MARINE SPATIAL PLANNING AND FISHERIES: THE POTENTIAL ECONOMIC LOSSES FOR FISHERIES IN THE CONTEXT OF COMPETING INTERESTS IN COASTAL ZONES

Jörg Berkenhagen, vTI-Institute of Sea Fisheries, joerg.berkenhagen@vti.bund.de
Ralf Döring, vTI-Institute of Sea Fisheries, ralf.doering@vti.bund.de
Heino Fock, vTI-Institute of Sea Fisheries, heino.fock@vti.bund.de
Matthias Kloppmann, vTI-Institute of Sea Fisheries, matthias.kloppmann@vti.bund.de
Søren Pedersen, ICES, soerenap@ices.dk
Torsten Schulze, vTI-Institute of Sea Fisheries, torsten.schulze@vti.bund.de
(in alphabetical order)

ABSTRACT

There is an increasing demand for marine space from many different economic sectors in the German coastal and exclusive economic zone: sand and gravel removal, wind farms, fisheries, shipping or oil and gas exploration. Additionally, the Natura 2000 directive requires the declaration of areas for nature conservation. Opposite to other economic activities, fishing is not connected with distinct rights on areas or on specific fishing grounds. First assessments show that fishermen may face heavy losses in case of the exclusive allocation of space to other activities. In the first part we depict the different economic activities in the German EEZ and the current process of spatial planning. Then we give an overview on the legal framework including the property rights system in the fishing sector. In the third part we calculate prospective losses in the scenario of the closure of huge areas for fishing. It will be shown that the approval process for wind farms underestimates the consequences for fisheries due to the lack of data. In many cases a reallocation of fishing effort will not be viable because of the dependency of certain species on specific habitats and their low abundance in surrounding areas. Especially small scale fishermen can only fish near the shore. Their individual quota can be interpreted as a strong property right. A closure of areas may have the same effect as a dispossession. Finally, we give an outlook on the possible process in marine spatial planning in the coming years.

Keywords: wind farms, marine spatial planning, impact assessment, VMS, fishing grounds

Introduction

Offshore wind farms have gained importance in the context of climate change and renewable energies. Onshore installations are more and more criticized for their potential negative influence on the landscape. Moreover, most onshore sites which are suitable for the production of wind energy have already been equipped with turbines. In 2009, 7.5% of the electric energy generated in Germany originated from wind farms, exclusively installed on land. As this share can not be substantially increased, offshore sites have been promoted as complements which interfere considerably less with their environment. They are too far away to be visible from land. Currently, the area of all offshore wind farms planned and approved for the North Sea would cover about 20% of the German EEZ in that area.

However, wind farms are permanent installations, they claim some maritime space and keep it from basically any other kind of usage. We investigate the German approval process for wind farms in the process of marine spatial planning and the extent to which consequences for fisheries are considered. Fishing effort and catches within small areas, such as wind farms, could so far only coarsely be approximated from logbook information, which provides low spatial resolution only. We present an approach using VMS (vessel monitoring system) data to achieve a higher resolution of fishing activities which allows a more precise impact assessment of wind farms for fisheries.

Noise creation, disturbances during construction, effects from cabling or other phenomena caused by wind farms with potential influence on fisheries are beyond the scope of our study.

Economic activities in the German EEZ

Within the German Exclusive Economic Zone (EEZ, = 200 mile zone), spatial use is administered under federal sovereignty. Activities subject to national administration range from recreation and nature conservation to waste dumping, from gas and oil exploitation to military use, from wind farms to fishing. Transportation (shipping routes), which strongly influences the spatial use, is subject to international planning.

The current process of spatial planning and approval of wind farms

Marine spatial planning and approval of wind farms in the German EEZ is the responsibility of the Federal Agency for Shipping and Hydrography (Bundesamt für Seeschifffahrt und Hydrographie, BSH). In German waters, there are no exclusive rights for fishermen, and there is no general protection of fishing grounds as a source for income. Therefore, marine activities are not vetoed only for general deterioration of fishing opportunities. Nonetheless, during approval procedure applicants for wind farms have to provide evidence that the project does not seriously affect the environment and does not affect the interests of other stakeholders.

In the context of fisheries, there are four main aspects which are considered for the evaluation of wind farm planning:

- yield reduction due to malformation and displacement of fish from traditional fishing grounds;

- opportunities for reallocating fishing effort to alternative fishing grounds

- spatially fixed natural fishing grounds

- fisheries as potential subject of ‘public interest’ providing resources for human consumption

For both the safety of vessels and crew and the protection of the complex post construction no shipping is allowed within the wind farm itself and a surrounding 500 m buffer zone. It is obvious that under current legislation wind farms will hinder all fishing operations in that area.

Until now, there has been not a single case in which an application for a wind farms had been rejected because the wind farm would substantially affect the interests of fishermen. The impacts were regarded as reasonable. By the time of the approval procedures, the impact analysis of wind farms on fisheries could only be based on (predominantly German) data reflecting the catches within the ICES rectangle in which the wind farm is planned. As no data were available on a higher spatial resolution, effort and catches were regarded as evenly distributed within the rectangle. As a single wind farm is very small compared with an ICES rectangle (see also fig. 1) and because each wind farm project was analyzed individually, potential conflicts between fisheries and wind farms were deemed negligible in all cases. It was assumed that fishermen can redistribute their effort in the remaining part of the rectangle without any consequences on costs or earnings.

However, there are two aspects which require further consideration. One is that the fishing effort cannot be reallocated in any desired manner, as adjacent regions are likely to be occupied by other stakeholders, e.g. another wind farm or Natura 2000 protected areas. ICES rectangle 38F6 (see fig. 1) is a striking example for an area in which fishing is strongly affected by all restricted areas as a whole, while the area of a single wind farm appears negligible in size. In other words, an individual wind farm probably does not affect fishing opportunities, but all together clearly do.

The second aspect is that effort and catch are not evenly distributed within an ICES rectangle. However, this aspect again could not be resolved as the spatial resolution of available data was limited to this scale unit.

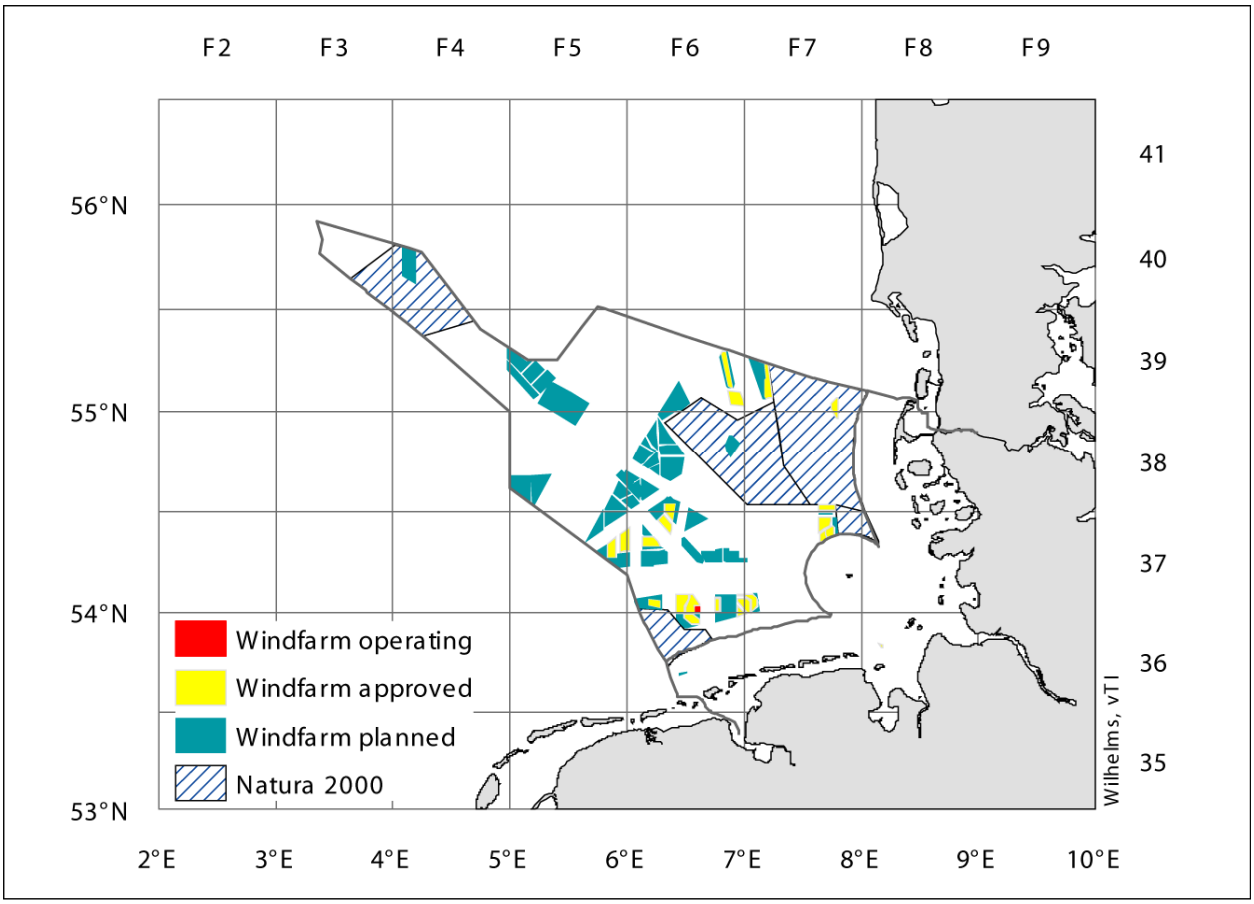

Fig. 1: Wind farm and Natura 2000 sites in the German EEZ (outside 12 nm zone). Labels at the top and right axes characterize the naming of ICES rectangles (30×30 nm²), the alternative labels indicate longitudes and latitudes.

The legal approval procedure and property rights system in the German EEZ

The legal framework in Germany favors the wind farm companies over fishermen in two ways:

1) Stationary offshore activities like wind farms are subject to the 'Federal Mining Act' and are treated as if the companies were exploiting resources at the sea bottom. Once the construction of a wind farm has been approved, the applicant receives a legal right to restrict any other business in that area. Fishing as an activity which is potentially harmful for the wind power stations may be banned completely or will be restricted to a very limited range of activities (oyster or mussel production, fishing with static gears).

2) Fishermen on the other side have only a license to fish and quotas for certain species, but no specific spatial rights.

The German allocation system for fishing rights is an individual quota system per vessel. Fishermen or producer's organizations receive a certain share of the national quota every year. They are not allowed to sell their individual quota, but there are limited possibilities to exchange quota with fishermen of the same producer's organization. The quota share is linked to a certain area, which is much larger than an ICES rectangle.

For some species, like brown shrimp, fishermen only need a fishing license, because they are not falling under a quota system. However, most of the species fishermen are targeting in wind farm areas are quoted.

As we will demonstrate, the methodology applied for the approval process for wind farms resulted in an underestimation of the consequences on fisheries due to the lack of data with sufficient spatial resolution. We do not argue that the results in the environmental impact assessments are not calculated very cautiously and in favor of fishermen. It was simply not possible to correctly assign effort and catch information to such a small area as a wind farm. Instead, these data had to be estimated from logbook data, which are related to an ICES rectangle (30 nm squared).

Two consequences of the impact assessment deserve more detailed consideration. Firstly, fishermen are affected by a typical problem in cost-benefit-analysis or impact assessment of comparably small projects. It is assumed that fishermen can reallocate their fishing activities to adjacent areas without noteworthy consequences on catch or cost. Opportunity costs are calculated as comparably low. Secondly, fish and therefore effort are being regarded as evenly distributed throughout an ICES rectangle. However, it is well known that for a suite of target species, fishing grounds are relatively fixed in the North Sea, amongst others for common shrimp, Norway lobster, crabs, and flatfish such as sole and plaice.

An individual wind farm project will lead only to the closure of a small percentage of the overall possible fishing grounds. However, with the number of wind farm projects increasing, the total area covered will increase as well, and in combination with other restricted areas, the space remaining for fishing activities can be restricted considerably. Under these circumstances, displacement of fishing activities can no longer be regarded as negligible. But these cumulative impacts of several wind farms on fisheries could not have been addressed in the approval procedure.

There is good reason to doubt that fishing opportunities can be substituted with remaining areas while many of them are considered Marine protected areas (MPA) under the Natura 2000 protocol (see fig. 1). Moreover, fish species prefer certain habitats and are not evenly distributed in a 30x30 nm square. They may be concentrated in the construction area and have a very low abundance in the surrounding areas.

Sole depends on a certain habitat and fishermen will probably not be able to fish the same amount in other areas. Opportunities to change the target species in the fisheries are also quite limited and warrant considerable investments from the fishermen. For areas adjacent to closed fishing grounds, spill-over effects have been frequently postulated, given that marine reserves were designed sufficiently large (Gell & Roberts 2003). However, for North Sea flatfish, seasonal movements to spawning grounds and from the nursery grounds in the Wadden Sea area are well documented (Bohl 1959, Bolle et al. 1994) and make the fish susceptible to fishing effort elsewhere. If fishing effort is forced to concentrate in small fishing grounds left open to fisheries, competition between fishermen will increase and catch rates will decrease rapidly (Rijnsdorp et al. 2000) so that no beneficial effects might then be expected. These displacement costs have never been addressed in the assessments.

An integrated approach to calculate prospective losses for fisheries from closure of areas

There is evidence that higher spatially resolved information on effort and catches is crucial for a more realistic impact assessment of wind farms on fisheries. We developed an approach using combined VMS (vessel monitoring system) and logbook data to assign catch and effort data to small spatial units, e.g. wind farms. This allows a much better estimate of potential losses from the closure of small areas for fisheries.

VMS data are to be sent every two hours from all vessels > 15m LoA. They include information on current velocity, position and course. Details on the procedure of combining both sources and assigning effort and catches are available through Fock (2008). Moreover, prices have been determined using national first hand sales reports.

The results of this approach are reflected in table 1. As about 20% of the German EEZ in the North Sea is dedicated to be used for wind farms, about the same share of catches should be expected to originate from that area, provided that catches are equally distributed over the entire area. In contrast, several species have been preferentially caught in the potential wind farm areas. Sole catches, as the most striking exam-

ple, originate by more than 50% from these areas. Also plaice, dab and turbot catches are substantial and significantly higher than under equal distribution.

Table 1: Comparison of catches and revenues within the German EEZ inside and outside areas which are designated to or intended for wind farms, data from 2006

		Area	Cod	Sole	Plaice	Turbot	Sandeel	C. Shrimp
Catch (tons)	outside WF		**317**	**562**	**7,497**	**503**	**32,977**	**20,534**
	inside WF		**142**	**611**	**4,034**	**343**	**4,746**	**318**
Revenue (1,000 €)	outside WF		**1,006**	**7,088**	**14,770**	**4,910**	**4,617**	**45,791**
	inside WF		**449**	**7,716**	**7,947**	**3,355**	**664**	**709**
%	outside WF	**80**	**69**	**48**	**65**	**59**	**87**	**98**
	inside WF	**20**	**31**	**52**	**35**	**41**	**13**	**2**

There is evidence that both assumptions derived from the approval procedure are to be doubted – neither is the catch equally distributed, nor can it be caught in adjacent regions. This also means that some of the criteria for approval are not fulfilled.

The consequences for individual fishermen might be even more severe, as their home port might be closer to these fishing grounds than to any other. Therefore the effort for steaming to the fishing grounds and therefore the cost might increase considerably for these fishermen. An analysis of fishing behavior based on single 'métiers' (specified by size, engine power, gear, and target species) revealed that individual vessels often use only one fishing ground close to the home port and are less flexible and dynamic than assumed from the overall analysis of the whole fleet (Beare et al. 2010). However, these patterns are métier specific and each métier will be affected differently.

As long as it is unclear which restrictions fishermen face from other restricted areas (especially Natura 2000 sites), marine areas might rather be designated more restrictively to wind farm use. At the moment there is a big run because of the legal situation – everybody wants to claim a certain area to be able to stay in the hunt for the payments for renewable energy which makes wind parks economically viable. These payments decrease over the years and will make investments less profitable.

Outlook on the possible process in marine spatial planning in the coming years

In the coming years fishing activity patterns are going to be analyzed with a higher resolution using the VMS data. It can be assumed that for many areas the losses from reallocation of fishing activities will still be not very high. However, taking all the other users of the area and the surrounding areas into account, this may result in a more or less ban of many fishing activities in huge areas. Then the closure for fishing activity may affect fishing enterprises in a way that fishermen go out of business. Such a 'dispossession' for the fishermen because they are not able to fish out their individual quota or use their license to fish may prevent the authorities from further assign marine areas to wind farm use. At the moment, a discussion is initiated on the extent to which wind farm operating companies are able to allow fishing in these areas. It is an insurance issue (increasing risk for collisions of vessels with wind mills), but also a technical question. Are certain use options economically viable (like mussel production)? If this is the case, a multiple use system in the wind farm areas might be established, and fishermen may have the option to switch activities from fishing to aquaculture.

VMS data - in combination with logbooks and landings declarations - have a huge potential to improve the planning procedures in the EEZ or in coastal waters to avoid the loss of important fishing grounds. This would decrease the risk of extension of conflicts between stakeholders in marine areas. For this purpose, it would be beneficial to get VMS data in a higher temporal resolution.
Implementing VMS data in marine spatial planning is a striking example for beneficial effects of data provided by fishermen. This is in contrast to the frequently experienced general reluctance of fishermen to provide information to authorities.

REFERENCES

Beare, D, A Rijnsdorp, TV Kooten, HO Fock, A Schröder, M Kloppmann, R Witbaard, E Meesters, T Schulze, M Blaesbjerg, U Damm and F Quirijns, 2010, Study for the Revision of the Plaice Box - Draft Final Report, Rep. No. C002/10. IMARES.

Bohl H, 1959, Die Biologie der Kliesche (Limanda Limanda) in der Nordsee. *Berichte der Deutschen wissenschaftlichen Kommission für Meeresforschung*, 1–57 (in German).

Bolle, LJ, R Dapper, JIJ Witte and H van der Veer, 1994, Nursery ground of dab (Limanda Limanda L.) in the Southern North Sea. *Netherlands Journal of Sea Research*, 32, 299–307.

Fock, HO, 2008, Fisheries in the context of marine spatial planning: defining principal areas for fisheries in the German EEZ. *Marine Policy* 2008; 32:728–39.

Gell, FR and Roberts, CM, 2003, Benefits beyond boundaries: the fishery effects of marine reserves. *Trends in Ecology & Evolution*, 18, pp. 448–55.

Rijnsdorp AD, PLv Mourik Broekman, EG Visser, 2000, Competitive interactions among beam trawlers exploiting local patches of flatfish in the North Sea. *ICES Journal of Marine Science*, 57, 894–902.