have expired or official plan approval procedures for approval of framework operational plans the exploitation of non-living materials have not been initiated in these authorisation fields, this alternative has been rejected. On top of this is the fact that there are no findings available regarding the necessity of extraction for supply of needs, which would make it advisable to additionally secure authorisation fields lying in the registered FFH area "Adlergrund" or in the nature reserve "Pomeranian Bight" (protected area according to the EU Bird Directive) through a planning area designation.

Pipelines
The laying and the maintenance of pipelines enjoy the freedom granted according to Art. 58 UNCLOS, whereby pursuant to Art. 79 Para. 5 UNCLOS, due consideration is to be shown for already existing pipelines. In particular, the possibilities of repairing existing pipelines may not be impaired. In order to meet all aspects of these circumstances, it is necessary to make area designations regarding the protection of existing pipelines, amongst other things to justify for defence against incompatible uses. A null variant does not come into consideration here. However, this would also not lead to any changes with regard to the environmental effects in comparison with the implemented designations.
The designations in the Baltic Sea are oriented along the pipelines in the course of approval procedures. Consequently, there are no spatial alternatives to the selected area designations.

Submarine cables for conduction of energy generated in the EEZ
The planned development of offshore wind energy in the EEZ results in the need for an appropriate number of planned cables for conduction of energy generated in the. For the connection to the mainland power grid it is necessary to secure the cable routing at suitable transfer points on the boundary to coastal waters. Based on this background, the stipulation of a target corridor (gate)– through which the cables for conduction of energy generated in the EEZ are to run – is necessary. A null variant does not come into consideration. Due to the omission of the gate's bunching effect through the increased area consumption, this would additionally entail increased negative environmental effects.
The gate's spatial location in the Baltic Sea results from the spatial planning designations or other regional planning considerations of the State of Mecklenburg-Western Pomerania (which are in turn oriented towards routing to suitable power supply points of the high-voltage/ultra-high voltage network), in which the plans in the EEZ follow. Under these given prerequisites there are no spatial alternatives to the gate.

Scientific marine research
In the EEZ there are extensive study areas in which long-term research series are particularly running for analysis of fish stocks. Designation of reservation areas is necessary so that these research series will not be devalued. The null variant is to be ruled out, since it could endanger the continuation of the research series.
Since the designations adopt the population, there are no spatial alternatives.
Offshore wind energy

In accordance with §3a SeeAnlV, the special suitability areas for wind energy “Adlergrund” and “Kriegers Flak” in the Baltic Sea have been designated on 31 December 2005 within the scope of the “Federal Government Strategy for Wind Energy Use at Sea”. After inclusion of further concerns – in addition to shipping and the marine environment – and concluding consideration, special suitability of these areas for use for wind energy generation was also noticed on the Maritime Spatial Plan, so that the areas were adopted as priority areas for wind energy in the .

Within the scope of the Federal Government Strategy for Wind Energy Utilization at Sea, the special suitability areas for wind energy “ Adlergrund” and “Kriegers Flak” were designated on 19 December 2005, in accordance with §3a SeeAnlV. After inclusion of further concerns – in addition to shipping and the marine environment – and after final consideration, special suitability of these areas for use for wind energy generation were also noticed at the Maritime Spatial Plan, whereupon the areas were adopted as priority areas for wind energy. Since this suitability area designation according to SeeAnlV has led to a high concentration of wind farm plans in these areas – of which one series has already been approved – the null variant is not an alternative.

Fisheries and mariculture
On one hand, area designations for fisheries are not possible because of the EU’s regulatory competence for fisheries policy and on the other hand because of spatially non-definable fishing grounds. Insofar as that is concerned, no area designations have been taken into consideration for fisheries.
Area designations are conceivable for mariculture. But since there are neither resilient experiences for the EEZ area nor emergent developmental trends in the realm of mariculture, spatial designations have been abandoned.

Marine environment
No specific area designations will be made for the protection and the development of the marine environment. There are various reasons for this. In principle, it is to be noted that the Maritime Spatial Plan may not make nature conservation area designations in lieu of technical authorities. And so the legally determined NATURA 2000 areas are already granted protective status. Additional designations in a Maritime Spatial Plan, thus, not comprise further control potential, so that a designations of priority or reservation areas will be abandoned.

The difficulty of the clear spatial definability of areas was also posed with regard to the considered designations of areas with significant importance for benthic communities. Therefore the protection of areas with occurrence of benthos communities worthy of protection was anchored as a textual principle on a source-related basis with the individual uses and abandoned from area regulations.

The problem of clear spatial definability of areas arises once again with regard to possible areas of special importance to bird migration, so that, again, no area designations were able to be made here. However, this concern shall be given due consideration in form of the exclusion effect in the NATURA2000 areas and in form of the adoption of a textual principle for mitigation of barrier effects during the construction and operation of OWEFs.

9.7.2 Description of the implementation of the strategic environmental assessment, including possible difficulties in the compilation of necessary information

On the one hand, in the Environmental Report at hand the current status of the environment will be described and evaluated, and the prospective development with non-implementation of the

plan will be presented. On the other hand, the prospective significant environmental effects caused through the plan's designations will be discussed and evaluated.
The basis for the assessment of possible effects of the Maritime Spatial Plan is a detailed description and assessment of the environmental status. The necessity for this ensues from the special features of the EEZ planning region: on the one hand, exhaustive planning will be pursued here for the first time, so that even with regard to the subjects of protection it is first necessary to prepare a comprehensive inventory. On the other hand, the special nature of the "sea" planning region necessitates a comprehensive analysis of the actual status.
The description and evaluation of the current status of the environment as well as the prospective development with non-implementation of the plan has been undertaken in view of the various subjects of protection.

The description and evaluation of the prospective significant effects of the implementation of the Maritime Spatial Plan on the marine environment also relate to the aforementioned subjects of protection. At the same time, it is to be taken into consideration that the Maritime Spatial Plan in the EEZ is a matter of single-stage planning, i.e. that project level subsequently follows.

All plan contents which can possibly display significant environmental effects will be scrutinised. The evaluation takes place on a verbal-argumentative basis.

With regard to the designations in which the possibility of significant impairment of the nature conservation objectives or the protection objectives of the areas of Community importance and of the European bird sanctuaries cannot be completely ruled out, an appropriate assessment commensurate with § 38 in conjunction with § 34 will be implemented for the FFH areas which are incorporated in the Commission List. The respective protection objectives and conservation objectives of the nature reserves (SPAs) or registered FFH areas designated through regulation are the criterion for these assessments. Insofar as they are available, the results of already implemented impact assessments will be incorporated within the framework of official plan approval procedures or designation procedures.
In accordance with the requirements of the SEA Directive, the measures which are planned in order to prevent, reduce and as fully as possible balance significant negative environmental effects due to the implementation of the plan will be presented. The totality of the plan's designations with regard to its reduction potential will be scrutinised for this purpose.

With regard to the examination of alternatives to the plan contents, their environmental effects will be scrutinised to the extent that this is necessary for any selection decision to be made on the Maritime Spatial Planning level.

For the description of planned measures regarding monitoring, existing monitoring measures as well as national and international monitoring measures are scrutinised with regard to their applicability for the Maritime Spatial Plan.

Information gaps and lack of evaluation criteria

Soil
The description and evaluation of the environmental effects in view of the subject of protection soil are based above all on the analysis of selective data surveys. In particular, there is a lack of an exhaustive sedimentary description with regard to the distribution of coarse sand-fine gravel areas and residual sediments in the form of gravels, stones and blocks as well as potential occurrence of the habitat type "submarine structures arising through escaping gas". No resilient statements of a quantitative nature concerning the spatial and temporal wrap-around of sand movements can be made for the natural sedimentary dynamics. In this context, there is a lack of

extensive information concerning the distribution and thickness of mobile or rearrangement-capable sands as well as suitable operational tools for modelling of sedimentary transport which provide resilient model findings concerning the rearrangement events on the seabed.

Water

In principle, sufficient knowledge is available for this subject of protection. The research project QuantAS will be referred to concerning the possible influences of a massive development of offshore wind energy on salt water incursions from the North Sea.

Phytoplankton and zooplankton

Information gaps appear with regard to possible effects of various uses on the occurrence of phytoplankton and zooplankton:

- Effects of the fisheries and mariculture on the phytoplankton and zooplankton in the EEZ are to a great extent unknown.
- Interactions between the effects of various uses and abiotic factors on the plankton are still insufficiently described and still not yet recorded in their entire diversity.
- Cumulative effects of eutrophication, fisheries, shipping and other uses on the plankton are to a great extent unknown.
- Prospective consequences of the fisheries on the plankton through the marine food chain cannot be reliably assessed.
- Prospective consequences of marine environmental pollution on the plankton and accumulation in the food chain cannot be reliably assessed.
- Changes in phytoplankton and zooplankton can neither be reliably ascribed to natural nor to anthropogenic causal influences.

Information gaps regarding natural variability and various effects through uses do not allow a reliable prediction of the development of phytoplankton and zooplanktons in the German EEZ:

- Effects of long-lasting activities with generation of turbidity vanes (such as gravel and sand extraction) are to a great extent unknown.
- Cumulative effects and/or interactions of climatic changes, fisheries, shipping, marine environmental pollution and other uses at sea on the phytoplankton and zooplankton in the EEZ cannot be assessed on the basis of the current state of knowledge.

The listing of knowledge gaps makes it clear that suitable measures for recording and monitoring the status of phytoplankton and zooplankton as the basis of the entire marine food web are still largely lacking.

Benthos

Information gaps still exist with regard to possible effects of various uses on the benthos:

- Effects of pollutants on the benthos are insufficiently known.
- Chronic effects and cumulative effects of various pollutants on the benthos are to a great extent unknown.
- Prospective consequences of fisheries on the benthos through the marine food web cannot be reliably assessed.
- Prospective effects of the introduction of hard substrate on the development of the benthos communities are still to a great extent unknown.

- Prospective effects through restriction of fisheries due to a possible navigation prohibition of certain fisheries vehicles in offshore wind energy farms are to a great extent unknown.
- Previous findings from the coastal waters and from different biotope types cannot be transferred to the situation in the EEZ without further ado.
- Prospective cumulative effects of various uses on the benthos cannot be reliably assessed.

Information gaps regarding natural variability and various effects through uses do not allow a certain prediction of the development of the benthos in the German EEZ:

- Quality-secured data on the use-specific effects on the benthos (particularly offshore wind energy as well as sand and gravel extraction) are lacking; effects of offshore wind farms on the benthos cannot yet be reliably predicted.
- Habitat expansion for benthos through introduction of hard substrate in offshore wind farms cannot be reliably predicted; cumulative effects on the population development of benthic species due to uses are to a great extent unexplored; the population development of Red List species cannot be assessed.
- Cumulative effects and/or interactions of climate changes, fisheries, marine environmental pollution, sand and gravel extraction, offshore wind energy use and other uses at sea on the benthos cannot be assessed on the basis of the current state of knowledge.

The listing of knowledge gaps makes it clear that suitable measures for recording and monitoring the status of benthic communities are still largely lacking.

Fishes

Information gaps still exist with regard to possible effects of various uses on the fish stocks:

- Interactions between species-specific development of fish stocks (as both prey organisms and predators) and fisheries are to a great extent unclear.
- Effects of pollutants on fish, particularly on commercially important species, are partially known.
- Chronic effects and cumulative effects of various pollutants on fishes are to a great extent unknown.
- Prospective consequences of fisheries on the fish fauna through the marine food web cannot be reliably assessed.
- Information about reaction of fishes to sound, particularly acoustic emissions from offshore wind energy plants, are only available on a very limited basis.
- Prospective effects of the change of habitat and food spectrum through introduction of hard substrate on the development of fish fauna are still to a great extent unknown.
- Prospective effects through restriction of fisheries due to a possible navigation prohibition of certain fisheries vehicles in offshore wind energy farms are to a great extent unknown.
- Prospective cumulative effects of various uses on the fish fauna cannot be reliably assessed.

Information gaps regarding natural variability and various effects through uses do not allow a certain prediction of the development of the fish fauna in the German EEZ:

- Quality-secured data on the use-specific effects on the fish fauna (particularly offshore wind energy as well as sand and gravel extraction) are lacking, so that the effects of offshore wind farms on fishes cannot yet be reliably predicted.
- A possible expansion of habitat and forage for fishes through introduction of hard substrate in offshore wind farms cannot be reliably predicted; cumulative effects on the

population development of fish species due to uses are to a great extent unexplored; the population development of Red List species cannot be assessed.
- Cumulative effects and/or interactions of climate changes, fisheries, marine environmental pollution, sand and gravel extraction, offshore wind energy use and other uses at sea on the fish fauna cannot be assessed on the basis of the current state of knowledge.

The listing of knowledge gaps makes it clear that suitable measures for recording and monitoring the status of fish fauna are still largely lacking.

Marine mammals
Information gaps still exist with regard to possible effects of various uses on the occurrence of marine mammals:
- Effects of pollutants on marine mammals are insufficiently known.
- Chronic effects and cumulative effects of various pollutants on marine mammals are to a great extent unknown.
- Prospective consequences of fisheries on marine mammals through the marine food web cannot be reliably assessed.
- Prospective effects of various uses on marine mammals cannot be reliably assessed.

Information gaps regarding natural variability and various effects through uses do not allow a certain prediction of the development of the marine mammals in the German EEZ:
- Quality-assured data on the use-specific effects on marine mammals are lacking, so that the use of offshore wind farms through harbour porpoises or possibly also habitat loss for harbour porpoises through avoidance of offshore wind farms cannot yet be reliably predicted.
- Moreover, possible effects such as injuries and physiological damages due to uses as well as behavioural changes due to operational noises or other operation-related effect factors in offshore wind farms and their environment are to a great extent unexplored.
- Cumulative effects and/or interactions of climate changes, fisheries, shipping, marine environmental pollution and other uses at sea on marine mammals cannot be reliably assessed on the basis of the current state of knowledge.

The listing of knowledge gaps makes it clear that suitable measures for recording and monitoring the status of marine mammals are still largely lacking.

Seabirds and resting birds
Information gaps still exist with regard to possible effects of various uses on the occurrence of sea and resting birds:
- Effects of pollutants on seabirds and resting birds are insufficiently known.
- Chronic effects and cumulative effects of various pollutants on seabirds and resting birds are to a great extent unknown.
- Prospective consequences of fisheries on seabirds and resting birds through changes of the marine food web cannot be reliably assessed.

Information gaps regarding natural variability and effects through various uses only allow a conditional prediction of the development of seabirds and resting birds in the German EEZ:
- Quality-secured data on the use-specific effects on seabirds and resting birds (e.g. offshore wind energy as well as sand and gravel extraction) are lacking.
- The species-specific use of offshore wind farms through sea birds cannot be reliably predicted.

- A species-specific habitat loss for seabirds and resting birds through avoidance of offshore wind farms cannot yet be reliably predicted.
- Possible effects such as injuries and physiological damages due to uses are to a great extent unexplored.
- The species-specific danger of collision for seabirds and resting birds with offshore wind energy plants is only partially predictable.
- Behavioural changes due to the operation of offshore wind energy plants with seabirds and resting birds are to a great extent unknown.
- Effects through disturbances or habitat losses with sea birds in the offshore area on the population level of species are to a great extent unknown.
- Habituation effects of species sensitive to disturbance with regard to uses in the offshore area still have not been analysed.
- A species-specific loss for seabirds and resting birds through avoidance of shipping routes remains uncertain.
- Prospective effects through habitat loss in use areas and displacement of the populations of sea and resting birds in adjacent areas cannot be reliably assessed.
- Prospective consequences in the event of population displacements (chance of survival, reproductive success) cannot be reliably assessed.
- Cumulative effects and/or interactions of climate changes, fisheries, shipping, marine environmental pollution and other uses at sea on seabirds and resting birds cannot be reliably assessed on the basis of the current state of knowledge.

The listing of knowledge gaps makes it clear that suitable measures for recording and monitoring the status of seabirds and resting birds are still largely lacking.

Migratory birds

Information gaps still exist with regard to possible effects of various uses on migratory birds:

- Sufficient findings concerning the effects of uses (particularly offshore wind energy) on migratory birds are still lacking at present.
- Previous findings concerning the effects of wind energy plants in coastal waters and on land are only transferable on a very restricted basis due to the various conditions.

Information gaps regarding natural variability and effects through various uses do not allow a certain prediction of the development of migratory events in the German EEZ:

- Quality-secured data on the use-specific effects on migratory birds (e.g. shipping, production platforms and offshore wind energy plants) are lacking.
- The species-specific danger of collision for migratory birds with offshore wind energy plants is to a great extent unknown.
- Possible barrier effects through offshore wind energy plants on species-specific migratory routes across the sea are to a great extent unexplored.
- Cumulative effects and/or interactions of climate changes, marine environmental pollution and other uses at sea on migratory birds cannot be assessed on the basis of the current state of knowledge.

The listing of knowledge gaps makes it clear that suitable measures for recording and monitoring bird migrations across the Baltic Sea are still largely lacking.

Bats

Information gaps stand out with regard to possible effects of various uses on the occurrence of bats:

- Fundamental findings concerning the effects of uses on bats are lacking at present

Information gaps regarding natural variability and effects through various uses do not allow a certain prediction of the development of the occurrence of bats in the German EEZ:

- Quality-secured data on the use-specific effects on bats (e.g. shipping, production platforms and offshore wind energy plants) are lacking.
- The species-specific danger of collision for bats with offshore wind energy plants is to a great extent unknown.
- Cumulative effects and/or interactions of climate changes, marine environmental pollution and other uses at sea on bats cannot be assessed on the basis of the current state of knowledge.

The listing of knowledge gaps makes it clear that suitable measures for recording and monitoring the migratory movements of bats across the Baltic Sea are still largely lacking.

Lack of evaluation criteria

Based on the existing information gaps it is particularly evident that criteria with regard to the evaluation of the status of biological subjects of protection as well as the evaluation of the effects of anthropogenic activities on the development of the living marine environment are still largely lacking.

The lack of criteria for evaluation of the status and the natural trend development of the biological subjects of protection in the marine area has manifold reasons specific to subjects of protection:

- Lack of historical data and long-term data series
- Lack of analysis of all available data in relation to subjects of protection
- Lack of trend analyses
- Lack of intersections of information from marine physics, marine chemistry, marine geology, marine biology and marine meteorology
- Lack of suitable methods for development of evaluation criteria with regard to the status of the living environment in the marine area.

In the aggregate, several factors complicate the arrangement of criteria for evaluation of the effects of various uses on the biological subjects of protection:

- Lack of criteria for evaluation of the natural status of the biological subjects of protection in the sea
- Lack of data concerning effects of individual uses (particularly with regard to new forms of uses) on the development of the biological subjects of protection
- Lack of long-term data concerning effects in order to be able to draw conclusions about permanent behavioural changes or impairments of populations
- Lack of suitable methods for development of evaluation criteria with regard to the effects of uses on the biological subjects of protection

Summary

The presented knowledge gaps make it clear that suitable measures for recording and monitoring the status of the individual subjects of protection are still in the process of development. But an increase of uses on the one hand and rapidly progressing changes of the marine ecosystem on the other hand necessitate specific measures for recording and monitoring the status of the subjects of protection as a basis for adequate Maritime Spatial planning as well as an effective protection of the marine environment. And so the following points would be particularly helpful for predictions within the scope of possible future updates:

- Analysis of all available data records from all research and monitoring programmes as well as environmental impact assessments within the framework of approval procedures for various uses
- Collective analysis and intersection of biological data with physical and chemical data
- Analysis of the impact monitoring in order to be able to record possible effects of uses such as offshore wind energy use on the subjects of protection.

9.8 Planned measures for monitoring the significant effects of the implementation of the Maritime Spatial Plan on the environment

The significant impacts of implementation of the Maritime Spatial Plan on the environment must be monitored according to § 7 sec. 10 ROG 1998 (cf. § 9 sec. 4 ROG). This is to ensure that any unforeseen detrimental impacts are discovered in good time for suitable remedial measures to be taken (cf. Art. 10 SEA Directive or § 14 m UVPG).

Accordingly, the planned measures for monitoring the significant impacts of implementation of the plan on the environment are to be designated in accordance with § 7 sec. 8 ROG 1998 (cf. § 9 sec. 4 ROG) of the Environmental Report. The monitoring is the responsibility of BSH, since this agency is the responsible authority for the Strategic Environmental Assessment (see § 14 m Para. 2 UVPG). At the same time (as is intended by Art. 10 Para. 2 of the SEA Directive or § 14 m Para. 5 UVPG), existing monitoring mechanisms can exploited in order to avoid duplicate work during the monitoring. The results of monitoring efforts must, in accordance with § 14 m Para. 4 UVPG, be taken into consideration whenever there is a renewed arrangement or a change in plan.

During the discussion and designation of planned monitoring measures, it is to be noted that the actual monitoring of significant effects on the marine environment can only be employed at the moment in which the regional development will be implemented, i.e. the uses designated in the Maritime Spatial Plan will be realised. Nevertheless, the natural development of the marine environment, including the development of climate changes, may not be disregarded during the analysis of monitoring measures. However, it applies that no general research can be pursued within the framework of the plan-related monitoring efforts.

This is why special importance is attached to the monitoring of the effects of the individual uses governed in the Maritime Spatial Plan. The guarantee of an optimal environmentally-friendly application of the use exploitation of non-living materials and wind energy have been designated in the Maritime Spatial Plan so that the effects on the marine environment shall be scrutinised and presented within the framework of project-related monitoring efforts.

The essential task of the plan accompanying monitoring efforts is to consolidate and analyse these results from the various monitoring programmes which will be implemented on the project level (so-called effect monitoring). The analysis will also refer to the unforeseen significant effects of the implementation of the Maritime Spatial Plan on the marine environment as well as the examination of the predictions and assumptions of the Environmental Report. In this connection and in accordance with § 14 m Para. 4 UVPG, the BSH will query the monitoring results – which are required for safeguarding of monitoring measures – on hand with the responsible authorities.

In summary, the intended plan-related monitoring measures in the Baltic Sea can be presented as follows:

- Consolidation and analysis of project-related effect monitoring efforts implemented on the project level and possible concomitant research
- Analysis of national and international monitoring programmes, in particular
  - National BLMP monitoring programme
  - BSH marine environmental monitoring network “MARNET”
  - Monitoring programme within the framework of HELCOM (for instance COMBINE, Pollution Load Compilation)
  - Monitoring programme within the framework of ICES
  - Monitoring of the preservation status of specific species and habitats according to Art. 11 FFH Directive
  - Management plans for the SPA “Pomeranian Bight” (European bird sanctuary) or studies for the assigned FFH areas
  - Environmental monitoring according to § 12 BNatSchG
  - Measures according to the EU Marine Strategy Directive
  - Measures according to the EU Water Framework Directive

Since the regulations of the Maritime Spatial Plan are predominantly related to existing uses, the ecological effects of many uses only depend to a certain degree on the implementation or non-implementation of the plan. Offshore wind energy represents an exception.

Initial findings for the monitoring at the spatial planning level are expected from the effect monitoring at the project level prescribed according to the standard for analysis of the impact of offshore wind energy on the marine environment (BSH standard assessment concept [StUK]), and from the accompanying ecological research by the Foundation of German Business (SDW) on the test field project located in the priority area for wind energy “North of Borkum” (offshore wind park “alpha ventus” with 12 wind energy facilities), sponsored by BMU research funds. In 2008, this wind farm shall be the first German wind farm to be constructed.

A series of measures for monitoring the effects on the marine ecosystem will be prepared until the end of 2007 within the scope of the designation of the project-specific analysis framework for the effect monitoring and the development of a concept for concomitant research for the test field project. For monitoring the implementation of the Maritime Spatial Plan, there are also certain measures planned that shall help to verify assumptions made with regard to significant impacts of offshore wind energy, and, wherever necessary, help to adapt use strategies and planned preventative and mitigating measures, or help to verify evaluation criteria, particularly those concerning cumulative effects.

It is planned to submit the entire concept of effect monitoring efforts (as formulated in StUK 3) to an initial evaluation during the construction and operation of the test field project in the priority area “Northern Borkum”.