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**A summary of a doctoral dissertation written under the scientific guidance of
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**“Development of the renewable energy market in a sustainable development
of gminas in Śląskie voivodeship”**

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Scientists have been warning for years about the negative consequences of climate change resulting from global warming. The effects of this are evident worldwide. Climate changes have caused the European Union (EU) to put great effort into stopping this process. The European Union’s environmental policy introduced aims to reduce CO₂ emissions by e.g. reducing the use of coal in the production of electricity, as well as increasing the share of renewable energy sources (RES) in the energy sectors of EU Member States. Without the commitment of all Member States, the realisation of these assumptions will not be possible. On 11 and 12 December 2008, the European Council adopted the so-called “3x 20” climate package, the objectives of which include:

- reducing greenhouse gases by 20%,
- improving energy effectiveness by 20%,
- 20% share of renewable energy sources in total EU energy consumption. For Poland, the objective was set to reach 15% by 2020.

The structure of electricity generation in the Polish energy sector has been based for decades on fossil fuels, such as coal, which accounts for approximately 80% of all electricity produced in Poland. The use of coal is associated with significant deposits of this material in the country. The biggest deposits of coal are located in the Śląskie voivodeship. The raw material extracted there is also burned in the four largest power plants, which are located in Rybnik, Jaworzno, Łaziska Górne and Będzin. The use of coal in outdated power plants has a big impact on climate change due to the CO₂ emissions.

An important role in achieving the objective of EU directives aimed at decarbonisation and increasing the share of renewable energy sources in the energy sector is played by municipalities (gminas) through their participation in the Agenda 21 programme, which aims to promote sustainable development. Agenda 21 underlines the need to integrate economic, social and environmental matters. The objectives set by the Agenda are:

- creation of international climate protection standards,
- creation of ratings, determination of general terms and obligations for Member States in the scope of sustainable development,
- development of measures to resolve international disputes in the area of sustainable development,
- participation of all countries in the formulation of international conventions on sustainable development.

Agenda 21 has given local authorities an important role. It states that local authorities are to create development, maintain cleanliness and order, implement national and regional environmental policy, as well as promote sustainable development in local communities. Currently, the concept of sustainable development has become an integral part of many plans and actions of the state both at the central level and in the practice of local governments. In 2015, a document was adopted entitled *Przekształcamy nasz świat: Agenda na rzecz zrównoważonego rozwoju 2030* (“Transforming our world: sustainable development Agenda 2030”). It included 17 objectives. Objective no. 7 – “Providing access for all to stable, sustainable and modern energy at an affordable price” – is particularly important. This can be reached by performing the following tasks:

- universal access to affordable, reliable and modern energy services must be ensured by 2030,
- the share of renewable energy sources in the global energy mix must be significantly increased by 2030,
- international cooperation to facilitate access to clean energy research and technology in the field of renewable energy should be increased by 2030.

Increased demand for electricity in the Śląskie voivodeship, as well as in individual gminas, should move towards decarbonisation and energy production from renewable energy sources. Investing in RES and using the energy produced this way will bring a number of benefits in terms of protecting and improving the environment. The use of RES eliminates the

risks arising from the exploitation of conventional energy sources, which allows for the reduction of emissions of:

- nitrogen and sulphur oxides (responsible for acid rain),
- carbon dioxide (which contributes to the so-called greenhouse effect, resulting in climate change),
- particles (that are harmful to all living organisms).

The amount of waste generated in the process of obtaining energy is reduced (or eliminated altogether). In addition to the obvious environmental benefits, the use of renewable energy sources also has social and economic benefits for gminas. The share of RES in 2018 in the Śląskie voivodeship was only 3.1%. In this dissertation, an assessment is performed of the potential of individual renewable energy sources in gminas in the Śląskie voivodeship. The objective of this thesis was to identify the conditions and barriers that determine the sustainable development of the renewable energy market in gminas in the Śląskie voivodeship.

The main hypotheses resulting from the potential of RES:

1. The budgetary resources of gminas in the Śląskie voivodeship has an effect on the development of RES,
2. The European Union, through its directives and acts, supports local governments of gminas in the process of sustainable development of RES,
3. The knowledge of the local community influences the development of RES in gminas in the Śląskie voivodeship,
4. Identification and elimination of barriers are crucial in the process of RES development in gminas in the Śląskie voivodeship.

In order to test the hypotheses, the following research questions were asked:

1. Why are gminas not interested in RES?
2. What is the current policy of gminas in the scope of RES?
3. What are the financial capabilities of gminas in the scope of realisation of RES investments?
4. What is the level of knowledge in the society concerning RES?
5. What are the barriers standing in the way of development of RES in gminas?

The subject of the research to verify the hypotheses were gminas and the local community in the Śląskie voivodeship. The research carried out made it possible to verify the research hypotheses and showed the existence of barriers in gminas in the Śląskie voivodeship.

The first chapter, entitled *The concept of sustainable development*, is devoted to general considerations on the concepts of sustainable development, energy security and energy efficiency. Theoretical basis for the concepts are presented therein.

The second chapter, entitled *Geographical conditions*, concerns the characteristics of the Śląskie voivodeship. The subject of this chapter was the examination of the potential of solar, wind, water, biomass and geothermal energy, as well as the assessment of the use of individual energy sources in gminas in the Śląskie voivodeship. The policies of gminas in the scope of renewable energy sources were evaluated.

The third chapter, entitled *Legal conditions*, contains a review of EU directives concerning climate change and the use of renewable energy sources. Attention was also drawn to the impact of directives and legal acts on the impact of the Polish energy market, which is obliged to strive towards decarbonisation. Legal actions affecting the development of renewable energy sources in gminas in the Śląskie voivodeship are also presented.

The fourth chapter, entitled *Economic conditions*, presents the Polish energy sector and the changes it has undergone over the years. The sustainable impact of coal in the energy sector and the difficulties in implementing investments are noted. Attention is also drawn to the regionally increasing demand for electricity. A financial analysis of gminas was out in the context of the possibilities of financing investments in renewable energy sources, as well as in the context of the method of RES promotion in gminas. The benefits that gminas can gain from the use of renewable energy sources were also identified.

The fifth chapter, entitled *Social conditions*, contains an in-depth analysis of a community survey. The profile of the local community and its important role in the development of renewable energy sources are presented therein. The air quality in gminas in the Śląskie voivodeship and the impact of pollution on the human body were also examined.

The sixth chapter, entitled *Evaluation of research results*, is based on survey results and the author's considerations. Barriers affecting the sustainable development of renewable energy sources in gminas in the Śląskie voivodeship were identified, and the actions that can be taken by the gminas in the future are presented.

The empirical context of the dissertation is manifested primarily in the conducted survey. There has not been such a large scale survey concerning actions taken in the development of renewable energy sources before. The survey consisted of 136 gminas in the Śląskie voivodeship. The analysis made it possible to identify the conditions during the research; the existence of geographical, economic, legal and social conditions was confirmed.

Theoretical considerations show that renewable energy sources are a permanent part of sustainable development policies and constitute an important objective. The development of renewable energy sources brings many tangible advantages. They are not only important from an environmental and pollution reduction perspective, but can also have positive social and economic effects. Ensuring the effective sustainable development of renewable energy sources requires a number of measures, mainly by removing existing barriers that have been piling up for years.

The performed analysis showed that renewable energy sources are in an early phase of growth, and sustainable development has already begun in some gminas. However, gminas should start to take firm decisions to make up for the lost time, because the current situation is not encouraging. The research has shown that the policies and barriers will only translate into a 10% share of renewable energy in most gminas in the Śląskie voivodeship by 2030.

An abstract covering the most important aspects will be drawn up from the thesis, together with the results of the research, which will be sent for free to gminas in the Śląskie voivodeship. The knowledge gained from this dissertation can help gminas to change their policies and introduce a number of changes to increase the use of renewable energy sources.