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THE CULTURE OF THE CO-EXISTENCE OF A PLANNED WIND FARM IN THE CONTEXT OF ENVIRONMENTAL CHANGES

ABSTRACT

Offshore wind power (OWP) as a renewable energy source (RES) is expected to have a significant share in the green energy market in the upcoming decades. Onshore energy generation is already a mature and proven technology, while its younger sibling is still in its infancy in the realities of our country. The development of OWP is a quantum leap towards using the natural energy potential of the Baltic Sea. It is supported by the government and is part of the country's energy transition plan. Experts make optimistic claims whereby the first energy from the Baltic Sea will flow into the national power grid in the middle of the next decade at the earliest. Economists and environmentalists agree that the development of energy technology in the Baltic Sea is an opportunity for the economy. It will be powered by another portion of clean energy. All parties claim that their primary task is to support environment protection from the point of view of zoology and avoid making a negative impact on the environment, including destructive events caused by natural forces and human activity, with considerations for socio-economic needs. The article contains the results of research conducted by the students of the University of Rzeszów as potential future consumers of electricity. They assessed the impact of OWP on Poland’s energy security and ecological security through the lens of culture, manifested as the lack of excessive consumerism.

Keywords: offshore wind energy, energy security, anthropopressure, ecology
INSTEAD OF THE INTRODUCTION – ENVIRONMENTAL DILEMMAS

Offshore wind energy is expected to implement two of the country's priorities: energy security and environment protection.¹ The goals of developing the energy sector in Poland were adopted by the Council of Ministers in the document: Poland’s energy policy until 2040 (PEP2040),² according to which, the share of electricity derived from RES is intended to reach at least 32% by 2030. Subjected to pressure with regard to the greenhouse gases emission, not only by European societies, the government was met with a quick response from the European Council, which issued the following conclusion after a meeting: “...To meet the EU’s 2050 climate neutrality goal, according to the objectives of the Paris Agreement, the EU needs to increase its aspirations for the upcoming decade and update its climate and energy policy framework. With that in mind, the European Council puts forward the binding goal of the EU to reduce the net greenhouse gases emission in the EU by at least 55%, compared to levels from 1990, by 2030”.³ Picture 1 presents the production of electricity in Poland.

By reducing greenhouse gases emission and replacing the coal-based power industry, OWP improves the condition of the atmosphere, but also interferes with the natural human marine environment. As an engineering structure, it affects not only the natural environment, but also the technified one, as shown in Picture 2.
The human environment is divided into a natural and technified one. In ecology, we deal with the functioning of the concept of ecosystem. An ecosystem is an area of relatively homogeneous abiotic conditions (biotope), occupied by a set of species corresponding to these conditions, linked by trophic and paratrophic relations, through which the stream of energy and matter flows. A technically developed area can also be considered as an ecosystem if it meets the above-mentioned conditions. According to this definition, an ecosystem consists of two components remaining in a close relationship:

- inanimate (biotope, also known as a habitat), which consists of soil, water and air with their physicochemical properties, as well as the climate;
- animate (biocenosis) consists of a combination of species appropriate for a given biotope in given geographical conditions.

The process that determines the functioning of ecosystems, and thus sustains the phenomenon of life on Earth, is the flow of energy and matter. A wind farm is an example of a technified environment which will affect both the natural and the technified environment. The culture of the co-existence of the planned wind farm in the context of environmental changes requires the designers and, subsequently, operators to solve the issues of design and organisation. Early and comprehensive involvement of environmental advisors in the field of EIA (Environmental Impact Assessment) allows for obtaining not only the projected economic result, but also to determine the culture of co-existence in the environment. Figure 1 presents the structural elements of an offshore wind farm. As an engineering structure in the natural environment, it will have an impact on: the ground environment – the bottom, water environment: underwater and above-water, and air environment. This will bring about difficulties for shipping, fishing, and air traffic. These difficulties will

result in closing water reservoirs and the airspace above them to the marine transport and fishing.\(^8\) This will result in adjustments to the recommended fairways and air corridors. Poland is gaining experience in influencing the marine environment by implementing the Vistula Spit canal investment.\(^9\) This experience will be helpful in the construction of offshore wind farms.


PROJECT CHARACTERISTICS

According to specialists from the RES industry, offshore wind energy is one of the most prospective projects in the power industry. The effectiveness of the investment is enhanced by:

- the technical constructions, applied and tested in other marine sub-areas, are more efficient by about 40-50% compared to the turbines installed inland,
- favourable morphometric conditions exhibited not only by the South Baltic sub-areas,
- excellent meteorological and hydrological conditions,
- the hydrography of a marine sub-area.

![Picture 4. Map of wind farms on South Baltic](source: https://wysokienapiecie.pl/23772-w-wiatraki-na-baltyku-wchodza-najwieksi-gracze/ (access: 2021.10.06))
AUTHOR’S OWN RESEARCH

The research was conducted in October 2021. A diagnostic survey was employed. It is one of the most widely used research methods. It is treated as a technique of investigating public opinion. The research group was selected randomly from among students of the Institute of Agricultural Sciences, Land Management and Environmental Protection of the University of Rzeszów. Surveys are qualified as qualitative research usually conducted using specially constructed questionnaires as research tools. A survey questionnaire was the tool employed. One hundred and eighteen people, who expressed their willingness to complete the questionnaire, participated in the research. The key research problem focused on the planned wind farm investment on the Słupsk Bank (Polish: Ławica Słupska) in relation to environmental changes. It was formulated as follows: *What impact may the planned construction of a wind farm on the Słupsk Bank have on the environment and on Poland’s energy security?*

The first question addressed to the respondents concerned their attitude to ecology (knowledge, sensitivity, pro-ecological attitudes). It is depicted in Chart 1.

![Chart 1. Survey participants’ approach to ecology](source: authors’ own research)

The vast majority of respondents assessed their attitude towards ecology as rather positive, and 15% as definitely positive. Among the respondents, as many as 14% could not define their pro-ecological attitude. In turn, 7% of the respondents rated their attitude as rather negative and 4% as definitely negative.
Being aware that it is worth starting to take appropriate pro-ecological measures oneself is a positive element. The Polish people are becoming increasingly aware of the link between the impact of their own behaviour and the condition of the environment. Sometimes it is better to do many small things, which will sum up to achieve something great.

The next question asked concerned the respondents' attitude towards renewable energy sources. The results are presented in Chart 2.

![Chart 2. Approach of interviewees to renewable energy sources](source: authors' own research)

The vast majority of the respondents are committed (67%) and very committed (21%) to the issues of renewable energy sources. On the other hand, the percentage of indifferent, not very involved and not involved respondents is 4% for each of the categories. Such indications are undoubtedly the result of the increased awareness of Poles about renewable energy sources and their impact on the energy security in our country.

Another question addressed the issue of solidarity with the "environmentalists" opposing the construction of a large offshore wind farm, Chart 3.
Among the respondents, 38% tend to sympathise with "environmentalists" opposing the construction of offshore wind farms. Almost the same percentage, 37%, has no opinion on the issue in question. 12% of the respondents strongly expressed their solidarity. However, the answer of 9% of the respondents was "rather not", whereas 4% of the respondents answered, "definitely not".

Such results may reflect insufficient knowledge about this particular investment. This may stem from the fact that, unlike inland wind energy, the development of offshore wind power generation in our country has only just begun.

In the next (4) question, the respondents were asked to explain the concept of energy security. All the respondents displayed a similar tendency to explain this concept. Their statements suggest that this is the simplest indicator of the country's energy security. It is energy self-sufficiency, understood as the ratio of the amount of energy obtained domestically to the amount of energy consumed.

In question 5, the respondents were asked to comment on the EU recommendations regarding the contribution of energy from renewable sources to the overall energy balance of the country.
In Chart 4, the most indications are "rather yes" (31%), "rather not" (29%) and "hard to say" (27%). This demonstrates that the respondents are very hesitant to support the EU recommendations regarding the percentage share of energy from renewable energy sources in the overall energy balance of the country. Only 10% of the respondents chose the answer "definitely yes", whereas 3% of the respondents "definitely not".

EU legislation on the promotion of renewable energy has evolved significantly in the last fifteen years. In 2009, EU leaders set a target whereby 20% of energy consumption in the Union should be derived from renewable sources by 2020. In 2018, a common objective for the year 2030 was agreed upon: by that time, renewable energy sources should account for 32% of power consumption in the European Union. In July 2021, in connection with the new climate goals of the EU, the co-legislators were proposed to raise the percentage to 40% by 2030. The future policy framework for 2030 is still being discussed.\textsuperscript{11}

In question 6, the respondents were asked to assess wind farm operation in terms of them posing difficulties for fishermen, as well as sport and recreational sailing. As far as the activity of fishermen is concerned, 14% considered the difficulties that might appear for this group as a result of the

operation of an offshore wind farm to be real. However, as far as sport and recreational sailing is concerned, only 4% claims that there might be disruptions connected to the operation of these farms. No less than 82% of the respondents do not consider offshore wind farms to be problematic for recreation, or fishermen’s work.

In the next question (7), the respondents were asked to assess the undertaken environmental initiatives.

![Chart 5. Demonstrating whatever ecological initiative](image)

More than a half of the respondents (54%) are likely to undertake any kind of environmental initiative, whereas 38% definitely undertake such activity. Only 4% of the respondents do not exhibit a pro-ecological attitude, and 4% of them cannot comment on this issue. It is important to be aware of the impact that our choices and actions have on the environment and climate and our legacy for the next generations. We ought not to question scientific research and climate change impact, and rather we should start working together.

The next question (8) asked to the respondents concerned the assessment of the implementation of EU recommendations in our country.
Chart 6. Assessment realization of EU recommendations in terms of renewable energy sources?

source: authors’ own research

Chart 6 demonstrates that the implementation of the EU recommendations in Poland was assessed as good by as many as 44% of the respondents, and as very good by 15%. Only 9% evaluated the implementation as bad. However, it is puzzling that 32% of the respondents could not assess these actions. It could be understood as a consequence of the respondent’s lack of knowledge.

The next question (9) focused on the understanding of the RES (Renewable Energy Sources) abbreviation. As many as 84% of the respondents decoded this abbreviation with ease. The respondents complemented their answers with the explanation of what renewable energy sources are and enumerated them:

- hydropower;
- wind power;
- solar radiation power;
- geothermal power;
- biomass power.

In the next question (10) the respondents were asked to specify the number of kWh (kilowatt-hours) used daily in their households. Only 5% of the respondents answered the question formulated in this manner. As many as 95% of them were unable to answer it. This demonstrates that young people do not track electricity consumption in their households.
The conscious use of electrical appliances is key to increasing savings. It is, however, difficult to talk about savings if we cannot pinpoint the exact electricity consumption. Do we know how much electricity really costs us? Once we have found the answer to this question, we may develop strategies to save money. If we take control of electricity consumption, we can patch up our budget.

In question 11, the respondents were asked to answer the following question: should the experiences from the Vistula Spit canal be taken into consideration while designing a wind farm? The vast majority of the respondents (91%) answered positively.

The last question concerned the assessment of the impact of an offshore wind farm construction on the Polish energy security.

In reply to the question formulated in this manner, 37% of the respondents answered with a "definitely yes", 48% with a "rather yes", and 15% could not take a stand on this matter. Having taken into consideration the results of this questionnaire, there can be no doubt that the respondents believe that this investment will influence our country’s energy security.

CONCLUSIONS

The results of the research carried out among the young inhabitants of Podkarpacie (Subcarpathia Province) could be surprising with regard to certain issues. The results indicate that the vast majority of the respondents assessed their approach to ecology as rather positive, or definitely positive. The vast majority of respondents is involved in the issues related to renewable energy sources too. Half of the respondents support the claims of the "environmentalists" who oppose the offshore wind farm construction. Surprising as this result may be, it also indicates the insufficient knowledge about this particular investment. The respondents remain hesitant about supporting EU recommendations on the percentage of the electricity obtained from renewable energy sources in Poland’s general energy balance. More than a half of the respondents assessed the implementation of EU recommendations in Poland as positive. The vast majority of the respondents do not consider offshore wind farms to be problematic for recreation and fishermen’s work. The vast majority of respondents can decode the abbreviation RES and are able to list the types of renewable energy sources. They also claim to undertake various pro-ecological initiatives. However, most of them cannot determine the electricity consumption of their household.

In response to the main objective of the research carried out among the students of the Institute of Agricultural Sciences, Environmental Protection and Management, the planned construction of the wind farm on the Słupsk Bank does not cause significant negative impact on the environment. At the same time, it will contribute to the improvement of the energy security of Poland.
Providing reliable knowledge on the impact of investments on the natural environment and health of the residents, as well as the possible economic benefits not only improves the investment process, but also protects the interests of both investors and the residents.

Environmental requirements are dictated by climate change and clearly indicate a need to invest in low-carbon energy sources. In the coming years it is our priority to build a virtually new power system, based on the zero-emission energy sources.

Offshore wind farms are among the most dynamically developing technologies in the production of electricity. The need for Poland to meet EU standards for reducing CO₂ emissions and the share of renewable energy in the final energy consumption is a huge challenge in the context of ensuring energy security in the country. Therefore, the topic of offshore wind energy is often raised, since it boasts high efficiency and stability in electricity generation.

According to research, offshore energy is the most socially acceptable technology for generating electricity.¹²

The development of offshore wind energy in Poland may be an important factor in reducing emissivity. Poland possesses great development prospects in terms of wind power potential. Offshore wind energy should be appreciated by the government, and its development should become one of the pillars of Poland’s energy policy.

REFERENCES

[1] A diagram showing components of a standard wind turbine

[2] Energia ze źródeł odnawialnych,


[4] PGE będzie promować na plażach morską energetykę wiatrową,

w sprawie polityki energetycznej państwa do 2040 r. (M.P. z 2021 r. poz.

¹² PGE będzie promować na plażach morską energetykę wiatrową,
264).


KULTURA WSPÓŁLISTNIENIA PLANOWANEJ FARMY WIATROWEJ W KONTEKŚCIE ZMIAN ŚRODOWISKOWYCH

STRESZCZENIE


Słowa kluczowe: morska energetyka wiatrowa, bezpieczeństwo energetyczne, antropopresja, ekologia