



## **Strategic environmental assessment for the utilization of offshore wind energy**

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**2<sup>nd</sup> Scientific Conference on the Use of  
Offshore Wind Energy by the Federal  
Ministry for the Environment  
20. and 21. February 2007 in Berlin**

**Conference Proceedings**

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# Strategic environmental assessment for the utilization of offshore wind energy

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## Abstract

The Strategic Environmental Assessment (SEA), based on the Directive from 27 June 2001 (2001/42/EC) was transferred into German law by the Act of 26. 5. 2005. It offers an appropriate instrument for securing standards of environmental protection at an early stage, covering wide areas of offshore wind energy-usage in the German Exclusive Economic Zone (EEZ). In cooperation with the "Projektträger Jülich", the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety have sponsored a research project concerning important aspects of SEA in the German EEZ. From the various stages of SEA-procedure, the article focuses on the environmental report and monitoring stage. The information in the SEA-environmental report differs from that provided by the developer in the Environmental Impact Assessment (EIA). Aspects in which this occurs are for instance the institution in charge of the report, the assessment of reasonable alternatives, dimensions of time and space and the treatment of knowledge gaps. Should the German Federal Government's offshore wind energy strategy be put into effect, then the CO<sub>2</sub>-output of the German power generating industry would be reduced by 14%. This positive effect on climate protection must be taken into consideration. Monitoring is another important issue of SEA. Before embarking on this process, however, a number of issues must be clarified, i. e. the aim of the monitoring process, financial responsibility or follow-up procedure in the case of deviations from those environmental impacts initially envisioned. Since positive effects on the environment must also be considered, SEA is not an instrument for preventing offshore wind energy usage but rather supporting the planning process.

## 1. Introduction

The Strategic Environmental Assessment - short: SEA (SUP in Germany) - is an instrument with which nature and environmental protection standards may be secured at a regional level and an early stage in the planning process. For the use of offshore wind power in the North and Baltic Seas, and in particular in the German Exclusive Economic Zone (EEZ), the SEA offers an opportunity for multilateral planning, including many different aspects which are not covered by current licensing procedures for individual wind parks.

These questions were examined in the research project „Strategic Environmental Assessment and Strategic Environmental Monitoring for Offshore Wind Energy Parks“ that was funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and by „Projektträger Jülich“. In the research project carried out by OECOS Hamburg, Bioconsult SH and the University of Lüneburg, the interdisciplinary fields of planning, biology and law were linked with one another from the beginning stages of research. In this way it was ensured that the expertise from one discipline could be directly integrated into the work of the other disciplines. The project was carried out in three phases, in which the first two - „Fundamentals of Ecological Planning“ (SCHOMERUS/RUNGE/NEHLS et.

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<sup>2</sup> The authors would like to thank Mr. Wiss. Mitarb. Dipl. Umweltwiss. MARCUS STEFFENS for assistance in the compilation of this article.

al., 2006, 1 ff) and „Effects and Monitoring at the Regional Scale“<sup>3</sup> - have already been completed. The third stage of the project that is recently applied for is to include an international comparison and calibration of the SEA for the utilization of offshore wind energy.

Though it is not possible to illuminate the entire breadth and depth of the project's contents here, the goal of this journal contribution is it to present some of the most important results. After an introduction to the fundamentals of SEA (2.) a few aspects will be discussed in detail i.e. the environmental report for the offshore wind energy use with its relevant differences between the Environmental Impact Assessment (EIA; in German UVP) and the SEA, and the inclusion of climate protection into the SEA (3.). The conclusion contains general remarks on monitoring (4.), as well as a summary of results (5.).

## **2. Introduction to the fundamentals of SEA**

The SEA is a relatively new spatial planning instrument (SCHINK, 2005, 143 ff. and SCHOMERUS/BUSSE 2005, 398). After considerable discussion in the year 2001, the European Commission SEA proposal (DIRECTIVE 2001/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment) was issued into law. The integration into national legislation in Germany first occurred on a specialized legal level via the so-called „Law for Integration of European Legislation in Building and Construction“ in 2004, in which legislators managed to hold the conversion deadline of 21.7.2004 (Law for Integration of European Legislation in Building and Construction 24.6.2004, BGBl. 1359 ff. The newly integrated § 18 a of the ROG is of particular importance for the utilization of offshore wind energy, as it offers the first opportunity to establish principles and goals of spatial planning in regard to the economic and scientific use, the guarantee of the security and the facility of maritime traffic as well as the protection of marine environments of the EEZ. In 2005, approx. one year after the expiration of the conversion deadline, the Bundestag passed the Act introducing a Strategic Environmental Assessment as an amendment to the law on EIA, (Publication of the amendment of EIA law UVPG v. 25. 6.2005, BGBl. I, 1757.) in which the fundamental rules for the execution of the SEA were defined.<sup>4</sup>

In all brevity the process of SEA can be outlined as follows (SCHOMERUS/BUSSE, NordÖR 2005, 45 ff.):

The so-called **Screening** stage serves to answer the question of whether or not a plan or program requires an SEA in the first place. Within the context of the restrictions of the United Nations Convention on the Law of the Sea (UNCLOS) in the EEZ, there are two possibilities of planning related area designations: firstly the spatial planning according to § 18 a ROG, and secondly a designation in especially suitable areas as described in § 3 a of the Marine Facilities Ordinance (SeeAnIV). According to No. 1.6. and 1.7. of Appendix 3 of the EIA law, a SEA is required in both cases. The strategy for wind power utilization at sea by the Federal Government in 2002 does not require a SEA to be carried out since no legal obligation exists for the production of this political programme (cf. Art. 2 a 2. of the SEA directive).

The so-called **Scoping** stage determines the investigative framework following the parameters of specialized legislation and in particular according to the material criteria as defined by § 3 of the Marine Facilities Ordinance (§ 3 SeeAnIV; on the endangerment of the marine

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<sup>3</sup> The final report on the project „Effects and Monitoring at the Regional Scale“ is in preparation and will be published in 2007 by Lexxion-Verlag, Berlin.

<sup>4</sup> The name of the EIA law is no longer accurate. Since environmental assessment is a generic term for EIA and SEA, it should correctly be called law on environmental assessment.

environment and interference of maritime traffic). Beyond that, scoping has a participatory function. All public actors who are in any way environmentally affected including experts, non-governmental organisations etc if so required, are included. This serves to avoid superfluous assessments from the beginning. Different from the EIA, scoping in context of the SEA is an iterative, procedure-accompanying process. Investigation area, depth and scale must be adapted and changed if necessary due to realisations in the planning process. The environmental report lies at the heart of the SEA. It is discussed in greater detail below. During the following public participation the so-called „affected public“ is to be included in the process, i.e. all persons inland or in neighbouring states whose interests are affected by the proposed plan or program. Necessarily included are organisations. Legal concernment is not required here. Also, a purely factual, „visual“ affectation leads to the authorisation of objection. The mere assertion of reasons of the common good is however not sufficient here. Appropriately, plans are to be laid out, not only in the Federal Maritime and Hydrographic Agency (BSH) but also in neighbouring coastal municipalities on the coast. According to regulations of the Environmental Information Act, a publication of plan documents is also to appear in the Internet.

The **compilation of the plan** presents an evaluation step in addition to the evaluation in the environmental report. The plan or programme and a summarising explanation regarding the inclusion of environmental considerations, as well as monitoring measures are subsequently to be disclosed. The way in which environmental considerations, statements and results of consultations have been included in the decision-making process are to be described. Furthermore a justification must be provided as to why the accepted version of the plan was preferred over alternative variations.

**Monitoring** is discussed in detail at the end.

### **3. The environmental report**

The anticipated substantial impacts on the environment due to the execution of the plan or program shall be described and evaluated in the environmental report (SCHOMERUS / RUNGE / NEHLS et. al., 211 ff.). Therein not only the negative effects from an environmental perspective, but also the positive effects are to be included. Possible negative effects on certain species such as harbour porpoises or loons must be weighed in contrast to positive environmental effects such as the reduction of CO<sub>2</sub> emissions by the generation of clean, renewable energy. Special weight is to be put on the examination of reasonable alternatives. A difference is to be noted here in comparison to the Environmental Impact Assessment (EIA), in which only alternatives of the same type, such as route variations or dimensioning alternatives, are to be regularly examined. A wider spectrum shall be further considered to also include strategic alternatives. The „zero-variant“ is above all to be examined, i.e. the question of how environmental conditions would develop without wind- energy turbines.

#### **3.1. Comparison of the environmental impact study of the EIA and the environmental report of the SEA**

The environmental report of the SEA can be compared with the environmental impact study of the EIA - both are integrated into respective procedures in a similar way and both have an almost identical catalogue of natural assets. Nevertheless a series of differences exists, in which not only the chances but also the risks of the SEA may be pointed out in the management of planning conflicts. These differences may be substantiated in the following

comparison between the environmental impact study in the framework of the EIA and the environmental report of the SEA.<sup>5</sup>

First of all, the major players are different. While the EIS is usually provided by private investors at their own expense, who according to the SeeAnIV must place a proposal for the authorization of wind farms, the public hand of the planning authority, in this case the Federal Maritime and Hydrographic Agency (BSH) is involved in the provision of the environmental report of the SEA. The constellation of interests is different: the investor naturally has a substantial financial interest in the implementation of the project and is ready to furnish payments in advance, while the authority responsible for the environmental report must account for the public welfare, despite clearly existing interests in the project. Their budget for ecological investigations is generally limited.

Furthermore the meaning of the aforementioned alternative assessment differs from the EIS to the environmental report. In the EIA, the alternative assessment is limited to linear purposes such as the construction of a certain wind farm. As far as a bound decision is concerned, as in the case of § 3 of the Marine Facilities Ordinance (SeeAnIV), there can be no tolerance in consideration wherein a reasonable alternative assessment would be possible (DAHLKE 2002, 472 ff). The purposes of the SEA, on the other hand, are more multidimensional, allowing for alternative assessment with a broad tolerance for consideration. This particularly applies to regional planning in the EEZ, whose purpose cannot solely be the expansion of offshore wind power, but rather one that encompasses a broad spectrum of topics and goals including commercial and non-commercial shipping, fishing, nature conservation, etc. Cumulative effects prove to be far more comprehensively assessed in the environmental report than in the EIS, especially in case of concretisation the plan or programme (BRANDT/RUNGE, 35 ff.; SCHOMERUS/RUNGE/NEHLS et. al., 211 ff.).

The greatest potential of the SEA shows itself in the comparison between the EIS and the environmental report with regard to **temporal dimensions**. The EIS is carried out directly before the planned project implementation in the context of the licensing procedure; it is carried out only once, and its time perspective is based on the expected life span of the facility. The temporal perspective of the environmental report is substantially larger in contrast. The environmental report is set in motion, notably before a possible project development begins and extends long after the expected life span of an individual facility. The completed assessment during the environmental report is furthermore repeated in the updating cycles of the plan or programme (i.e. when changes occur) as well as in parts of the subsequent monitoring. This far-reaching temporal dimension of the SEA strengthens the process character of the Strategic Environmental Assessment.

A comparison of the **spatial dimensions** is particularly decisive for the larger spectrum of the environmental report. The spatial coverage of the EIS is pinpointed and project-related, the area to be examined extends locally or at best regionally. The environmental report is different: it refers to wide reaching land uses, considering potentially effected areas on a regional or even global scale - keyword *climatic protection*. Such a broad spatial interpretation of the SEA requires an adjustment of scale by site survey and evaluation methods.

Pursuant to how they are categorized in § 2 par. 1 of the EIA law, the natural assets of the EIS are to be specified at a regional scale. In principle the same catalogue of assets applies for the environmental report of the SEA as those, which are defined by the EIA law. However, in the case of the SEA this catalogue is to be extended to the supra-regional scale,

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<sup>5</sup> A specific study about the differences between SEA and EIA can be found in SHEATE/BYRON/DAGG/COOPER, Imperial College London Consultants, 2005.

whereby questions of biodiversity or climate are given new priority. Effects concerning migrating species, global climate changes, or questions of cross-regional pollutant transport may be secondary at the project level but receive greater precedence by the implementation of regional land-use plans or programmes.

Uncertainties and knowledge gaps must be taken into account in both the EIS and environmental report of the SEA (SCHOMERUS/RUNGE/NEHLS et. al., 230 ff). In the context of the EIS, it is to be noted that prior knowledge concerning environmental conditions in the EEZ is still incomplete – until now there has been relatively little experience with offshore wind technology. These uncertainties also play a role in the environmental report, but are again larger in scale. The diversity of effects is larger, the spatial spectrum broader and the prognosis periods are on a more long-term basis. The SEA must therefore be able to handle greater knowledge inconsistencies as compared to the EIA. This increased knowledge uncertainty in the SEA requires special control mechanisms. Appropriate instruments for this include among other things the de-stratification of the EIA (investigations are concretised at the project level), a carefully considered, problem-appropriate monitoring and a regular updating of planning, as well as the environmental report over long-term time intervals.

### **3.2. The issue of climate protection**

The EIA law's catalogue of natural assets is comprehensive. The climate is expressly mentioned in § 2 par. 1 no. 2. While the micro and meso-climate stand in the foreground of the EIA at the project level, the macro-climate is of greater importance at the regional planning level of the Strategic Environmental Assessment. Climatic protection is no foreign concept to the SEA; this has already been recognized in the British handbook "Strategic Environmental Assessment and Climate Change: Guidance for Practitioners". The British environmental agency has devoted an entire manual of guidelines solely to this topic (see [http://www.environment-agency.gov.uk/commondata/105385/sea\\_climate\\_change\\_905671.pdf](http://www.environment-agency.gov.uk/commondata/105385/sea_climate_change_905671.pdf)).

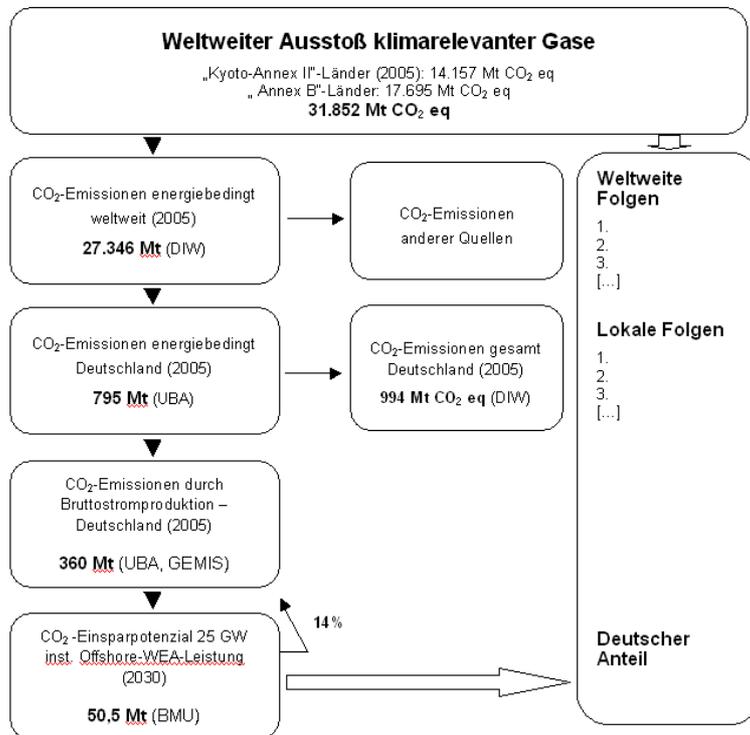
46% of harmful CO<sub>2</sub>-emissions arise from the generation and transformation of energy production. This sector is thus a far cry from households, traffic, trade and industry. The contents of the SEA therefore include aspects of climate change and air pollution control by plans and programs for energy supply. Pursuant effects on natural assets are to be regarded as issues of great relevance in the environmental report. Despite the fact that the climatic and air pollution effects caused by offshore wind turbines are marginal, this topic is essential in the context of the zero-alternative assessment. With a pending SEA for the entire German EEZ, all German offshore wind energy must undergo assessment. The environmental effects are to be compared with conventional energy production facilities to the same extent of complexity. The reduction of climate and air pollution effects sways the balance heavily in favour of offshore wind energy utilization.

Good practice deems that the breadth of the environmental assessment is adapted to the expected environmental effects. Within the framework of the SEA for offshore wind energy utilization projects, under the criterion of spacious effects not only effects at sea, but also on land are of importance. Nevertheless a practical planning requirement also exists in order to optimally reduce the complexity and to place the effects to the planned area in the foreground of the environmental report. A clear gradation of more general synopses, special literature studies and site-related investigations is hereby advisable for the report. If at all possible, prognosis of effects should be taken down to marine level.

The ecological report contains new data, which, as was recently published in the world climatic report of the Intergovernmental Panel on Climate Change in 2007, is to be

considered and updated when new knowledge comes into play (see <http://www.ipcc.ch/>). As is the case for the common abiotic natural assets, research concerning climatic effects is equally important for common biotic natural assets. Among other things, atmospheric warming can bring about a rise in total biomass. A rise in species numbers and individual numbers, as well as an increase in total biomass of floor-bed fauna is likewise probable for benthos. Species shifts among fish can also be a result, as well as the loss of habitats and a shortage of nourishment for avifauna. Altogether a rise in non-native invasive plant and animal species is to be expected with unforeseeable consequences for domestic ecological systems.

One of the questions dealt with in the research project is whether effect chains can be concluded regarding climatic changes and air pollutant effects, and whether this is relevant in the implementation of the SEA. In other words to what extent this can be represented quantitatively is asked; how much avoidance of damages is possible and whether this can be considered in the planning context by a weighing up of interests. The CO<sub>2</sub>-reduction potential which will presumably be obtained by the intended development of offshore wind energy facilities, must first be determined. For example, the world-wide emission of climatically relevant gases was used as an initial basic measure. In the next step, the CO<sub>2</sub>-emissions of energy production were determined globally and specifically for Germany. In a national context these figures were broken down into gross electricity production. Compared with the potential generation of electricity by offshore wind energy, a figure of 14% is arrived at. CO<sub>2</sub>-output caused by gross power production in Germany is reduced by this figure.



**Figure: Greenhouse gas emissions, CO<sub>2</sub> reduction potential by offshore wind power utilization and climatic sequences on the basis of the yearly 2005 (own illustration)**

As a result of the compiled research, the following points are to be derived:

1. The expected effects of climate change and specifically energy related pollutants by large-scale emissions can be described and differentiated for a multiplicity of marine natural assets.
2. Cause and effect correlations are quantitatively difficult to determine, due to the greater regional scale and existing prognosis uncertainties. However, a qualitative description of the expected effects based on recent knowledge serves the overall consideration and the decision-making process.
3. The attainable CO<sub>2</sub>- and other air pollutant reduction associated with offshore wind energy utilization can be comprehensibly determined and standardized. This data serves as evaluation criteria in the environmental report and where appropriate as a measure for comparing areas of differing CO<sub>2</sub>- reduction potentials.

## **4. Monitoring**

The new legal obligation for planning supervision according to German law has few binding regulations, allowing greater tolerance for authorities responsible for plans and programmes (BALLA 2005, 131 ff.; BRINK/RUNGE 2004, 273 ff.; BUNGE 2005, 124 ff.; RODER, in: HENDLER (Hrsg.), 225 ff.).

Monitoring must already be included in the environmental report. This serves above all to compare the plausibility of prognoses with the reality of the situation. It seeks out unexpected effects. It supervises the implementation of plans with regard to substantial environmental effects. It controls the execution and/or effectiveness of avoidance- and mitigation measures and draws conclusions for the total regional situation.

Monitoring is also vital in the matter of unforeseeable reciprocal effects in the EEZ. It can be understood as a quality control for the environmental report. The comprehensive monitoring at the plan and programme level is widely applied, yet exhibits few similarities with the surveillance of facilities, e.g. such as that according to the Federal Control of Pollution Act (BImSchG). In as far as possible, such existing surveillance mechanisms should be integrated into the monitoring to avoid doubled efforts.

Key points of the monitoring process should be clarified promptly and if necessary according to § 14m of the EIA law as specified with the acceptance of the plan or programme. These include:

### The establishment of goals and focal points

The larger the uncertainties connected with the results of an SEA are, the more useful monitoring is, whether these reflect objective knowledge limitations or the restriction of data acquisition based on literary sources. Monitoring should therefore refer to particularly uncertain prognoses in addition to well-known or potentially substantial environmental effects.

### Financing

Financial requirements stemming from investigation methodology and -frequency must be coverable. Otherwise a monitoring programme could be considered superfluous. Clarifying resource requirements and their necessary coverage requires early preparations (proposals, referenda), which lie to a large extent outside of the actual planning.

### Implementation authorities

Implementation institutions must be clearly identified. Mere allocation is not enough. A formally declared agreement with the assigned institutions is necessary.

### Controlling authorities

Although not a binding requirement, the involvement of multiple independent experts serves to gain acceptance of plans and programmes. Different stakeholders together with interested representatives of the public-sphere may merge to form advisory committees for the execution of monitoring measures.

### Deadlines and durations of single controls and the filing of reports

In order to ensure the validity of the monitoring, timely deadlines and the duration of intended investigations should be specified.

### Methodology

The methodology of the monitoring must correspond to the respective plan and thematic intentions.

### Addressees of the monitoring report

Results of the SEA are to be handed over to several carriers of public interests. This is to say that such a group shall also be known as the „addressee circle“ of the monitoring report.

### Consequences in the case of plan and/or program deviation

The results of the monitoring should allow consequences in the form of corrective measures during further implementation of the plan. Taking all possible results into consideration, it may be difficult to predict which conclusions should be drawn, in which cases. In individual cases however, certain consequences can be linked with certain effect thresholds.

An inclusion in the context of the gained information via monitoring is possible both on plan and project levels. At the plan level the adjustment of the plan is possible, either by changing problematic designations, or by designation of other possible compensation measures. An obligation for adjustment however, does not exist. An adjustment at project level is likewise possible. If in the context of the monitoring, negative effects on the marine environment appear as a result of realized projects, project permission can be subsequently adapted according to § 4 par. 3 SeeAnIV by additional arrangements.

## **5. Conclusion**

Generally it can be said that the SEA does not present a universal remedy for all problems of spatial planning in the EEZ nor can it replace the EIA at project level. SEA and EIA should recognize and support each other mutually. Above all, a well thought-out stratification is necessary.

The Strategic Environmental Assessment serves as a suitable instrument for the planning of offshore wind-energy utilization, not only at the level of spatial planning in the EEZ, but also for the designation of suitable areas according to SeeAnIV which regulates spatial and lasting effects in the planning process. The SEA can only be efficient if it obtains binding legal status in relation to the subsequent project planning. For this purpose, the SeeAnIV must be amended by a regional planning clause (BÖNKER 2004, 537 ff.; MAIER 2004, 103 ff.; SCHOMERUS/RUNGE/NEHLS et. al 2006, 77 f.).

SEA in the planning of offshore wind power utilization clearly increases the importance of environmental and climate protection. The position of environmental aspects can thus been strengthened and can be better argued for. This includes the securing of participation rights of the public concerned.

Finally the implementation of the plans by the government is facilitated, according to strategic reports with necessary consideration of the positive aspects of offshore wind-energy

utilization - in particular regarding climate protection. The SEA is therefore not an instrument for the prevention or hindrance of offshore wind-energy utilization, but rather serves a higher quality of its planning and implementation.

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