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Introduction

The Department of Regional Economy at the Faculty of Economics, Management and Tourism of Wrocław University of Economics organized yet another scientific conference entitled: “Local and regional economy in theory and practice”. It was already the 23rd conference held on 23-25th September 2015 in “Chata za wsią” hotel in Mysłakowice near Jelenia Góra.

The conference was attended by the representatives of national and international scientific circles, regional and local government structures, and also other entities representing business practice and interested in the problems of local and regional economy, as well as PhD students. Over 80 participants of the conference arrived from over 30 national and foreign scientific centres and institutions to present papers and posters.

The subject matter of the conference covered the following areas: local and regional development, local and regional governance, application of quantitative methods in regional studies, partnership in local and regional development, directions of research in local and regional development, cooperation between academic centres and local government units.

The conference contributed to establishing more extensive and stronger relationships, created within the framework of the constructed platform for the exchange of scientific and practical experiences (the conference has been held cyclically since 1992) at the local, regional, national and international forum. The discussions were focused on the dissemination of research results, the exchange of experiences and the establishment of a discussion forum covering both theoretical and practical aspects of local and regional development. They also resulted in more extensive cooperation between academic centres, local government units as well as research and development centres, including the cross-border ones.

The conference is cyclically attended by the representatives of science from Poland and abroad. So far we have hosted e.g. the research workers representing academic centres from Ukraine, the Czech Republic, Italy, Sweden, Germany, Austria, Denmark, Slovakia and also the representatives of business practice, e.g. city presidents and mayors, village heads, county governors, presidents of regional development agencies or of local enterprises, etc.

As a result of the organized conference, the hereby publication presents the collection of thematically selected articles in English covering the broadly understood problems of local and regional economy. Its authors represent the following scientific centres: Warsaw School of Economics, University of Łódź, Gdańsk University of Technology, Koszalin University of Technology, University of Warmia and Mazury in Olsztyn and Wrocław University of Economics.

We are most grateful to the conference participants for the joint meeting and we do hope for further cooperation.

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THE IMPORTANCE OF RENEWABLE ENERGY SOURCES FOR SUSTAINABLE DEVELOPMENT OF POLISH REGIONS

ZNACZENIE ODNAWIALNYCH ŹRÓDEŁ ENERGII DLA ZRÓWNOWAŻONEGO ROZWOJU REGIONÓW POLSKI

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Summary: Energy policy plays a key role in the European Union and has a significant impact on the socio-economic development of regions. EU energy policy has been focused on efforts to reduce energy consumption and to increase energy efficiency and wider use of renewable energy sources. In recent years, the share of renewable-energy sources has significantly increased in the total Polish energy balance. The aim of the article will be to analyze the impact of capabilities of renewable energy sources in Polish regions along with potential benefits of applying them.

Keywords: renewable energy sources, sustainable development, regions, EU.

Streszczenie: Energetyka odnawialna staje się coraz ważniejszym czynnikiem wpływającym w istotny sposób na możliwości rozwoju społeczno-gospodarczego regionów, zwłaszcza w aspekcie ochrony środowiska, wykorzystania lokalnych zasobów, wzrostu innowacyjności gospodarki oraz poprawy jakości życia ludności. Dlatego też celem artykułu jest omówienie wpływu energetyki odnawialnej na rozwój polskich regionów.

Słowa kluczowe: odnawialne źródła energii, rozwój zrównoważony, regiony, UE.

1. Introduction

Progressing socio-economic development processes frequently cause significant and irreversible changes in the natural environment. Problems related to environmental degradation and disruption of the concept of sustainable development are also largely connected with Polish regions. One of the major factors influencing both the state of the natural environment, as well as the level of economic development and the

quality of life, are sources and methods of manufacture utilized in the production of thermal and electrical energy. In Poland, renewable resources remain a completely unused source of green energy; effectively applied, they could, on the one hand, help improve the state of the natural environment, as well as – through the positive impact on the economy and the job market – become an important factor favorably influencing the quality of life. Therefore, in the article an analysis was conducted of the influence and importance of renewable energy resources in the sustainable development of the Polish regions along with potential benefits of applying them.

The paper includes a literature review to summarize recent knowledge regarding the essence and objectives of the concept of sustainable development. Additionally, we used data available from the strategic documents and reports to describe the potential and perspectives of the development of renewable energy resources in Poland, and their influence on the regional economy.

2. The essence and objectives of the concept of sustainable development

Sustainable socio-economic development is one of the greatest challenges in the contemporary world. The basic assumption of sustainable development is conducting activities in particular sectors of the economy and social life, so that the resources and values of the natural environment are preserved in a way which ensures permanent possibilities of using them, both by current and future generations, with simultaneous preservation of the functioning of environmental processes and natural biodiversity on the level of the landscape, ecosystem, species, and genes [II Polityka... 2001]. Therefore, in the process of fulfilling current needs of the individual, one must take into consideration the needs of future generations; moreover, efforts to increase the quality of life should entail efforts to ensure equal distribution of the growing prosperity. As a result, one cannot overlook the analysis of conditions of sustainable development in the categories of inter- and intragenerational justice:

- intragenerational justice (consisting in efforts to fulfill the basic needs, protect health and life, and fulfill intellectual needs, etc.),
- intergenerational justice (consisting in preserving the natural capital for future generations by means of the economical use of the available natural resources) [Kiełczewski 2009].

Within the economy of sustainable development one may distinguish three equal areas (ecological, economic, and social) [Bosselmann 2016]. The essence of sustainable development is not balancing the relationship between particular dimensions, but selecting the degree of sustainability. The degree of sustainability determines the focus on environmental protection and the desire to preserve the natural capital in relation to the needs of the economy and society [Purvis 2004; Dizdaroglu, Yigitcanlar, Dawes 2010].

The scope of penetration, complementarity, or exclusion between the abovementioned dimensions depends on the structure of entities taking actions, the accepted procedures, or the ecological knowledge and awareness of the members of a given community. In spite of all the shortcomings and controversies surrounding the idea of sustainable development, one needs to strive to balance and rationally use the possessed resources in order to ensure the sustainable development of the present and future generations. The problems are especially important in the European Union, where matters connected with environmental protection or the rational use of resources are among the priorities of European policies, and have been contained in documents defining the strategic directions in the development of the Union. They are reflected in, among others, works by the European Commission, which set three priorities in the document *Europe 2020. A strategy for smart, sustainable and inclusive growth*:

- smart growth (development of a knowledge- and innovation-based economy),
- sustainable growth (promoting an economy using resources more effectively, and being more eco-friendly and more competitive),
- inclusive growth (promoting an economy with a high level of employment, ensuring social and territorial cohesion) [Europa 2010].

The abovementioned assumptions have been reflected in Polish legislation, according to which Poland should pursue the idea of sustainable development in its activities. It is preordained by, among others, Art. 5 of the Polish Constitution, which refers to the principle of sustainable development, according to which “the Republic of Poland watches over the independence and inviolability of its territory, ensures freedom, human and citizenship rights, and security of its residents, protects the national legacy and provides environmental protection, following the principle of sustainable development”. Moreover, reference to the concept of sustainable development is made in Art. 74, in terms of ecological security and the principle of environmental protection and justice between generations [Konstytucja Rzeczypospolitej Polskiej, Art. 74]:

- public authorities pursue a policy that ensures the current and future generations ecological security;
- environmental protection is the responsibility of public authorities;
- everyone has a right to access information about the state and protection of the environment;
- public authorities support the residents’ activities for the purpose of protecting and improving the state of the environment.

Reference to sustainable development is also found in many other legal acts. One should at least mention the Act of 27 April 2001 on the Right to Environmental Protection, which states that “environmental protection should take place in accordance with the principle of sustainable development,” or the Act of 27 March 2003 on Spatial Planning and Management, which accepts sustainable development

as a basis for the actions [Ustawa z dnia 27 kwietnia 2001]. In the implementation of the objectives of sustainable development an important role is played by particular regions, including territorial self-government units functioning within them, which have a significant influence on the shaping of local and regional development. It is also their actions and decisions that influence the shape and directions of socio-economic policies.

3. The potential and perspectives of the development of renewable energy resources in Poland, and their influence on the regional economy

The use of renewable energy resources is one of the key actions within the energy policy of both the European Union and Poland, being part of the development of the innovative economy utilizing local and regional resources, climate protection, energy security, and environmental protection.

The need to develop investments in renewable energy is determined by, among others, the accepted international public obligations connected with changes in energy production and environmental protection. Art. 194 of the Treaty on the Functioning of the European Union introduces a specific legal basis in the field of energy by reason of competences shared between the EU and its member states. Numerous objectives have been set for the states, the implementation of which will be necessary to implement the energy policy:

- guaranteeing the supply of electricity to Europe,
- ensuring that the prices of energy do not hinder competitiveness of Europe,
- protecting environment, especially prevention of climate change,
- developing of energy networks.

At the same time, the member states have complete freedom in investing in energy resources of their choice; however, they must take into consideration the European objectives connected with renewable energy resources.

Therefore, it is clear that Poland, as a member state, has committed itself to pursuing energy policies remaining in accordance with the European Union's strategy, which is based on the constant growth of the share of energy produced by means of renewable resources. The main obligations in the field of using renewable energy resources include implementation of the provisions of the "3×20%" package, according to which by 2020 the economy of the European Union is to reduce the emissions of greenhouse gases by 20% in relation to 1990, reduce energy consumption by 20% in relation to prognoses for the EU in 2020, and increase the share of renewable energy resources in total energy consumption in the EU by 20%. An increase in the use of renewable energy resources in transport to 10% is also assumed.

These obligations have been mentioned in the strategic document *Polityka energetyczna Polski do 2030 roku* [Polityka energetyczna... 2009]. As given in the abovementioned document, “the development of renewable energy production is of great significance in the implementation of the basic aims of energy policy.”

Poland is a country with great potential in terms of renewable energy resources. The possibilities of using those resources in particular areas of the country are varied. The size of renewable energy resources depends on a number of factors, among which the most important are natural conditions, and the state of agriculture and forestry [Paska, Sałek, Surma 2009].

While analyzing the greatest potential renewable energy resources, one must note that among the available renewable resources in the country, wind energy production is characterized by its significant potential for development (especially in the provinces of West Pomerania, Pomerania, Wielkopolska, Kujawy-Pomerania, and Podlasie). Small wind power stations also have great potential in provinces with less potential for building large wind farms (that is Małopolska, Mazovia, Podkarpacie, or Lublin). The use of the potential of solar energy production would require installation of about 14.7 million sq. M. of solar collectors by 2020. The greatest potential in this field is found in the following provinces: Mazovia, Silesia, Małopolska, and Wielkopolska. The smallest potential in terms of the possibility of acquiring solar energy is, on the other hand, found in Lubuskie, Opole, Świętokrzyskie, and Podlasie. In Poland, also the potential of solid biomass production at permanent plantations is still poorly used. The largest potential in terms of biomass production is present in Lublin, Mazovia, and Podkarpacie. The least favorable conditions for the development of renewable energy production on the basis of biomass production in a given area are found in Opole and Lubuskie. The leading position in the total potential of the technical use of agricultural biogas is occupied by Mazovia and Wielkopolska, as well as Warmia-Masuria, Podlasie, and Kujawy-Pomerania [Krajowy... 2015; Programowanie... 2014; REmap... 2015].

The qualitative assessment of the potential of renewable energy resources for particular regions against the background of the planned increase in the use of the market potential of RER in the years 2014-2020, and the path of the development of RER technologies for the purpose of producing heat and electricity in Poland by 2020 have been presented in Tables 1 and 2.

As the research and the analyses show, Poland has enormous potential and great possibilities of using renewable energy resources. The potential is “the result of the favorable geographical and climatic location of Poland, the large area of the country (diversity of geographical and climatic zones, possibility of ‘collecting’ dispersed energy resources from the vast area), its forms of spatial development (with the dominance of the agricultural use of space, favorable to RER), and its relatively low population density” [Określenie... 2011].

Table 1. Qualitative summary of the assessments and potential of RER for particular regions against the background of the planned increase in the use of the market potential of RER in Poland in the years 2014-2020

Description	Wind power	Small wind energy production	Thermal solar energy	Photovoltaics	Agricultural biogas	Biomass from energy crops	Biomass–straw	Forest biomass	Deep geothermal energy	Shallow geothermal energy	Water power
Lower Silesian	o	o	o	–	–	o	o	–	o	o	o
Kuyavian-Pomeranian	x	o	o	–	x	o	x	–	–	o	o
Lublin	–	x	o	–	o	o	x	–	–	o	–
Lubusz	o	o	o	–	–	–	–	–	–	o	–
Łódź	o	x	o	–	o	o	o	–	x	o	–
Lesser Poland	–	x	x	–	–	o	–	–	o	o	–
Mazovian	o	x	x	–	x	o	o	–	–	o	–
Opole	–	o	–	–	–	–	x	–	o	o	–
Podkarpackie	o	x	o	–	–	o	o	–	–	o	o
Podlaskie	x	o	–	–	x	o	–	–	–	o	–
Pomeranian	x	o	o	–	o	o	x	–	–	o	–
Silesian	–	x	x	–	–	o	o	–	–	o	–
Świętokrzyskie	–	x	–	–	–	o	o	–	–	o	–
Warmian-Masurian	o	o	o	–	x	o	o	–	–	o	–
Greater Poland	x	x	x	–	x	o	x	–	x	o	–
West Pomeranian	x	o	o	–	o	o	o	–	x	o	–
Planned increase in the use of resources in the years 2014-2020 in Poland – according to the NACE (ktoe)	750	37	392	0.09	384	812			112	87	48
Participation of RER technologies in the increase in energy production and potential use planned by the NACE (2014-2020) (in %)	19	1	13	0	12	28		0	4	3	2

Key: insignificant potential: –, significant potential: o, very significant potential: x.

Sources: [Określenie... 2011].

Table 2. Paths of the development of RER technologies for the production of heat and electricity in Poland by 2020 (ktoe)

Description	2015	2016	2017	2018	2019	2020
Solid biomass	3996	4118	4250	4361	4594	4636
Solar energy	176	258	324	406	441	506
Biogas	231	275	320	364	408	453
Deep geothermal energy	57	70	86	105	107	178
Heat pumps	72	85	99	114	130	148
Onshore wind farms	634	735	822	929	1018	1132
Biomass, biogas, biofluids	851	890	947	1003	1113	1223
Offshore wind farms	0	0	0	0	0	129
Small wind power stations	15	20	26	34	40	47
Hydroelectric power stations >10 MW	119	119	119	119	119	151
Hydroelectric power stations –10 MW	54	55	57	58	60	61
Hydroelectric power stations <10 MW	37	38	39	40	42	43
Photovoltaics	0.17	0.17	0.17	0.26	0.26	0.26

Sources: [Określenie... 2011].

4. Socio-economic conditions for the development of the Polish regions in terms of using renewable energy resources

The implementation of energy policy in the regions is possible because of properly selected and adapted instruments, which allow local and regional authorities to affect public utility units, as well as businesses and residents. The influence of particular instruments on the socio-economic development of a given region is varied, and visible with different degrees of intensity. In view of their nature and specific characteristics, the instruments of the energy policy of particular territorial self-government units can be divided into [Maśloch 2008]:

- legal and administrative instruments (ordinances, administrative decisions),
- financial instruments (incomes, expenses),
- information and organizational instruments (development strategies, development plans, information campaigns, promotional campaigns, educational campaigns),
- investment projects (energy investments in the infrastructure managed by territorial and regional self-government units, investments made by municipal companies, investments in cooperation with other entities).

Potential benefits within the concept of sustainable development that a region can obtain as part of its development- and RER-oriented energy policy include the following:

- development of an innovative economy in the region, using modern technologies of processing renewable energy resources, and using production and services for this purpose,
- environmental protection (reduced carbon dioxide emissions through an effective reduction in greenhouse gas emissions, etc.),
- creation of new jobs (jobs usually do not appear in large, centralized industrial centers, but in rural areas, and are dispersed in nature. The Ministry of Economy predicts that employment in the renewable energy resources sector may amount to about 90,000 people in 2020, which can be contrasted with the number of about 160,000 people employed in the energy sector in 2010) [Paska, Surma 2013],
- development of decentralized renewable energy production, which is connected with changes in the direction of cash flows for payments for energy. In case of the use of fossil fuels, the resources flow outside the region, contributing to the transfer of resources to other settlement units (e.g. regions that have coal mines within their areas). A region investing in renewable energy resources in this way increases its income base,
- emergence of new businesses (production and system support), and an increase in the residents' economic activity,
- cultivation of agricultural renewable resources (energy crops), which allows the capital to be brought to agricultural areas. Moreover, cultivation of energy crops helps use untilled land. In this respect, there are great reserves, as the majority of agricultural areas are not cultivated at all, and – in view of the progressing negative demographic changes and the increasing agricultural productivity per hectare – the tendency is likely to strengthen in the next years,
- creating and promoting an environmentally conscious image of the region,
- increasing the local and regional energy security by means of becoming independent from external suppliers of fossil fuels and increasing the diversity of energy-generating products,
- influence on the reduction in energy costs connected with the protection of the health of the region's residents by means of improving the state of the natural environment,
- ensuring future generations access to non-renewable energy resources, according to the principle of sustainable development.

However, the main difficulties and problems connected with the need to develop renewable energy resources in the region include:

- lack of political will to introduce changes and act in accordance with resolutions related to energy and climate,
- lack of will and social acceptance for investments in renewable energy resources (especially in regions with a mining tradition),
- lack of adequate financial resources for the purpose of making the investments.

5. Conclusions

The dynamic economic, social, and political changes in Polish energy production create completely new chances for particular regions. The increased interest in RER gives regional economies brand new opportunities in terms of implementing the principles of sustainable development.

Renewable energy, being one of the fastest developing sectors of the economy, poses a number of challenges to the Polish regions; the challenges should be accepted, so that the regions can grow. The increased use of renewable energy resources carries a greater degree of independence from imported energy. Promoting the use of RER allows for an increase in the diversity of energy resources, and creation of conditions for the development of distributed energy production based on locally available resources. Renewable energy production usually takes the form of small production units situated close to the client, which allows for an increase in the local energy security, and a reduction in transmission losses. Renewable energy production is characterized by low or nonexistent pollution emissions, which ensures positive ecological effects. Moreover, the development of renewable energy production contributes to the growth of less developed regions, rich in renewable energy resources [Polityka energetyczna... 2009].

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