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# THE RISK OF SOCIAL CONFLICTS IN THE SOUTH BALTIC AREA IN LIGHT OF THE LOCATION OF FACTORS OF OFFSHORE WIND FARMS

Piotr Biniek

Institute of Spatial Management and Socio-Economic Geography, University of Szczecin, Mickiewicza 18, 70–383 Szczecin, Poland, ORCID: 0000-0002-5953-1987  
e-mail: piotrbiniek.bin@gmail.com

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### Abstract

Offshore wind farms have become one of the fastest growing renewable energy technologies in recent years. Projects developed in the area of the Polish Exclusive Economic Zone (EEZ) are considered crucial for the future of the energy sector in Poland. One of the arguments for the development of this sector is the common opinion among investors and decision makers that offshore wind farms are much less exposed to the risk of social conflicts compared to onshore installations. Due to the lack of completed investments in the Polish EEZ area and restriction of possible construction of farms to Baltic shoals only, explicit exclusion of the risk of protests seems wrong. The article identifies the factors of offshore wind farms OWF localization and the most important social groups at risk of participating in social conflicts. The Delphi method research indicates that, above all, numerous conflicts with other users of the maritime area should be expected, and the groups most vulnerable to conflict are fishermen, environmentalists, media and residents of coastal municipalities.

### Key words

offshore wind energy, offshore wind farm, Polish Exclusive Economic Zone, south Baltic Sea, renewable energy sources.

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## 1. Introduction

The dynamic development of offshore wind energy started at the beginning of the 21st century, when in 2001 the Middelgrunden farm with a capacity of 40 MW was connected to the grid in the Øresund Strait. Earlier in Europe, small projects had been developed, often of an experimental or research nature. Despite market fluctuations, the accumulated capacity in the offshore sector has been growing exponentially over the last 10 years. According to the

“Global Wind Energy Council” report (Global..., 2020) on development of the global offshore wind market, a total of 6.1 GW of new offshore wind generation capacity will be installed globally in 2019. This makes offshore farms the most dynamic sector of renewable energy sources (RES) not only in Europe, but also in China and the United States. In the first half of 2019, the International Renewable Energy Agency indicated in its report “Renewable power generation costs in 2018” (Anuta et al., 2019) that between 2018 and 2020, wind farms became cost-competitive

compared to conventional power generation. The dynamically growing sector is responsible not only for increasing the balance of renewable energy, but also a clear stimulus for developing the maritime industry. Wind Europe estimates that 75,000 people are directly employed by the industry (Walsh, 2020).

Note that despite still significantly higher investment costs than onshore, OWF are increasingly competitive. This is due to the following features of this technology (Anuta et al., 2019; Blažauskas et al., 2012; Czaplinski, 2016; Lewandowski, 2010; Sobolewski, 2010; Wiśniewski et al., 2012):

- wind on large open waters blows with greater speed and less variability than on land, which significantly improves not only the utilization coefficients of the wind energy source itself, but also the stability of the power system;
- no space limitations allow for the installation of larger wind turbines; it is also easier to transport large components by sea from the production site to the installation site;
- offshore wind farms do not arouse such strong emotions in the society and do not cause extreme social conflicts.

Poland has one of the largest economic potentials of offshore wind farms in the Baltic Sea. Given the natural, economic and military constraints, the total area where offshore wind farms (OWF) can be built was initially determined by the Maritime Institute as 3590 km<sup>2</sup>, which corresponds to a technical

potential of 35 GW. The Act of 21st March 1991 on Maritime Areas of the Republic of Poland and Maritime Administration (Act ..., 1991) and its amendment of 2011 limits the construction of OWF only to the area of the Polish Exclusive Economic Zone (Polish EEZ). Commissioned by the Ministry of Transport, Construction and Maritime Economy, a map was developed (Fig. 1) designating the northern and north-eastern side of the Słupsk Bank, the south and south-western side of the Middle Shoal and the northern side of the eastern boundary of the Pomeranian Bay as the location of future farms.

Although no wind farm has been built in the Polish EEZ area so far, that investors are highly consistent in the development of specific projects. The total capacity of the 13 offshore wind farm projects which have already been granted the conditions is nearly 7100 MW. The main players on the market are Polenergia SA, PGE Energia Odnawialna, PKN Orlen and the Baltic Trade and Invest capital group. Considering that offshore wind energy (OWE) plays an increasingly important role in Europe and in the world, it can be expected that this energy sector will move from the planning phase to the implementation phase also in Poland (Purta et al., 2016; Stryjecki et al., 2013).

Although one of the features of offshore wind energy is the lack of social conflicts related to the NIMBY effect, British experience in particular shows that specific locations may arouse strong opposition

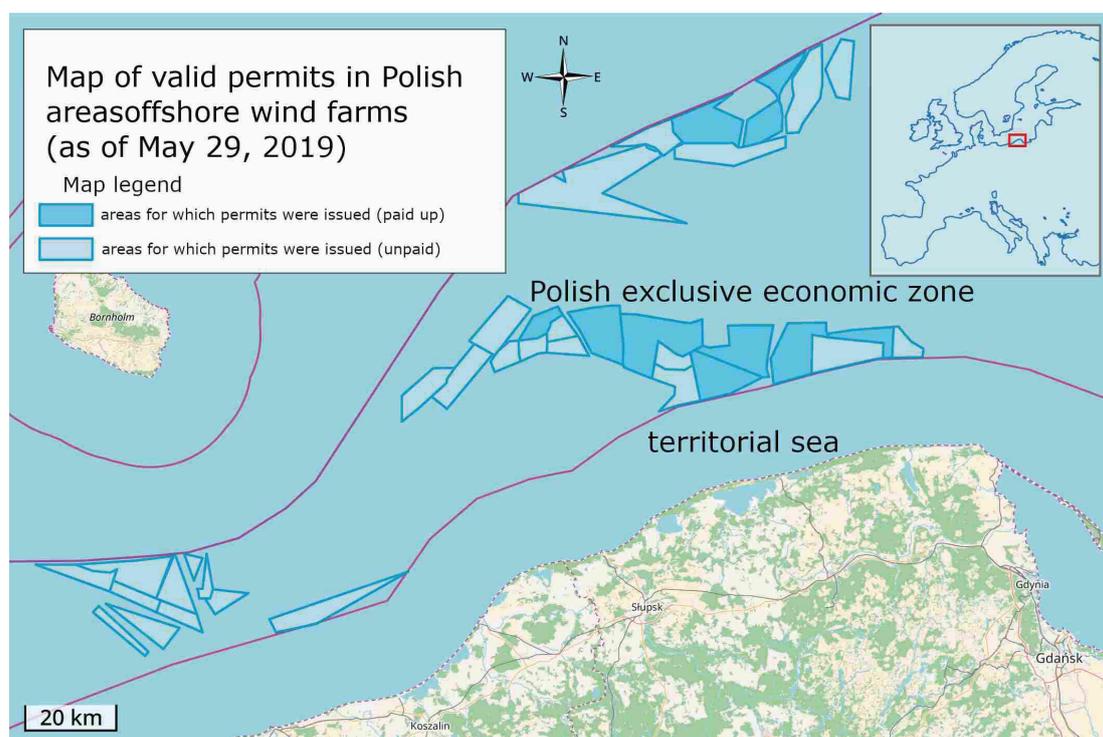


Fig. 1. The map of sites intended for the location of wind farms in the Polish EEZ

Source: own study based on: Matczak, Psuty, 2017.

from various groups (Todt et al., 2011). Whereas on land the protests against the construction of wind farms come primarily from local residents, at sea it is mainly fishermen and environmental organizations who come out in force. Although power plants in the Polish EEZ area cannot be built too close to the bird routes, it is difficult to determine the actual impact of the OWF on the Baltic avifauna at the planning stage. The list of potential sources of environmental and social conflicts is certainly unknown, especially that the studies of the impact on the environment and fisheries to date are ambiguous and even full of contradictions (see: *Morska Farma ...*, 2015; Stryjecki et al., 2013). Once built, the offshore wind farm is a navigational obstacle and marks an area closed to ship traffic (except for service ships). Vessels are forced to bypass the farm at a sufficient distance, and the OWF are defined as sea structures threatening the safety of maritime traffic (Gucma, Mattac, 2002).

Numerous potential areas of conflict have emerged in the course of this research. The scale of offshore installations and the theoretical freedom to configure and locate turbines, currently overlooked or even unknown risks regarding environmental impact, such as noise emissions or impact on birds, may be even more important than in the case of onshore wind farms. Variable elements, such as wind, sea state or visibility, are important elements influencing the occurrence and significance of environmental collisions of this technology.

This article analyzes the risk of social conflicts with the Delphi method in light of the assessment of OWF location factors. The spatial dimension of the research focused on the relationships between the indicated locations, their relations with other forms of using the Polish EEZ and the natural environment. The social dimension of the research concerned groups at risk of participating in social conflicts resulting from the development of OWE. The basic research question concerned the determination of which factors of OWE localization are the most important in terms of the risk of social conflicts. The research hypothesis assumed that, in practice, most of the OWE localization factors are characterized by high sensitivity to social conflicts; however, particularly important factors can be identified.

## 2. Methodology of research on OWF location factors

The adoption of the Delphi interviews as the key research method for the location factors of OWE required, apart from establishing a list of experts, also the preparation of an appropriate questionnaire. In

this paper, a set of questions – in particular, regarding the location factors – was developed primarily on the basis of the available, extensive literature in this field, including G. Rowe and G. Wright (1999), M. Matejun (2012), and J.W. Creswell (2013). However, due to the limited use of the classic division of industry location factors, a decision was made to conduct additional research in the form of unstructured in-depth interviews with three industry experts. Based on the interviews, a detailed list and breakdown of the location factors was prepared, and consequently a list of survey questions was sent in two rounds to a group of experts selected on the basis of observations of professional activity and recommendations of the Polish Wind Energy Association. In addition, experts answered the question about the possibility of implementing solutions mitigating the effects of social protests from onshore wind energy. 21 people responded to the invitation to participate in the study. The questionnaire was prepared in the Google Forms tool, whose main feature is the effective management of the information collection process, as well as the ongoing modification of the questionnaire while protecting data that is stored on an external server. The questions, arranged in sections, related to the forecasts of OWE development in Poland. Experts identified conflict areas in the physical space of the Polish EEZ and social space and assessed social groups due to the risk of conflict or collision. The detailed sensitivity of individual social groups was assessed using a linear scale. The basic task of assessing the location factors was carried out using a multiple-choice form. One of the sections contained questions about conflict management and assessment of the possibility of implementing solutions mitigating the effects of social protests. The research results were used to assess the significance of the OWE localization factors with regard to the risk of social conflicts in terms of time and space. The quantitative and qualitative data were collected simultaneously and in parallel in each round of the research. The IBM SPSS Statistics 25.0 software was used to develop the results of the analyses.

The first forms were dispatched in January 2020, the second round in March 2020. In the course of the research, the necessary technical correction of the questions was made and, on the basis of expert advice, it was decided that respondents should complete the form themselves using an online survey, which was due to the Covid-19 pandemic. The inevitable loss of content and data that could be obtained during personal free interviews has been minimized by increasing the number of specific questions as well as open-ended questions relating to the key research topics.

The phenomenon of social conflict in OWE is related not only to specific location factors but also to stakeholder groups, sometimes referred to as players or actors of the conflict. Identification and determination of mutual relations between groups was important not only as regards the analysis of factors and forecasting social processes, but also as a basis for presenting tools to mitigate the effects of experts' protests. As part of the research, the results of surveys on diagnosing social groups were analyzed using Friedman's analysis of variance in order to compare the estimates of the probability of involvement of given groups in a conflict. The consulted experts rated the probability on a scale from 1 – negligible probability, to 5 – very high probability. The conducted analysis showed significant differences between the groups,  $\chi^2(17)=157.29$ ;  $p<0.001$ . In order to determine the nature of the differences in assessments between the analyzed social groups, an additional *post hoc* analysis was conducted using the Dunn's test with Bonferroni correction of the significance level.

### 3. OWE location factors and social conflicts

Fig. 2 presents descriptive statistics for the assessments of the compared social groups and other stakeholders of the current and future OWE sector.

As shown in the figure, the highest-rated conflict probability was assigned to the group of fishermen, pro-ecological entities, media and residents of coastal municipalities.

The results of the research confirm experts' forecasts expressed in open questions. Note that mainly fishermen expressed their objections in public discussions, who pointed to the impediment to access to fisheries and the closure of trawling areas due to the construction of underwater cable routes (Morska Farma ..., 2015). According to representatives of fishing groups, OWE locations in the Polish EEZ may significantly hinder or completely prevent the use of the fishing quotas allocated to Poland. The owners of recreational fishing cutters also have many concerns, arguing that the OWF will limit access to popular areas used by recreational and angling sea tourism operating, inter alia, in the northern part of the Słupsk Bank.

As an introduction to the analysis of OWE location factors, the shoals were assessed for the likelihood of social protests. The same statistical method was used for the study as for the assessment of social groups. Friedman's analysis of variance showed significant differences in the assessment of shoals,  $\chi^2(2)=8.94$ ;  $p=0.011$ . In order to determine differences, an additional *post hoc* analysis was performed using Dunn's test with Bonferroni correction of the significance level. The average rank in the analyses is

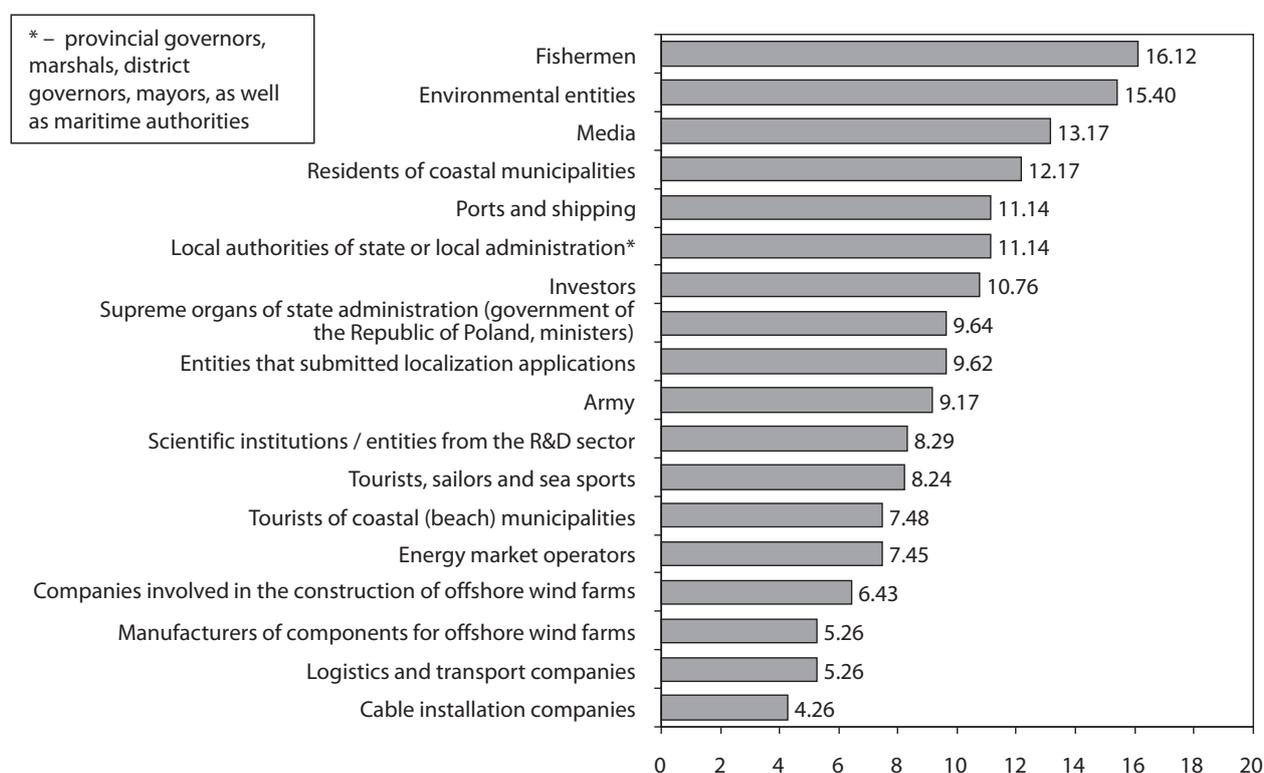


Fig. 2. Average rank of the probability of a conflict related to OWE

Source: own study based on research.

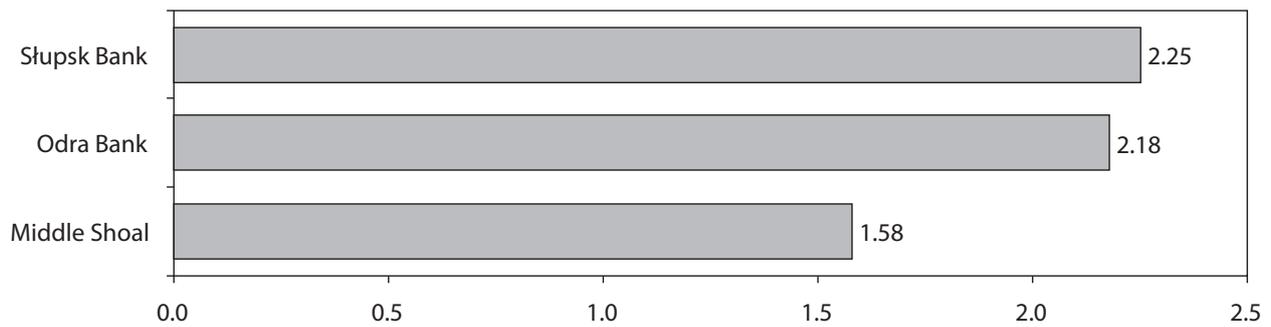


Fig. 3. The average rank of the probability of an OWE-related conflict on individual shoals

Source: own study based on research.

calculated in such a way that the data are sorted from the smallest to the largest – they are assigned ranks (consecutive natural numbers) and then an average is created for such data. The analysis showed that the probability of social protests in the Middle Shoal was assessed lower than in the case of the Słupsk Bank. Nevertheless, after considering the correction for multiple comparisons, this difference ceased to be significant ( $p=0.098$ ). The differences in the assessments of the Słupsk and the Odra Banks turned out to be insignificant ( $p=1.000$ ), just as between the Middle Shoal and the Odra Bank ( $p=0.173$ ). In experts' opinions, such a result suggests that all three shoals show a similar degree of probability of social protests. The results of the analyses are presented in Fig. 3.

Experts pointed out that the potential risk of conflicts at OWE depends not only on a given shoal, but also on the investment stage, as well as on individual project characteristics, such as the size and the type of turbines, the type of foundations and the energy transmission technology.

The Delphi research in the field of location factors assessment was aimed at diagnosing a hypothetical future that may concern the development of OWE in the southern Baltic Sea. Due to the large number of theoretical location factors, they were divided into 5 groups. The first one comprised environmental (natural) factors, the second one – technical factors (including infrastructural and spatial ones). The next groups were social and economic factors, and factors defined as "other", including political, military or maritime cluster ones. 21 experts took part in the study, and their task was to select the most important factors from each group in terms of the risk of social conflicts. Detailed results of the analyses are presented in Fig. 4 to 8.

Of the environmental factors (Fig. 4) which may affect the risk of conflict, experts most often indicated the impact of the project implementation on birds and sea animals, as well as the presence of

protected areas and visual effects. The shape of the bottom, the impact on the operation of radars and acoustic effects were the least frequently indicated. It is interesting to draw experts' attention to the importance of visual effects as a conflict factor. Note that, according to Polish law, wind farms must be away from the shore outside the territorial sea zone (over 12 INM). With such a large distance, even farms located on the border of the Polish EEZ will be visible during the day only in very good weather conditions. However, as experts note, at night, wind turbines are a source of strong flashing red light which can be seen, for example, from rooms in high-rise seaside hotels. Additionally, the visual effects may be detrimental to sailors for whom it is also a difficult and dangerous navigational obstacle. Some experts also pay attention to the influence of turbines on radars. This factor may be much more important after the first investment is completed. The experience of the British army shows that constructions of this type can have a significant adverse effect on operating this type of equipment.

Of the important technical factors (Fig. 5) experts pointed to the proximity of the proper port, energy collection and the shape of the bottom to cable routes, as well as access to the port and the presence of mined areas. The technology currently available was the least frequently indicated factor. Note that the 'port proximity' factor relates not only to issues related to fishermen's protests, but also to the impact of farms on shipping. Some locations will require changes to traditional routes, with increased costs. The issue of energy consumption is also an important source of potential social conflicts from the group of technical factors. In order to connect and evacuate power from a wind farm, it is necessary to implement a number of onshore grid investments. Cable routes, transformers, connections to high-voltage power lines require large areas and severely limit the development of other activities – in particular tourism.

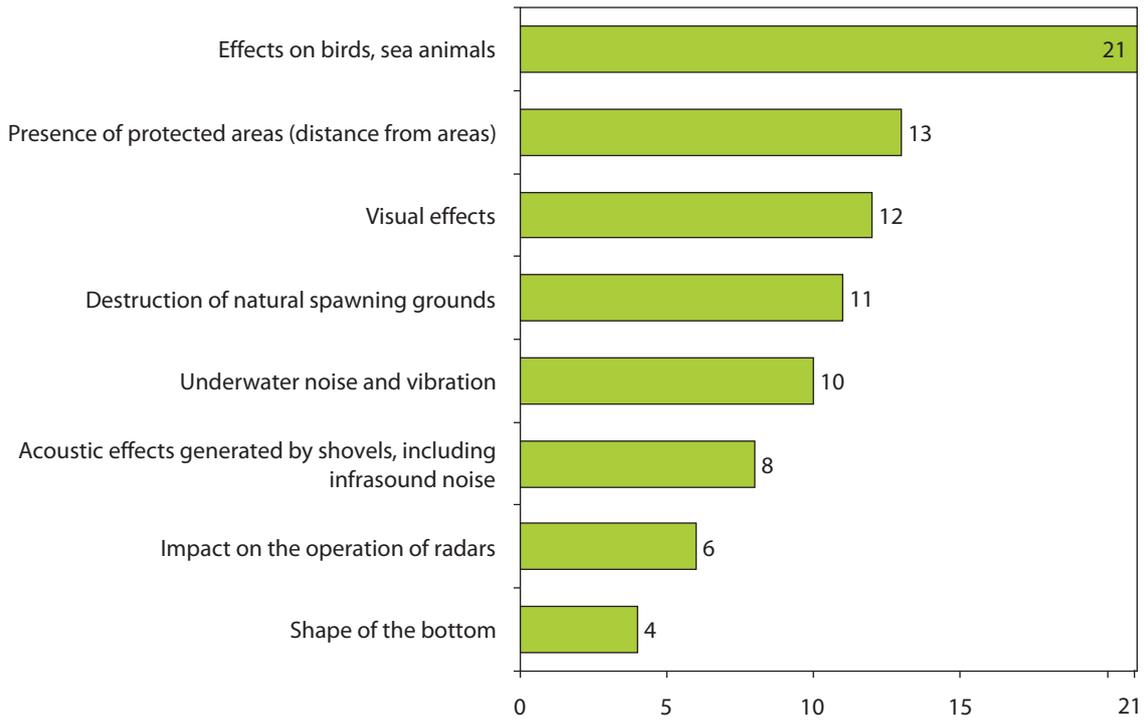


Fig. 4. Number of indications for environmental and natural factors influencing the risk of conflict

Source: own study based on research.

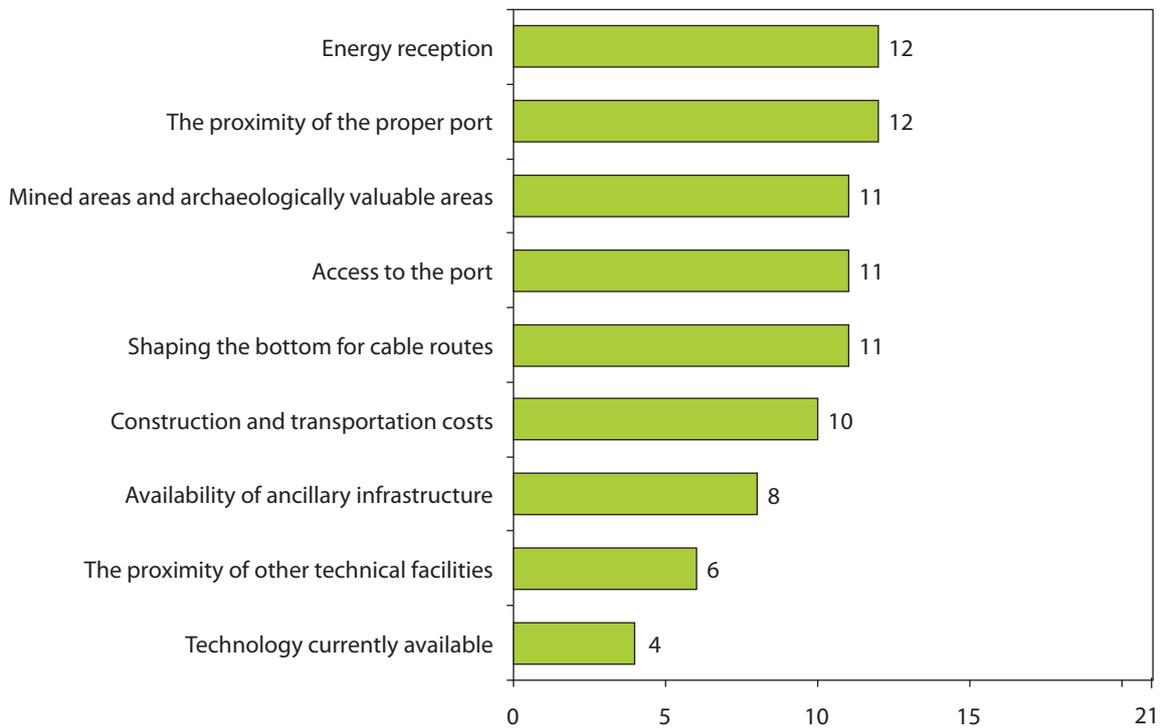


Fig. 5. Number of indications for technical, infrastructural and spatial factors influencing the risk of conflict

Source: own study based on research.

Note that as many as 95.2% of respondents indicated that fishing activity is the conflicting factor from the group of social factors (Fig. 6), followed by the activity of environmental organizations. The experts least often indicated the activity of sailing tourism. As a group exposed to protests, fishermen

are also most often mentioned in reports on OWE in the Polish EEZ area. In the public consultations, this group points to the impediment to access to fisheries and the closure of trawling areas due to the construction of underwater cable routes. According to representatives of fishing groups, OWF locations in

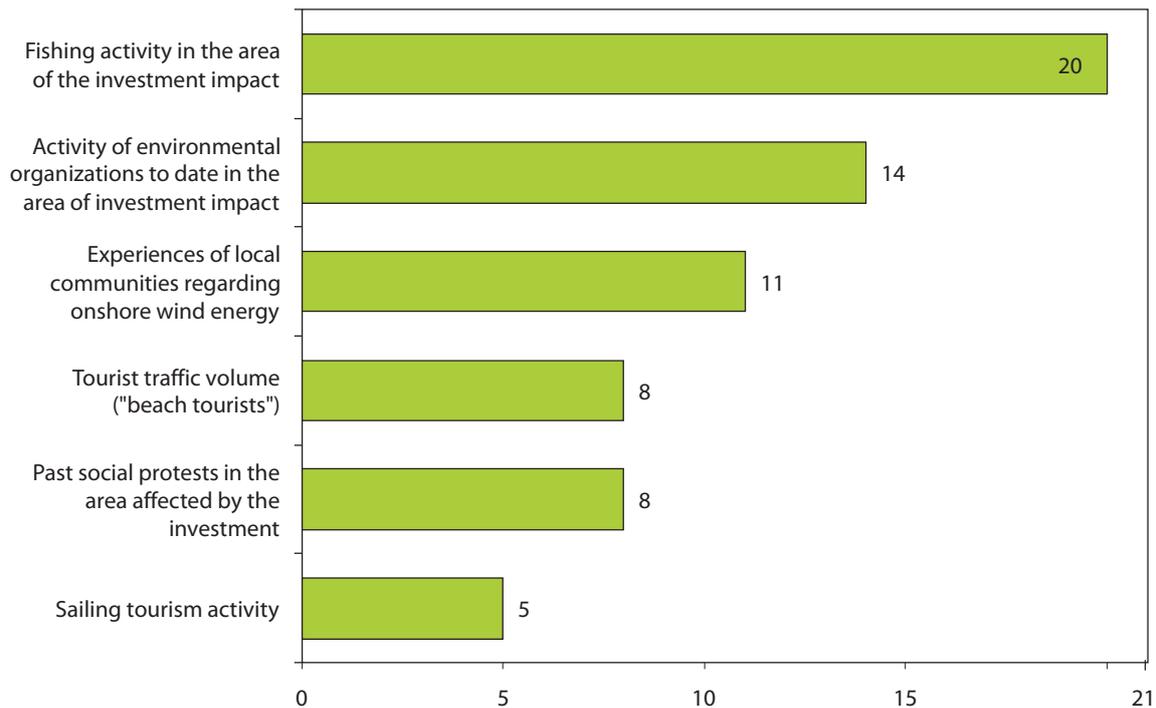


Fig. 6. Number of indications for social factors influencing the risk of conflict

Source: own study based on research.

the Polish EEZ may significantly hinder or completely prevent the use of the fishing quotas allocated to Poland. The owners of recreational fishing cutters are also concerned. Popular areas used by recreational and fishing sea tourism are located, i.a., in the Słupsk Bank. The general postulate of the fishing community is to postpone the issuance of location decisions for the OWF until the actual impact of the turbines on the ichthyofauna, including the life cycle and migration routes of fishing species, is examined. However, this postulate was not fulfilled – the prepared development plan in practice left areas for the development of OWE on Baltic shoals.

However, in the group of economic factors (Fig. 7), the profitability of the investment as well as the size of the wind farm itself turned out to be the most important. Both factors are strongly correlated: Polska Grupa Energetyczna estimates the cost of building offshore wind farms with a capacity of approx. 1,000 MW for approx. PLN 12–14 billion. Such high investment costs generate wide interest from many entities who see both their opportunities and threats in this sector. In the Delphi survey, one of the additional questions was: "Please indicate possible motivations of investment opponents - why can they protest, what are their interests, what values guide them?" Experts had no doubts that the most common reason for involvement in the protest was precisely the economic factor. Experts indicated, *inter alia*, law firms and PR companies as a group of particular interest when it comes to motivating participation in

protests. Lawyers or specialists in social communication may, of course, simply be employed by the parties to conduct activities related to extinguishing (or strengthening) conflicts, but according to experts, an active role cannot be ruled out either. It is a truism to say that such entities "live off conflicts", and one can imagine a situation where the motivation (even unconscious) is the desire to constantly fuel it. Energy supply forecasting and wind measurement costs were the negligible economic factors.

In the group of factors referred to as "other" (Fig. 8), experts most often point to the significance of central political decisions as a risk of conflicts. Another important factor was the plans for the development of energy networks. Proximity to borders and the presence of a cluster of offshore wind farms were indicated least frequently. The motives of the military representatives (military aspects factor) may be interesting. This factor was not highly rated in expert surveys, but in informal discussions (journalistic off-record strategy), survey participants, especially practitioners, drew attention to systemic, often legally and substantively unjustified, blocking of investments by representatives of the army, who are not involved in planning work related to the future of Polish EEZ.

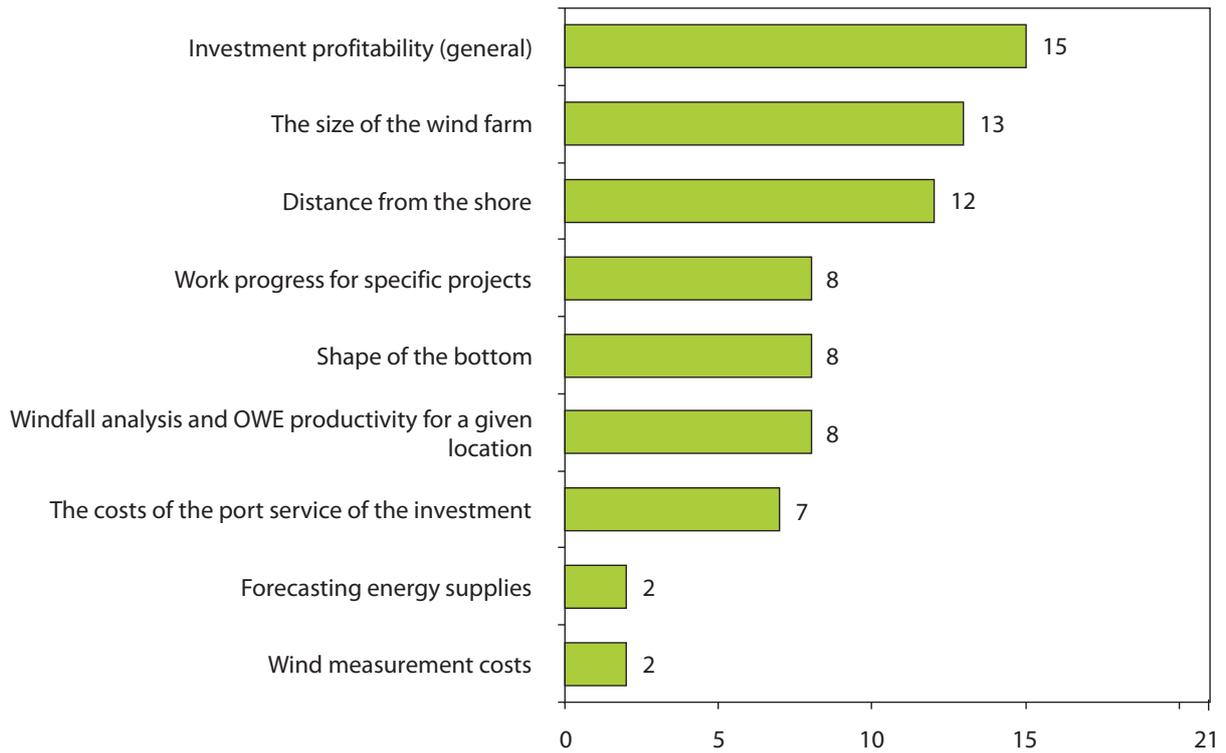


Fig. 7. Number of indications for social factors influencing the risk of conflict

Source: own study based on research.

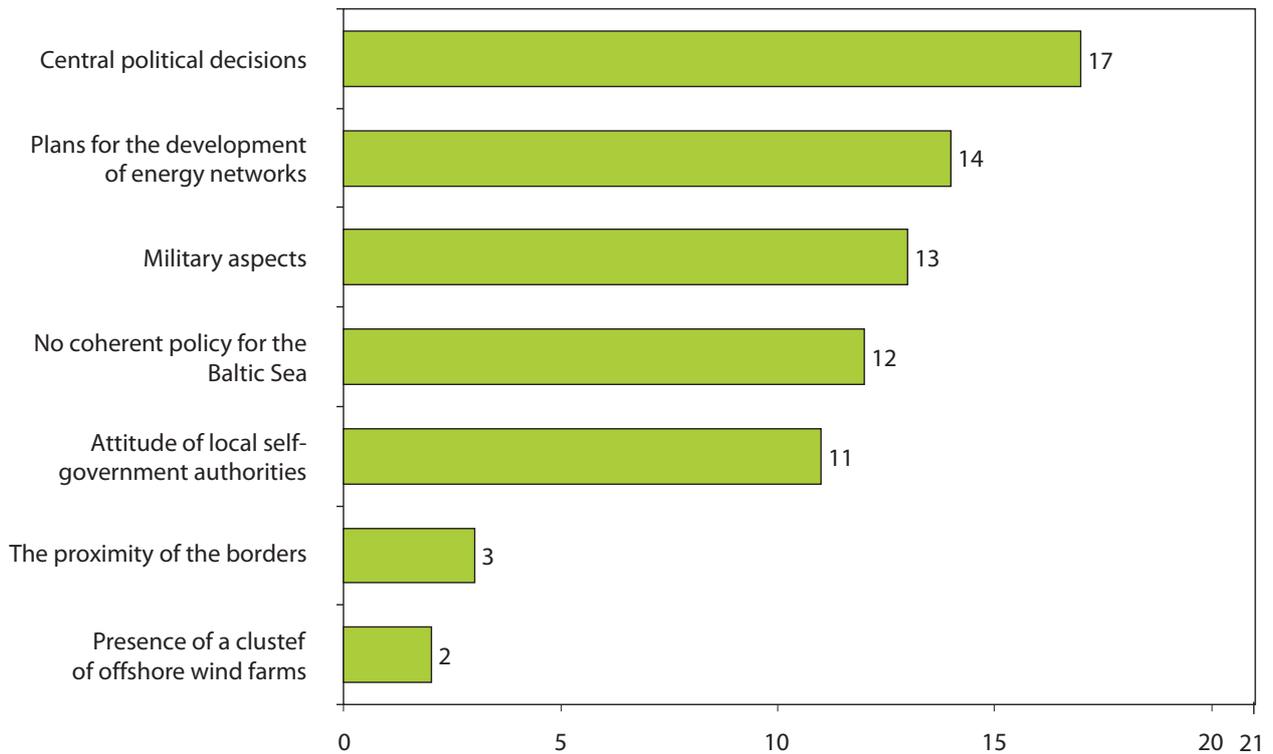


Fig. 8. Number of indications for other factors influencing the risk of conflict

Source: own study based on research.

#### 4. Conclusions

The research on the factors of OWF location in the Baltic Sea directly relates to three shoals indicated as areas for the development of this technology. Statistical analysis shows that some of the factors are considered extremely important by experts, in particular: “impact on birds, marine animals” from the environmental group, or “fishing activity” from the group of social factors. The factors related to the presence of protected areas and “underwater noise and vibration” were of great importance. The correctness of the assessment of these factors by experts is confirmed by the British experience, in which these very threats were most often used by the opponents of the IMF construction. The importance of factors directly related to fishermen as a social group is confirmed, *inter alia*, by the SEANERGY2023 project financed by International Energy Efficiency, as well as by the Roadmap for Maritime Spatial Planning (2008) prepared by the European Commission and the sectoral development plan for OWE in Scotland (Blue Seas Green Energy, 2011), indicating the need for a detailed study of the impact of investments on fisheries. Subsequently, the sectors of tourism and maritime transport, as well as the mining industry, are mentioned as groups at risk of conflict. The qualitative data obtained in expert interviews clearly show a high risk of social conflicts at OWE in the Polish EEZ area. The data obtained in the form of qualitative conclusions may be the basis for the development of universal assumptions for the development and, consequently, implementation of mechanisms and tools mitigating the effects of possible protests. According to the authors, preventive action is much more important.

The current state of advancement of investments in the Polish EEZ is the proverbial last chance for educational campaigns aimed at the broadly understood society. The case of onshore wind energy, the development of which has been halted for many years due to social protests, should be a clear warning for both OWE investors and decision makers, especially that the difficulties, delays or blockades of investments due to possible protests are much more severe for the OWF.

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