


Article

Energy Transition of the Coal Region and Challenges for Local and Regional Authorities: The Case of the Bełchatów Basin Area in Poland

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Abstract: The transition to a climate-neutral economy presents a particular challenge for the areas where the economy is based on rich lignite resources. One of them is the Bełchatów Basin Area in Poland. The complexity of the phenomena occurring in the area of transformation requires an interdisciplinary and integrated approach to development planning and managing. It is important to create stable conditions, allowing for the introduction of necessary changes, including the involvement of various stakeholders. The research is aimed at identifying the challenges faced by the region with a lignite-based economy, the inhibitors of the transformation process, and recommendations for public policy. During the research, secondary and primary data were analysed with the use of triangulation, which allowed to combine various techniques and sources, as well as an in-depth description and multi-faceted understanding of the case under study. The study poses a key question as to whether the public authority is capable of implementing the energy transition that would protect the global public interest. The conducted research showed deficiencies negatively affecting its implementation. There are barriers affecting cooperation in the public sphere and with other stakeholders. An analysis of the limitations in cooperation showed the dysfunction of energy policy implementation at the regional level. Vertical and horizontal actions between different stakeholders of the transformation are necessary to identify seed industries representing a transformational opportunity in the Bełchatów Basin. Renewable energy sources may play a key role in this process. Their share in electricity production should be increased. A clear and precise vision of the development of this territory, as well as a stable and diversified system of financing are important elements of change. The article draws attention to the lack of a transformation leader. Identifying an actor responsible for the protection of the global public interest is essential.

Keywords: energy transition of a coal region; energy transition policy; governance in coal region; integrated management of development; functional urban area; cooperation in coal region; government failure; territorial just transition; energy transition barriers



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1. Introduction

Progressive climate change and environmental degradation are the chief challenges of the modern world [1] that currently require radical, large-scale, cross-border, and integrated actions. These changes present all of the European regions dependent on mining and coal energy (including hard coal and lignite) with the complex challenge of economic transition towards climate neutrality [2]. The aim of the European Union's (EU) energy and climate policy, which is gradually moving away from fossil fuels in the processes of electricity and heat generation, is to eliminate coal and build a low- and zero-emission economy. The transition to a climate-neutral economy affects several areas. The essential and most anticipated area of change is the measures ensuring a positive impact on the natural environment. However, the transition should also address other aspects, such as a permanent change in the industrial structure, a transformation of the regional labour market, and the search for new green energy sources.

The role of central, regional, and local governments is to moderate/stimulate actions leading to a just transition, minimising social and economic risks resulting from the loss of a significant element of the economic ecosystem. A just transition is a relatively new concept, often equated with investment in infrastructure. Its key element is also the social factor.

Łódzkie Region is one of the largest electricity generators in Poland thanks to the Bełchatów Power Plant and the associated lignite mine—it produces approximately 20% of the electricity used in the country. It is also one of the largest employers in the province, which means that the transformation process will be complex, expensive, and time-consuming. The Bełchatów mining production, initiated with the extraction of the first tons of lignite in 1980, has led to numerous negative consequences in the environmental and spatial spheres, as well as in the economic and social domains. Changes to the energy system planned for 2030, leading to the ultimate transformation by 2050, will gradually reduce conventional sources of energy and switch to low-carbon, innovative sources, ensuring energy security. This paper aims to present the challenges faced by the region dominated by a raw material economy, based on rich lignite resources, and finding itself on the threshold of energy transformation. It is meant to present the inhibitors of the transformation process and recommendations for public policy. The argument will be conducted on the example of the Bełchatów Area (Bełchatów and its functional area) located in Poland, in Łódzkie Region (Voivodeship). The analysis of secondary materials (including foreign and Polish literature, strategic and planning documents, reports, statistical data, and websites), as well as the directions of development of the EU and its regions, led to the following research questions:

What is the framework of the European Union's energy and climate policy and what solutions do member states adopt in this context?

What solutions for energy and climate policy are adopted at the regional level?

What are the effects of the energy transition for post-coal regions?

What are the challenges of the energy transition for post-coal regions?

Are local and regional governments capable of implementing a just transition?

To what extent does the theory of government failure apply in the implementation of energy and climate policy?

The following subjects prompted the decision to conduct the research:

1. A special role in the energy transition process is attributed to the public authorities as responsible for moderating/stimulating actions that limit the possible social, economic, spatial, and environmental consequences of the transition;
2. The ability of public administration (in particular the local and regional authorities) to implement energy policies that protect the global public interest is one of the most important conditions for the transition to succeed;
3. The complexity of the challenges faced by Bełchatów and its functional area requires the implementation of integrated activities, involving various types of stakeholders. Taking joint and integrated projects is crucial for an effective transformation process;
4. The energy transition requires favourable conditions in the organisational, legal, institutional, financial, and psychosocial spheres, allowing for the involvement of various actors representing the public and private sectors, and social partners, who will jointly create a network of institutions working together towards an effective transition. The limitations in cooperation hinder this process.

Taking into account the problems occurring in areas dominated by coal-based economy, the following thesis has been formulated: local and regional authorities are incapable of implementing energy policies that would protect the global public interest.

In each part of this study, an attempt was made to present the challenges faced by the coal region in the process of energy transition. The article starts with a description of the methodology applied in the research (using primary and secondary data). Section 3 presents the implementation of the energy and climate policy in a broader context, starting at the EU level, and then focusing on the guidelines in Polish national documents. In Section 4,

the results of the research were included. The added value of Section 4.1 is a comparative analysis of the Łódzkie Voivodeship strategic and planning documents, which set the directions of transformation of the Bełchatów Basin from the perspective of its territorial and functional development planning. The subsequent part of this paper characterises the Basin (Section 4.2), taking into account its social, economic, spatial, and environmental issues. It should be stressed that the complexity of the presented phenomena requires an interdisciplinary and integrated approach to planning and managing the development of this territory, and the reliance on the principle of partnership (one of the principles of integrated development management [3]). The next part of this article (Section 4.3) is of particular value, as it presents the results of the author's research into local and regional determinants of transformation. First, the author presents the results of her research on the share of the Bełchatów Area in the production of renewable energy in Poland. Second, she presents and analyses the barriers to cooperation that hinder transformation. This field of interest has not been the subject of in-depth consideration, or the focus was on other problems resulting from the energy transition [4–9]. Third, the author presents the results of her research, characterising the activities undertaken so far in the area of transformation. In Section 4.4, the author discusses the implementation of the energy and climate policy in Poland in view of the government failure theory. The author's findings were the basis for the final parts of the article containing the conclusions regarding the greatest challenges facing the region and recommendations for public policy. The article's main focus is one of the Polish coal regions, but the described phenomena is likely apply to other regions, particularly to the post-communist or developing countries of Central and Eastern Europe.

2. Materials and Methods

This paper is a case study of one of the Polish coal regions with the world's largest lignite power plant. The analysis will be focused on a number of thematic areas, including the presentation of the European and national energy and climate policy framework, as well as the solutions adopted in the region. The area will be presented with particular emphasis on the effects of mining activities in the economic, social, and spatial-environmental spheres, and on the challenges faced by public administration. The difficulties of green transformation prompted the author to analyse the use of renewable sources in the process of energy generation in the area of Bełchatów, one of the functional areas of Łódzkie Voivodeship. An important element of the deliberations is the presentation of the local and regional conditions which determine the transformation in this area, taking into account the aspects of public-private cooperation, fundamental to the long-term strategic development of territorial capital (understood as a synergistic and relational resource) [10] (p. 115), i.e., with the involvement of local government units, economic, academic, scientific and research units, and civic organisations. The contemporary competitive advantages, crucial for socio-economic development, are increasingly determined by cooperation between local self-government and other stakeholders, their formal and non-formal relations, and strongly connected to a high level of social capital [11] (p. 241).

The catalogue of entities was adopted based on the Triple Helix model [12] that defines the dynamics of the relationship between science, industry, and government, but also with the inclusion of civil society input—the Quadruple Helix model [13–15]. The research was focused on local government units of Łódzkie Region; the samples used differed depending on the stage. As a rule, mayors and managerial staff were included in the study.

The research carried out for this article is one of the stages of research and application projects focused on functional urban areas, which the author has been working on for years. The rolling research was conducted in several stages (Figure 1).

During the research, secondary and primary data were analysed with the use of triangulation [16]. The first stage focused on the critical analysis of secondary data (including literature, legal acts, strategic and planning documents, reports, statistical data, and internet resources), which allowed the author to pose research questions and formulate the thesis. The second stage was carried out in the form of quantitative research, based on

a questionnaire addressed to two hundred and one local government units in Łódzkie Region (gminas and powiats). It aimed to identify and evaluate cooperation undertaken by local government units with other local governments, entrepreneurs, universities, and non-governmental organisations. The rate of return in this part of the study was 19.40%. An important objective of the conducted research was to identify the barriers limiting this cooperation. The third stage was a field study (qualitative research) consisting of interviews. The use of this research technique allowed for a deeper insight into the issues in question by obtaining information on human experiences and interpretation of facts, as well as the way of receiving and understanding reality. This stage of research was closely related to the second one, especially in the context of in-depth characteristics of barriers to cooperation. They allowed, among others, to confirm the results using the questionnaire, and to characterise them. In her research, the author focused mainly on the functional area of the town of Bełchatów. A total of seventeen representatives of local governments, including seven from the Bełchatów Area, participated in this part of the research. The last stage of the research, carried out in 2020, was the analysis of cooperation between local government units in the Bełchatów Basin Area. Again, the research (at this stage) was based on a questionnaire addressed to all local government units of the Bełchatów Basin. The rate of return was 32%. The research was aimed at identifying and characterising projects implemented in the transformation area (current and planned), with particular emphasis on projects conducted in partnerships. At the same time, their essence was also the identification of problems affecting or likely to affect the development of the Bełchatów Basin. An important element of the research was the analysis of the use of green investments treated as the driving force of energy transformation. The section on the characteristics of the area, in the context of renewable energy sources, was prepared based on the quantitative data analysis published by the Energy Regulatory Office.

The multiplicity and diversity of phenomena occurring in the area of transformation require an interdisciplinary, continuous, and iterative approach in research, involving various stakeholder groups at various stages. Each territory should be approached individually—the research process should be adapted to its specificity and existing problematic phenomena.

The research methodology used by the author may be considered a model that might potentially be used not only in research on other areas in the process of energy transition but also on the implementation of energy policy, including the concept of governance. The key element of the methodology used here is the variety of research tools (both secondary and primary). Multiple data collections and perspectives allowed for a reduction in the possibility of misinterpretation [17] (p. 640). Triangulation allowed for the combination of various techniques and sources, and thus provided a full description and multifaceted understanding of the case [18] (p. 24). Its application was important from the point of view of several research questions and the use of various methods and sources [19] (p. 25). The methodology used by the author is exploratory (as a result of the research procedure, general questions, and the research thesis being defined), descriptive (the phenomenon was described comprehensively, taking into account the context of its occurrence), and explanatory (focused on the analysis of the causes and effects of existing relations) [20]. The research was rolling, which allowed for the modification and development of its methodology at subsequent stages of the process. A strongly emphasised element of the research process is its iterative nature, allowing the author to return to selected research areas in subsequent phases. The presented research results (collected by the author thanks to the implementation of the process according to these general principles), as well as the conclusions drawn, can contribute to the knowledge of the processes related to the management of the development of areas undergoing transformation, and be a source of inspiration for other researchers.

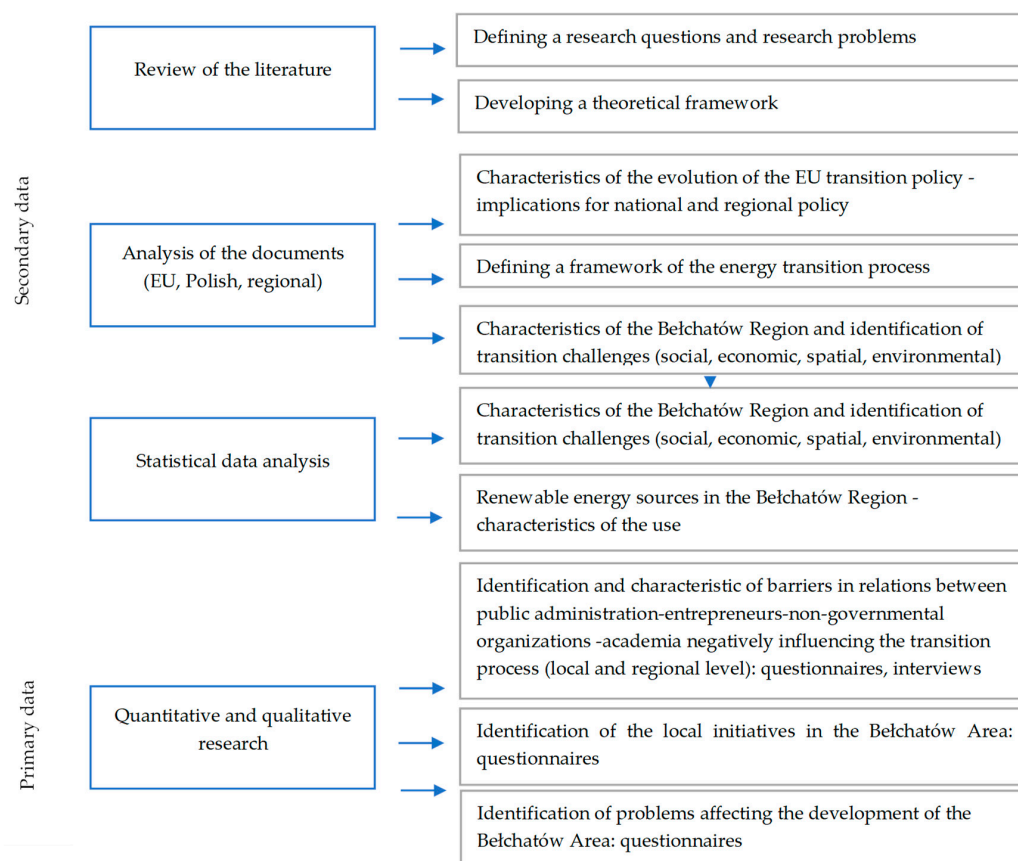


Figure 1. Stages of the research. Source: own study.

3. Literature Review

3.1. European Energy and Climate Policy Framework

International climate protection discussions and cooperation were formally initiated in the nineteen-eighties during the “Earth Summit” in Rio de Janeiro. The United Nations Framework Convention on Climate Change [21] and Agenda 21 [22] were signed, followed by the Kyoto Protocol accompanying the Convention in 1997 [23]. The strategic goal was to prevent the increase in the average temperature on Earth by more than 2 °C by the end of the 21st century. The intermediate goal resulting from the Kyoto Protocol was to achieve a 5.2% reduction in global greenhouse gas emissions below the 1990 levels by the period between 2008 to 2012. Differences between countries in terms of emissions, level of development, and ability to cope with greenhouse gas emission reductions, as well as the lack of arrangements for concrete actions addressed to all countries, resulted in a negative assessment of the implementation of the provisions of the Convention and the failure to achieve the assumed indicators. Moreover, in 2012 emissions were 20% higher than in 2000 and about 14% higher than the allowable limit [24]. The discussion initiated at that time resulted in further political actions for climate protection.

Responding to the global challenge, the European Union has adopted a long-term vision for achieving the EU’s climate neutrality (by 2050) and regulatory mechanisms to stimulate progress in the coming decades. The EU’s energy and climate policy assumes a gradual transition away from fossil fuels in the process of electricity and heat generation until the complete elimination of coal and a successful transition to a low- and zero-emission economy [25] (p. 159). The process of stepping up action for climate protection and transition to a low-carbon economy was initiated by the European Commission in 2007 through its proposal of the first climate and energy package (the so-called “3 × 20” or “20-20-20” package), which focused on the implementation of the European Union’s climate change objectives. This package was adopted by the European Parliament in 2008 and the targets

that the Community had committed to achieving by 2020 were centred around three areas: (1) reducing greenhouse gas emissions by at least 20% (compared to the base year 1990) or by 30% if a global agreement on greenhouse gas reduction is achieved; (2) increasing the share of energy from renewable sources in final energy consumption up to 20%; (3) increasing energy efficiency by 20% compared to the fuel and energy demand forecast. An important part of the agreement, which has resulted in the lack of progress along the adopted guidelines, was the assumption that individual Member States would participate according to their capabilities and their different levels of ambition and involvement in the process of reducing greenhouse gas emissions. The 3 × 20 package consists of several legal acts that aim to achieve the set objectives both at the Community level and at the level of individual Member States [26–38]. The adopted energy and climate package set targets for 2020. This time perspective forced the need to take action to prepare a second package for 2020–2030. In 2011, the European Commission adopted the *Roadmap for the transition to a competitive low-carbon economy in 2050* [39]. Its premise was the reduction in CO₂ emissions for individual sectors of the economy, including the energy sector, for which the value was set in the range of –54% to –68% (by 2030, compared to the 1990 level) and subsequently in the range of –93% to –99% (by 2050, compared to the 1990 level). In December of the same year, the European Commission also adopted the Energy Roadmap 2050. It was a continuation of the previously adopted low emission economy plan, with the amended energy and climate policy objectives adopted in the first energy and climate package. This document proposed a reduction in CO₂ emissions by 80–95% by 2050 compared to the 1990 level. It defines, among others, “the challenges posed by delivering the EU’s decarbonisation objective while at the same time ensuring security of energy supply and competitiveness” [40] (p. 2), as well as EU decarbonisation scenarios in the perspective of almost forty years. One of them assumes that in 2050 renewable energy sources (RES) will generate 97% of energy in the EU.

Energy is the exclusive competence of Member States—the EU has gained indirect influence on energy policy through the prerogatives granted to the EU in the field of environmental protection, which translates into its competencies in the field of CO₂ emissions reduction, promotion of renewable energy sources and energy saving strategies. Eventually, these measures yielded results: at the beginning of 2012, the Danish Presidency proposed higher CO₂ reductions in the European Union Council Conclusions [41]. However, this was not favourably received by all Member States—Poland vetoed the conclusions due to its extensive use of coal in the energy sector, thus slowing down and suspending new climate policies. In 2013, the European Commission published the Green Paper [42], thus launching the consultation process for the 2030 climate and energy policy framework. The pillars of this new initiative are: (1) to ensure the EU’s leading role in climate action, achieving the target of cutting greenhouse gas emissions by 80–95% by 2050 compared to the 1990 level; (2) a higher share of renewable energy (30% by 2030, including 20% photovoltaics and wind energy); (3) improving energy efficiency; (4) better and smarter energy infrastructure, as well as (5) promoting long-term competitiveness and security of energy supply.

In March 2014, the European Commission presented a more stringent concept of climate and energy policy [43]. The first objective presented in the document was an extended reduction in greenhouse gas emissions by 2030 by 40% below the 1990 level, which shows a significant quantitative change. The next objective set a target of 27% renewable sources in the total energy consumed by 2030. It should be noted that the target levels apply to the entire energy production in the EU, which means that not all countries will have to reach this production level. The third objective concerned reforms in CO₂ emission trading.

In November 2016, the Commission presented the “Clean Energy for All Europeans” package [44] to provide consumers with safe, sustainable, competitive, and affordable energy. Dubbed the Winter Package, it contained the European Commission’s recommendations for the energy and climate policy until 2030. After more than two years of negotiations, in 2018 the European Parliament, the Commission and the European Council

announced a compromise on the components of the Winter Package. Its main provisions include: (1) a 40% reduction in emissions compared to the base 1990 level; these reduction targets were differentiated for entities within the European Emissions Trading System (ETS—43% reduction) and those outside this system (non-ETS—30% reduction); (2) a 27% increase in the RES energy in final energy consumption. These values were defined for the entirety of the European Union, individual Member States defined them individually. At the same time, individual Member States are obliged to develop integrated national energy and climate plans for 2021–2030, as well as long-term energy and climate strategies. The main objective of the package is the Europeanisation of energy policies, promoting their regional and European importance, as well as integrating energy markets by strengthening regional markets, harmonising energy trade, and coordinating the security of energy supply within the regions [45] (p. 89).

Key to the implementation of climate policy was the Paris Agreement concluded in December 2015 during the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21). It advocates that the average global temperature be kept at below 2 °C compared with the pre-industrial era. It became the foundation of the Green Deal policy adopted in 2019. The European Green Deal is *“a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use. . . . this transition must be just and inclusive. It must put people first, and pay attention to the regions, industries, and workers who will face the greatest challenges”* [46] (p. 2). The European Green Deal presents an action plan for various sectors to protect the climate. It urges the implementation of a series of projects to transform Europe into a modern, resource-efficient, and competitive economy, which is characterised by zero net greenhouse gas emissions by 2050, as well as advocates the decoupling of economic growth from resource consumption and an equal standard of living in all regions. The European Green Deal focuses on three key principles for the clean energy transition, which will help reduce greenhouse gas emissions and enhance the quality of life [47]. One of the main goals is the achievement of climate neutrality by the mid-twenty-first century, reducing greenhouse gas emissions to the 50–55% level (compared to the 1990 level), which means a significant increase in the price of emission rights. Member States have adopted a plan to reduce greenhouse gas emissions to at least 50%, and potentially up to 55%, of the 1990 level by 2030. At the same time, they committed to transform Europe into the first climate-neutral continent. To this end, they were required to submit energy and climate plans by the end of 2019, outlining their contribution to the EU-wide targets. The clean energy transition is a complex, multi-layered process that requires the involvement of different public entities, businesses, and consumers, who should tangibly benefit from this transition [47]. The European Green Deal is delivered through the European Climate Law [48].

In order to adapt the existing law to the 2030 and 2050 targets, the EU has introduced changes to the climate, energy, and transport regulations as part of the “Fit for 55” package. It is a set of proposals to revise and update EU legislation and to put in place new initiatives to ensure that EU policies are in line with the climate goals agreed upon by the Council and the European Parliament [49]. The new proposals address: (1) a comprehensive revision of the existing EU Emissions Trading System—the aim is an overall reduction in emissions in the affected sectors by 2030 by 61% of the 2005 level; (2) increasing the EU reduction target from the current 29% to 40% (compared to the 2005 level) and updating the national targets in line with this objective; (3) raising the current target for the share of renewable energy sources in the overall energy mix from 32% to at least 40%; (4) raising the current Union-wide energy efficiency target from 32.5% to 36% of final energy consumption and to 39% of primary energy consumption. The proposed solutions are currently being negotiated with the European Parliament.

In 2020, the European Commission also launched the European Climate Pact to inform, inspire and support cooperation between individuals and organisations, including

national, regional, and local authorities, businesses, civil society organisations, educational institutions, consumer organisations, research organisations, as well as to involve them in climate action [50]. In the starting phase, the Pact will focus on four areas: green areas, green transport, green buildings, and green skills but it will expand over time to other spheres [51].

Despite a substantial number of factors affecting the transformation of the energy sector and creating challenging conditions for achieving the adopted guidelines, the decarbonisation of the energy system is considered possible. The aforementioned factors include “*the availability of natural resources and their global demand, the prices of energy carriers, the rate of economic growth, the effectiveness of the international community’s efforts to prevent climate change, and the pace of technological progress in the field of energy generation*” [25] (p. 164). This catalogue should now be extended to include the economic and geopolitical crises, budgetary problems of Member States and companies, changes in energy markets around the world (including renewables, unconventional gas and oil sources, and nuclear energy); the difficult situation of households in terms of obtaining energy at affordable prices and of enterprises with regard to competitiveness; as well as different levels of ambition and commitment of international partners to reducing greenhouse gas emissions [40].

Achieving climate neutrality by 2050 will be a serious challenge for some countries, especially those dependent on fossil fuels and carbon-intensive industries. That is why the European Union has introduced the Just Transition Mechanism (JTM), allowing for financial and technical support for regions that will suffer the most as a result of the transition to a low-carbon economy. JTM is a set of financial tools to ensure that the transition towards a climate-neutral economy happens in a fair way, leaving no one behind. It provides targeted support to help mobilise around €55 billion over the period 2021–2027 in the most affected regions, to alleviate the socio-economic impact of the transition. JTM addresses the social and economic effects of the transition, focusing on the regions, industries, and workers who will face the greatest challenges. It consists of three pillars: (1) a new Just Transition Fund, (2) InvestEU “Just Transition” scheme, and (3) a new Public Sector Loan Facility. Support will be available to all Member States, focused on regions that are the most carbon-intensive or have the most people working in fossil fuel industries. The Mechanism will support people and communities, companies, and member states or regions. It aims to prevent widening disparities by investing in territories which need to phase out the production and use of coal, lignite, peat and oil shale or transform heavily polluting industries [52].

It should be noted that the EU’s ambitious climate change and energy transformation policies have been defined as a collective goal for the entire European Union, i.e., implemented based on contributions from Member States. However, this participation depends on many factors, including local determinants, differing starting points, reduction potential, the principle of sovereignty in shaping the national energy mix, and the need to guarantee energy security. The policies are defined rationally and realistically, considering the principles of justice and solidarity. It should be remembered that the achievement of the adopted guidelines, as well as the coherence and effectiveness of the actions taken are influenced by the principle of participation of individual Member States, in accordance with their individual capabilities and their varying levels of ambition and involvement in the process of reducing greenhouse gas emissions.

3.2. National Energy Policy

The commitment of the EU Member States to prepare integrated national plans and long-term energy and climate strategies for 2030 has resulted in the Polish government taking concrete action. In December 2019, the National Energy and Climate Plan for the years 2021–2030 (NECP) [53] was submitted to the European Commission. The document was prepared based on national development strategies approved by the government, including the 2030 Strategy for Sustainable Development of Transport [54], the Development Strategy in the Area of the Environment and Water Management until 2030 [55], the 2030 Strategy for Sustainable Development of Villages, Agriculture and Fisheries [56], and on the

draft document of 2040 Polish Energy Policy. The NECP presents an integrated approach to the implementation of the five dimensions of the Energy Union, i.e., energy security, internal energy market, energy efficiency, decarbonisation and research, innovation, and competitiveness. This document sets out the following climate and energy targets for 2030: (1) a 7% reduction in greenhouse gas emissions in non-ETS sectors compared to 2005 levels; (2) a 21–23% share of RES in gross final energy consumption; (3) a 23% increase in energy efficiency compared to PRIMES2007 projections; (4) a reduction in the share of coal in electricity production to 56–60%. The indicators for achieving the set goals include:

1. no more than 56% of coal in electricity generation in 2030;
2. at least 23% of RES in gross final energy consumption in 2030;
3. implementation of nuclear energy in 2033;
4. a 30% reduction in greenhouse gas (GHG) emissions by 2030 (compared to the 1990 level);
5. a 23% reduction in primary energy consumption by 2030 (compared to the 2007 consumption projections).

At the beginning of 2021, the Energy Policy of Poland until 2040 (EPP2040) was approved [57]. It is a strategic document setting the direction for the development of the Polish fuel and energy sector. EPP2040 is one of the integrated strategies based on the Strategy for Responsible Development for the period up to 2020 [58], which is part of the National Energy and Climate Plan for the years 2021–2030 [53]. According to its guidelines, the statutory objective of the state energy policy is energy security, concurrent with ensuring the competitiveness of the economy, energy efficiency, and the reduction in the environmental impact of the energy sector [58] (p. 6). EPP2040 contains a description of the conditions and determinants in the Polish energy sector. It is based on three pillars, including:

1. Just Transition—focusing on the regions and communities most affected by the negative effects of the low-carbon energy transition, i.e., the post-coal regions. With the obtained support, new jobs and new industries participating in the transformation of the sector can be created. It is vital to involve various public and economic entities in these activities, as well as individual energy consumers who will actively participate in the energy market. The fair manner of transformation will be ensured (it will not leave anyone behind), and the principle of participation will be fulfilled (i.e., grassroots transition conducted locally);
2. zero-emission energy system—a long-term objective to be achieved through the implementation of offshore nuclear and wind energy, the increase in the role of distributed and civic energy, the involvement of industrial energy, while at the same time ensuring energy security;
3. good air quality—visible improvement in air quality and its effect on public health. It is the most noticeable sign of a shift away from fossil fuels. The implemented investments will transform the heating sector (systemic and individual), electrification of transport, and the promotion of passive and zero-emission houses using local energy sources.

These three pillars were assigned eight specific objectives and the actions necessary to achieve them, including the so-called strategic projects (Table 1).

According to EPP2040, “for social, economic and environmental reasons, coal regions will be restructured so as to ensure that a just energy transition leads to economic reinforcement, leaves no one behind and will serve future generations. This process will be supported by financial instruments under the EU’s Just Transition Mechanism, mobilising support resources of PLN 60 billion. Detailed solutions in this regard will be included primarily in national and territorial plans for a just transition” [57] (p. 8).

In the regions dependent on coal extraction and on coal-generated energy, the reduction in or termination of coal mining will be associated with economic and social problems. The whole post-mining regions such as Śląskie (Silesia), Dolnośląskie (Lower Silesia), Wielkopolskie, Małopolskie, Łódzkie and Lubelskie Voivodeships, will have to

be socially and economically transformed and recultivated. The key aspect of the process is the implementation of development programmes supporting development projects, creating favourable conditions for business ventures, and other mechanisms conducive to the development of the labour market, and investments in low- and emission-free energy generation sources.

Table 1. The objectives and strategic projects.

Specific Objective	Strategic Project (to Achieve the Objective)
1—Optimal use of own energy resources	1—Transformation of coal regions
2—Expansion of electricity generation and grid infrastructure	2A—Capacity market 2B—Implementation of smart grids
3—Diversification of supply and development of network infrastructure for natural gas, crude oil, and liquid fuels	3A—Construction of the Baltic Pipe 3B—Construction of Line2 of the Pomeranian Pipeline
4—Development of energy markets	4A—Implementation of the Action Plan (to increase cross-border electricity transmission capacity) 4B—Gas Hub 4C—Development of electromobility
5—Introduction of nuclear power	5—Polish Nuclear Power Programme
6—Development of renewable energy sources	6—Implementation of offshore wind energy
7—Development of district heating and co-generation	7—Development of district heating
8—Improvement of energy efficiency	8—Promoting energy efficiency improvement

Source: own study based on Energy Policy of Poland until 2040 [57] (p. 5).

The transition must be fair. It will be financed from the EU funds, i.e., the Just Transition Mechanism, including the Just Transition Fund. Support will be provided subject to the development of just territorial transition plans, which identify the areas most affected by the transition and in need of support. The plans must also recommend solutions that will mitigate social, economic, and environmental problems. The Mechanism will support:

1. people and communities—facilitating employment opportunities and reskilling, improving energy-efficient housing and fighting energy poverty;
2. companies—making the transition to low-carbon technology attractive for investment, providing financial support for and investment in research and innovation;
3. member states or regions—investing in new green jobs, sustainable public transport, digital connectivity and clean energy infrastructure [59].

One of the beneficiaries of the Just Transition Fund is the Bełchatów Basin Area.

4. Results

4.1. The Bełchatów Basin Area in Regional Planning and Strategic Documents

The Bełchatów Basin is located in central Poland in Łódzkie Voivodeship, one of the sixteen large Polish administrative regions. The province covers the area of 18,219 km² and is the ninth largest in the country. According to Statistics Poland data, Łódzkie province had 2,448,713 inhabitants in June 2020 (the sixth most populated region in Poland). Its administrative structure consists of twenty-one powiats (counties), three cities with powiat status, and one hundred and seventy-seven gminas (communes) of which eighteen are urban, twenty-eight are urban-rural and one hundred thirty-one are rural. Łódzkie Voivodeship was one of the first Polish regions to strongly promote the territorial-functional approach to development planning. This concept was reflected in the Development Strategy of Łódzkie Region 2020, adopted in 2013 [60] (DSL2020) and in the Spatial Development Plan of Łódzkie Region [61] (SDPŁR). Both documents indicated functional areas with a relatively separate, intense, and open system of social, economic, or natural connections, conditioned

by the features of their geographical environment (natural and anthropogenic) [62]. The Strategy was the first document to take into account the principle of an integrated development approach, moving away from sectoral planning towards building and strengthening territorial capital which had been under development for over 20 years [63–72]. Due to their spatial features, endogenous potential, concentration and development of specialised economic functions, as well as their existing and emerging functional links, five functional areas were identified as strategic for building a strong competitive position of the region [60] (p. 48). This catalogue, apart from the Łódź Metropolitan Area, the Opoczno-Tomaszów Mazowiecki ceramics production area, the area of intensive agricultural and tourist development in the Pilica, Warta, and Bzura river valleys, and also includes the Bełchatów-Szczerców-Złoczew mining and energy basin. The delimitation of functional areas was based on two criteria. The first was the uniformity of endogenous potentials resulting from the physical-geographical or structural-economic characteristics of the area. The second criterion was the functional and spatial connections of internal and supra-regional nature. These links accelerate the development processes, increase the attractiveness and competitiveness of the voivodeship and its socio-economic development [60] (p. 104). A similar classification is used by the Spatial Development Plan of Łódzkie Region [49]. The endogenous development potential of the voivodeship results from its physical-geographical or structural-economic characteristics, which are vital factors in the development of individual functional areas and of a significant part of the region [61] (p. 246).

Both the Development Strategy [60] and the Spatial Plan [61] of Łódzkie Region treat the Bełchatów-Szczerców-Złoczew mining and energy basin as a region of the voivodeship characterised by a dominant raw material economy, based on rich lignite resources and on the production of electricity and heat. According to the delimitation adopted in the Strategy, this area consists of nineteen gminas (communes) on 1878 km² of land, which accounts for 10% of the whole voivodeship [60] (p. 53) (Figure 2a).

The new Development Strategy of Łódzkie Region (DSL2030) adopted in April 2021 [2] defines territorially balanced development of the entire voivodeship in different terms. The first draft of this document advocated a departure from the concept of development based on the potential of individual functionally related territories. However, the European Union's policy of allocating specific financial resources based on functional areas forced the regional authorities to change their approach.

The territorialisation of the current strategy is designed, among others, to focus interventions on areas requiring specific support and to identify priority actions, which, when implemented, will contribute to solving problems and activating endogenous resources. The objective is to rationalise the spending by targeting areas where it is most needed and will have the most desirable effect. This strategy responds to development disparities and contributes to their reduction [2] (p. 99). The document identifies five so-called strategic intervention areas (SIA) of national and regional importance. SIA is defined as having existing or potential functional links, or specific social, economic, or spatial conditions, which result in development impediments, or in solid and available development resources. This area becomes the addressee of public intervention, combining regulatory solutions, economic, investment, infrastructural or human resources financed from various sources [62]. The SIA of Łódzkie Region include, among others, the mining and energy transformation area of the Bełchatów Basin, also referred to as the area of new energy. It was defined as a specific problem area and at the same time one of the biggest development challenges in the field of territorial cohesion in the voivodeship [2] (p. 60). Thanks to territorially targeted intervention, this area is to achieve stable socio-economic development by 2030 and, through a just transition, it will gain new energy sources to achieve this target [2] (p. 99). It is noteworthy that DSL2030 delimits this area as much larger than DSL2020. It now covers the area of thirty-five communes from two subregions (Piotrków and Sieradz) with a total area of 3667 km² and a population of 417,000, which constitutes 20% of the entire area of the voivodeship and 17% of its population (Figure 2b). This delimitation

was prepared for the Territorial Just Transition Plan for Łódzkie Region [73], taking into account the socio-economic aspects (including the volume of employment in the mining and energy sector, commuting to mines and power plants, networks of connections between enterprises, and revenues in local government budgets from taxes transferred by the Polish mining and energy group, the PGE Capital Group) and environmental aspects such as the mining area and the depression cone [2] (p. 102).

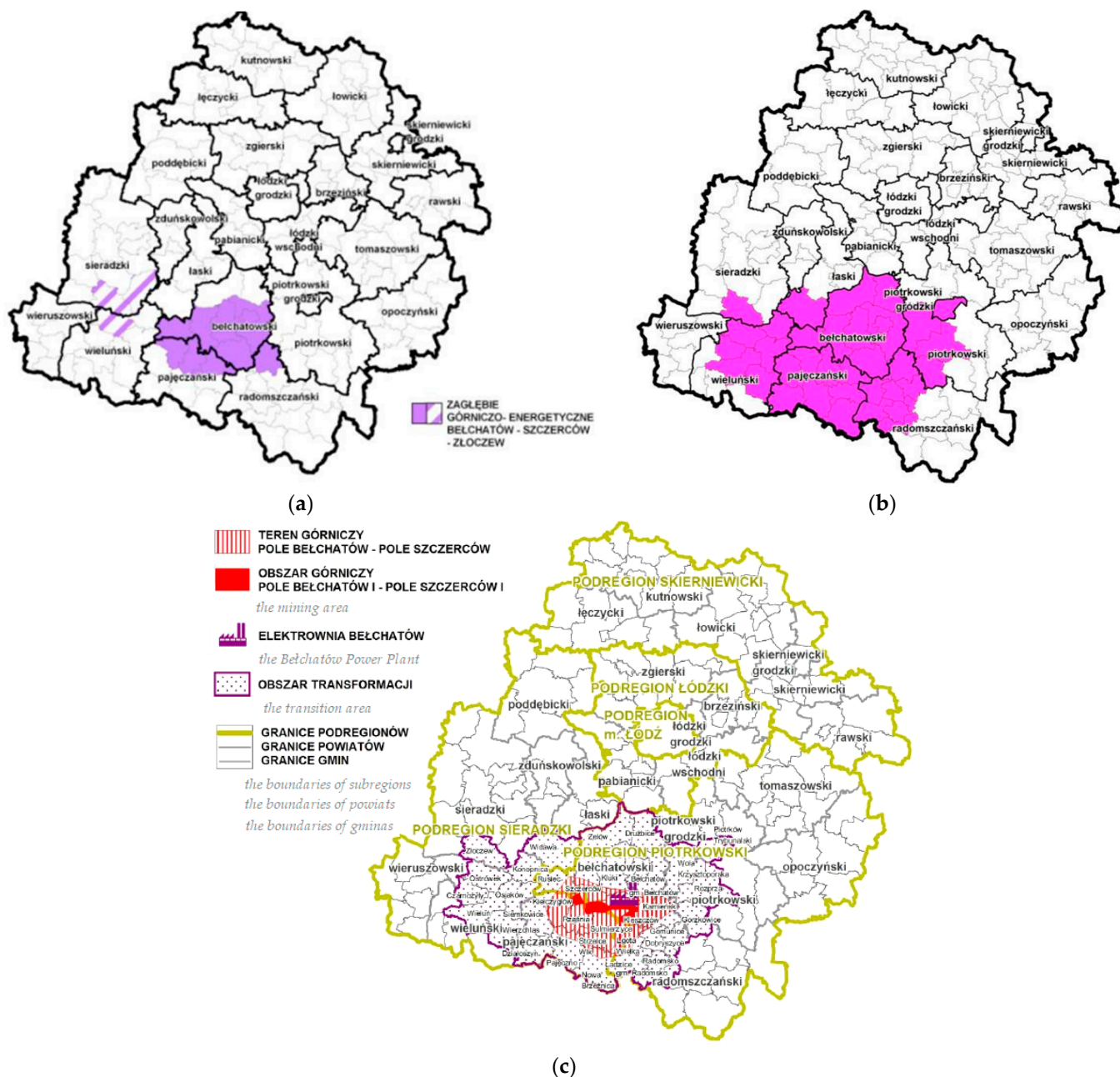


Figure 2. Delimitation of the Bełchatów Area: (a) Mining and energy basin Bełchatów-Szczerców-Złoczew, the Development Strategy of Łódzkie Region 2020 [60] (p. 53); (b) Mining and Energy Transformation Area, the Development Strategy of Łódzkie Region 2030 [2] (p. 103); (c) Mining and energy basin Bełchatów-Szczerców-Złoczew, Territorial Just Transition Plan for Łódzkie Region [73] (p. 6).

The mining area of the so-called Bełchatów Field is 12 kilometres long and 3 kilometres wide, thus being “the largest hole in Europe” (Figure 2c).

As per the governmental guidelines on the energy transformation of selected areas of Poland, the regional authorities prepared a draft of the Territorial Just Transition Plan for Łódzkie Region, which was then adopted by a resolution of the voivodeship board and submitted to the European Commission in March this year. It initiated the process of formal negotiations of this document, consistent with state-level documents, including the guidelines of the National Just Transition Plan (draft) [74] and the Development Strategy of Łódzkie Region 2030 [2], the fundamental document defining the directions of regional development. The plan identifies the challenges of the transition, its objectives, and required results in three main areas, i.e., economic, social, and spatial (Table 2).

Table 2. Transformation of the Bełchatów Basin Area.

	Economic Transformation	Social Transformation	Spatial Transformation
Challenges:	<ul style="list-style-type: none"> job creation; development of an innovative and diversified economy, using ICT technologies; encouraging entrepreneurship; mobilising industry towards a clean and circular economy 	<ul style="list-style-type: none"> retraining employees and improvement of their professional skills; development of human capital and limiting depopulation; development of social capital and management of the transformation process; improving the quality of and access to public services; reducing poverty and social exclusion 	<ul style="list-style-type: none"> reducing pollutant emissions for clean environment. providing clean, affordable, and secure energy. rational use of natural resources and reclamation of post-mining areas. accelerating the transition to sustainable and smart mobility
Operational objective:	<p>OO1 a competitive, innovative, and climate-neutral economy based on smart growth, diversified industry modern technologies, and attractive jobs</p> <ul style="list-style-type: none"> new, attractive jobs, including those in the green economy sector, the creative industries, and leisure sectors (tourism, recreation); bridging the job gap resulting from the reduction in the mining sector; diversified, innovative, and resource-efficient economy, including circular economy solutions; increased R&D and innovation capacity (research, innovation); a high level of entrepreneurship, due to new opportunities for new business entities in the area of the former mine and power plant complex (new companies, start-ups) production and services for the green economy, including RES and low-emission technologies (design, prefabrication of components, and construction of RES installations); a high level of digitalisation in businesses and services; new sources of revenue for local government units; preventing marginalisation of the transformation area. 	<p>OO2 a qualified, informed, and actively involved society, with equal access to high-quality public services</p> <ul style="list-style-type: none"> new professional skills and qualifications in the groups most affected by the transformation process adapted to the needs of the modern economy; increasing employment opportunities in new and transitioning sectors; reducing social inequalities resulting from the transition; reducing migration from transformation areas by ensuring decent living conditions; greater professional activity of residents in transformation areas, especially women; an integrated local community actively involved in the transformation process; increasing public acceptance of the transformation process and its consequences; effective management of the transformation process; better access to social services. 	<p>OO3 space with high-quality natural environment and landscape, guaranteeing adaptation to climate change and characterised by good transport accessibility</p> <ul style="list-style-type: none"> supporting the process of changing the energy mix in Poland towards zero emissions; modern, accessible, and climate-neutral energy; energy from RES due to the development of energy storage, prosumer energy, energy cooperatives, and energy clusters; diversification of electricity and heat supply; efficient electricity infrastructure, district heating systems based on unconventional sources; energy-efficient construction; reduction in CO₂ emissions in electricity generation; reclaimed post-mining areas redeveloped for the benefit of local communities; stable ecosystems (with high biological balance and biodiversity) climate- and drought-resilient and with the potential to provide ecosystem services; reducing water consumption for energy production and improving water and sewage management; an attractive space for the development of tourism, recreation, and leisure in the reclaimed post-mining areas; high air quality ensuring high comfort of living; efficient transport system; well-developed, sustainable low- and zero-emission public transport.
Results:			

Source: own study based on the Territorial Just Transformation Plan for Łódzkie Region (draft) [73].

According to the guidelines, the process of shutting down power units is to be carried out in the years 2030–2037, the exploitation of lignite deposits in the Bełchatów Field is to end by 2026, and in the neighbouring Szczerców by 2038.

4.2. The Economic, Social, and Spatial Effects of Mining Activities in the Bełchatów Mining Area

For several decades, the development of the Bełchatów Basin has relied on lignite mining and generation of electricity from raw materials. In the Basin, the Bełchatów Power Plant and the Bełchatów Brown Coal Mine operate as part of the Polish Energy Group: Mining and Conventional Energy S.A. (PGE Group). The mine is the largest open pit mine in Poland and one of the largest in Europe. In 2019, its lignite extraction totalled 40,788,190 tons, which accounts for 77.2% of the entire domestic annual production of

this raw material [2] (p. 60). The power plant is one of the largest lignite-fired thermal power plants in the world and the largest electricity producer in Poland, with a capacity of 5 gigawatts (GW) and producing 20% of the country's energy. The power plant is also the largest emitter of gases and particulates [75] (p. 75) in Łódzkie Voivodeship and is one of the largest CO₂ emitters in the European Union—in 2019, its annual CO₂ emissions reached 32.7191 million metric tons (Mt) [2] (p. 60). The production of conventional energy is complemented by the production of energy from RES, including wind, produced in 62 wind power plants with a total capacity of over 80 MW, and solar energy with a total capacity of approximately 13 megawatts (MW) [61] (p. 156).

4.2.1. Characteristics and Economic Effects of Mining Activities

One of the key problems in this area is the dependence of its economy on the mining and energy sector. In 2018, the Piotrków subregion generated a gross domestic product (GDP) of PLN 30,212 million, which constitutes 1.4% of the country's GDP, and 23.8% of the GDP of Łódzkie Voivodeship. The GDP per capita of this subregion in 2018 reached PLN 51,557, i.e., 100.3% of the voivodeship's average, 93.3% of the national average, and 66% of the EU average [73] (p. 13).

The economy of the Bełchatów Basin is poorly diversified and lacks innovation. The level of entrepreneurship, measured by the number of entities in the national economy per 10,000 inhabitants, is much lower than in other areas of Łódzkie Voivodeship. The share of high-tech and medium-high technology entities in the total number of entities is much lower here than the corresponding indicator for the whole voivodeship. There is a shortage of research and development (R&D) units, and R&D expenditure per one inhabitant in the entire region is considerably lower than the country's average [73] (p. 13). Industrial enterprises are characterised by a relatively low level of digitisation and automation. This area also suffers from an insufficiently developed service sector, with the exception of the dynamically developing logistics industry.

The PGE Capital Group is the largest employer in Łódzkie Voivodeship. More than 20,000 people are employed in the Bełchatów Mining and Energy Complex and the related sectors, including the PGE Mining and Conventional Energy Bełchatów company (over 8000 people), the PGE subsidiaries (5500 people) and other associated companies located in the Basin and beyond (as of 30.06.2020, according to the Regional Just Transition Plan [73] (p. 7)). At the end of 2020, 7500 people were employed in the sector related to lignite mining and energy production. In the sectors undergoing transformation, including the metallurgical, mineral, ceramic, paper, and wood industries, in 2019 there were 123 companies employing approximately 5000 people. The mining and energy industry is also characterised by a higher level of wages than other economic sectors (approx. 138.4% of the voivodeship's average in the business sector) [73] (p. 8).

The dominance of the mining and energy sector is also noticeable in PGE's ties with companies from the transformation area and beyond. The Group cooperates with over eight hundred entities in such industries as transport and warehouse management, construction, industrial processing, assembly and repair of steel structures, repairs of machinery and equipment for open-pit mining, production of rubber elements, and the sector of services associated with the mining and energy complex (including protection of persons and property, catering, accommodation, and cleaning).

PGE Group's activity translates significantly into the financial situation of local municipalities. Their revenue depends largely on PGE's operations and is the source of financing for most of their investments. PGE, the largest employer in the Bełchatów region, contributes substantial financial resources to local government units and the State Treasury in local taxes and fees. In 2019, the Basin municipalities contributed fees in the amount of PLN 288 million, PLN 212.6 million of which came from the municipalities of the Bełchatów powiat and constituted as much as 39.2% of their revenue [73] (p. 9).

Taking into account the economic structure of the Bełchatów area, phasing out lignite mining and lignite-based electricity production without effective intervention will have

negative economic effects such as decreased GDP, decreased employment in the mining, energy, and mining-related sectors, declining prosperity of residents and local government units, deterioration in the quality and availability of public services and a decreased investment rate, all inevitably leading to economic shrinkage in the region.

4.2.2. Characteristics and Social Effects of Mining Activities

The Bełchatów area is characterised by adverse social phenomena, including demographic trends such as a declining and aging population. The decrease in population is determined by the negative natural growth rate and migration (especially the outflow of young people), which is particularly worrying in view of the changes that will take place in the market.

The analysis of the mine and power plant staff age structure shows that 74.5% of employees are aged 45+, and over the years 2021–2030 (inclusive), a total of 3045 of them will acquire their pension rights. The mine and power plant personnel is dominated by men (88% of the crew). A total of 29% of PGE's employees have a university degree and 40% have secondary education [73] (p. 15).

Low professional activity among women is a significant problem, related to the economic structure of the area. It is dominated by the mining and energy sector, in which the share of female staff does not exceed 20%. The unemployment rate among women in the region is significantly higher than among men, especially in the Bełchatów district—in 2020, 61% of the total number of unemployed were women, with the largest group of unemployed women being those aged 25–34 (33.2%) [73] (pp. 8, 15).

Health in the basin area is poor (especially in the Piotrków subregion), with the lowest life expectancy among men in Poland, as a consequence of harmful work conditions, air pollution, and unsatisfactory access to quality health care services.

The Bełchatów Basin is also characterised by its adult population's low participation in life-long learning, and therefore their limited acquisition of new skills, including digital competence. The local community is also affected by transport exclusion due to the low availability of rail passenger transport and the poor condition of technical infrastructure.

Departure from lignite mining will primarily result in a 40.4% reduction in mine and power plant employment. Jobs will not be recreated, which is particularly important, considering that for every single job in the mine and power plant there are four jobs in the region. Retraining about 4485 mine and power plant employees will become necessary by the end of 2030. This will also apply to PGE's subsidiaries, where 66.9% of employees are under the age of 45 [73] (p. 11). The changes in the labour market resulting from the transformation will exacerbate the problem of the insufficient number of jobs and higher levels of unemployment among women and among young people with higher education, who will be unable to find attractive positions in the transition area.

Limiting employment in the mining and energy sector to the level of approximately 4500 will lead to the financial deterioration of local residents and will indirectly affect the consumer goods and services market. It will also increase the rate of unemployment, poverty (including energy poverty), and social exclusion. This process will be worsened by an unsatisfactory level of social capital, including low attachment to the region among the migrant population, which constitutes a large share of the workforce. Changes in the labour market, as well as the challenges faced by the local community, will require intensive action in education, in particular in vocational training, which must adapt to the changing needs of the labour market in terms of new qualifications and skills. The key aspect is the change in mining vocational schools' education profile and the introduction of new directions of training related to RES and other professions of the future. Such change, in turn, requires modernisation of infrastructure and raising competences of the teaching staff.

4.2.3. Characteristics, Spatial and Environmental Effects of Mining Activities

In Łódzkie Region, the average annual temperature increased by 2 to 3 °C in the period between 1971–2000. There were also anomalies in the annual amount of precipitation and

its decrease by 10% to 30%, which results in the appearance of a low annual rainfall zone. The lowest forest cover in Poland and the very low retention capacity of the catchment are the other two factors contributing to the drought. The problem of water scarcity is particularly noticeable in the area of the depression cone, caused by the operation of the Bełchatów Lignite Mine [2].

Long-term exploitation of lignite has caused negative environmental effects, large-scale degradation of the earth's surface, soil, water resources, landscape, and the decline in biodiversity. The negative environmental impact is felt throughout the Bełchatów district and beyond, including in the neighbouring areas; the depression cone affecting groundwater currently covers 482 km², and in 2025 is expected to cover approximately 390 km² [73] (p. 12). In terms of the area of devastated and degraded land requiring reclamation, the Łódź region is third in the country.

Open-pit coal mining has caused the most extensive transformations of the lithosphere in Poland and one of the most advanced changes in Europe. As a result of mining investments, an open pit was created in the Bełchatów Field that is 18 km long and 250–280 m deep. The external mine dump has the form of an embankment up to 180 m in height. In 2019, the excavation site in the Bełchatów and the Szczerców Field reached a total of about 2900 ha [2].

One of the area's key challenges is poor air quality, caused mainly by emissions from individual heating sources (central heating boilers etc.) [74] (p. 16). Łódzkie Region ranks fifth in Poland in terms of hard coal consumption in households. Point emissions also have an adverse impact on air quality—the Bełchatów Power Plant plays a significant role here, and so do the cement plant in Działoszyn, and the power plants in Piotrków Trybunalski, Radomsko and Wieluń.

4.3. Local and Regional Determinants in the Transformation of the Bełchatów Basin

4.3.1. Renewable Energy Sources in the Bełchatów Area

The growth of low-carbon and renewable energy sources in global demand and supply is conspicuous [76], but regional differences show that transformation is challenging not only for individual countries, but also for various stakeholder groups (including certain industries, international and national companies, and consumers) [77]. This is confirmed in particular by the analysis of the installation of renewable energy sources in Poland, in particular in Łódzkie Region, published by the Energy Regulatory Office. The main RES installations in Poland include photovoltaic assemblies (PVA), hydropower (HP), biogas (BG), wind energy (WE), biomass (BM), and thermal waste treatment plants (WTTI). The share of renewable energy sources in the total energy production in Poland in 2020 was at the level of 17.9%, while in Łódzkie Voivodeship it reached a meagre 6%, thus placing the region in the penultimate position in the country. Both the number of installations and their capacity [MW] confirm the negligible share of Łódzkie Region in the Polish renewable energy market. The total capacity of green energy produced in Poland is 10,569 MW, with 777.73 MW in Łódzkie Region (only 7.36% of national production). The 5053 installations in the country in 2021 (among which only 417 were in Łódzkie Voivodeship) were primarily wind and solar energy (Figure 3), the main source of energy production in Poland.

It is worth noting the negligible market share of waste thermal treatment installations. In Poland, in 2021, there were only 10, none of which were located in Łódzkie Region. Wind energy was the main source of RES generated power—63.21% for the whole country, and as much as 78% in Łódzkie Voivodeship (Figure 4).

The analysis of data from individual districts in Łódzkie Region, indicates the small share of the Bełchatów district in the energy generated from renewable sources in Łódzkie region (4.2% of all energy produced). Most installations are solar (Figure 5).

However, it should be noted that wind energy has the largest market share (Figure 6).

The diverging interests of the mine and the power plant in the Bełchatów district, with the latter focusing on the use of RES in energy production, will bring about a fundamental change in these indicators not only in the transformation area, but also in the entire voivodeship.

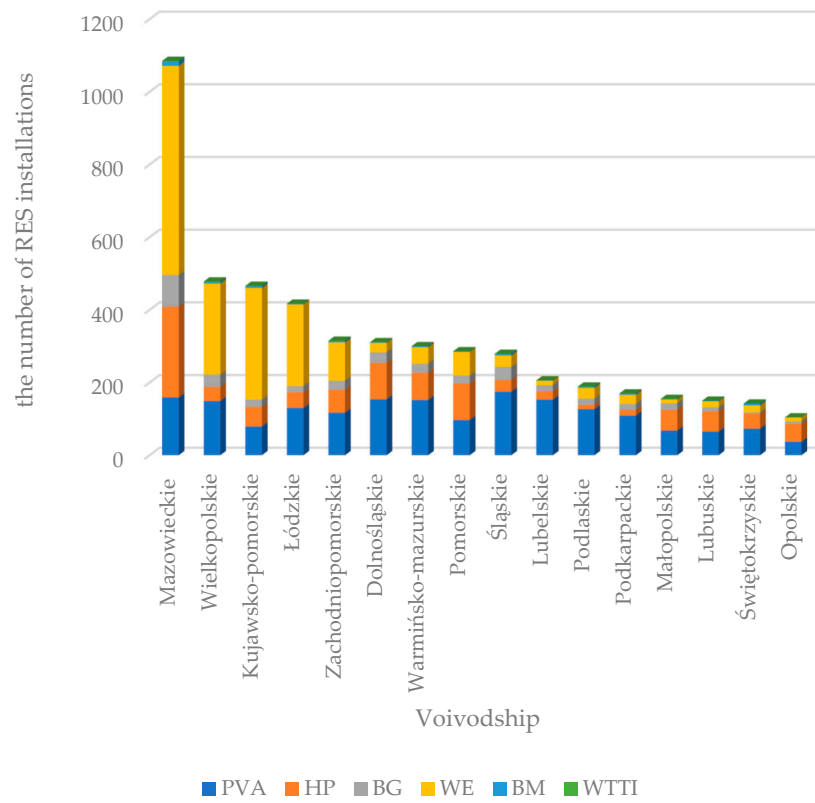


Figure 3. The number of RES installations in individual voivodships in Poland. Source: own study based on data published by the Energy Regulatory Office [78].

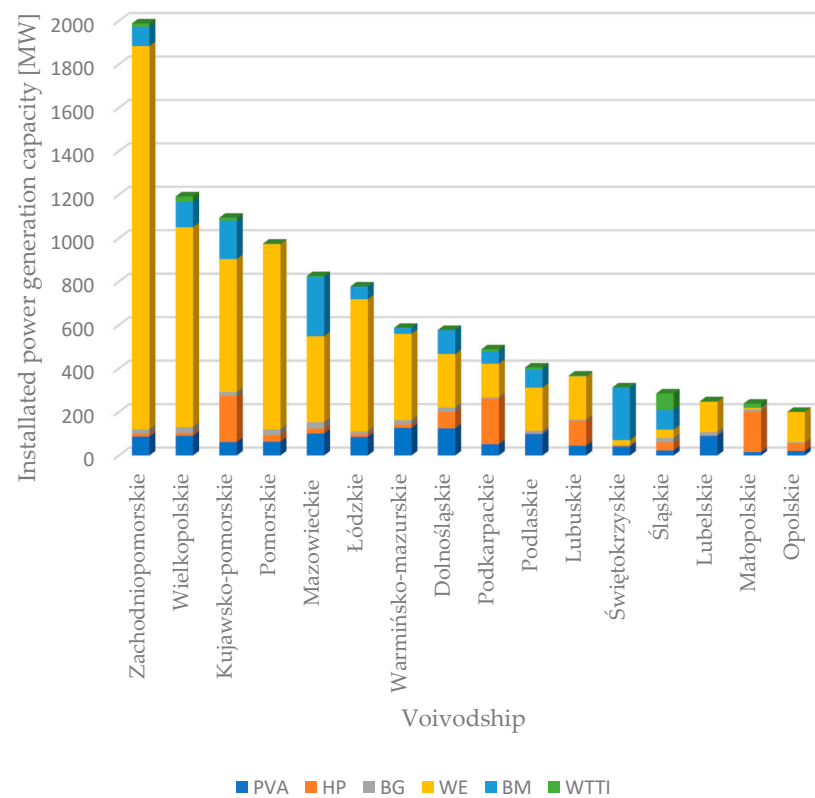


Figure 4. The power of RES installations in individual voivodships in Poland. Source: own study based on data published by the Energy Regulatory Office [78].

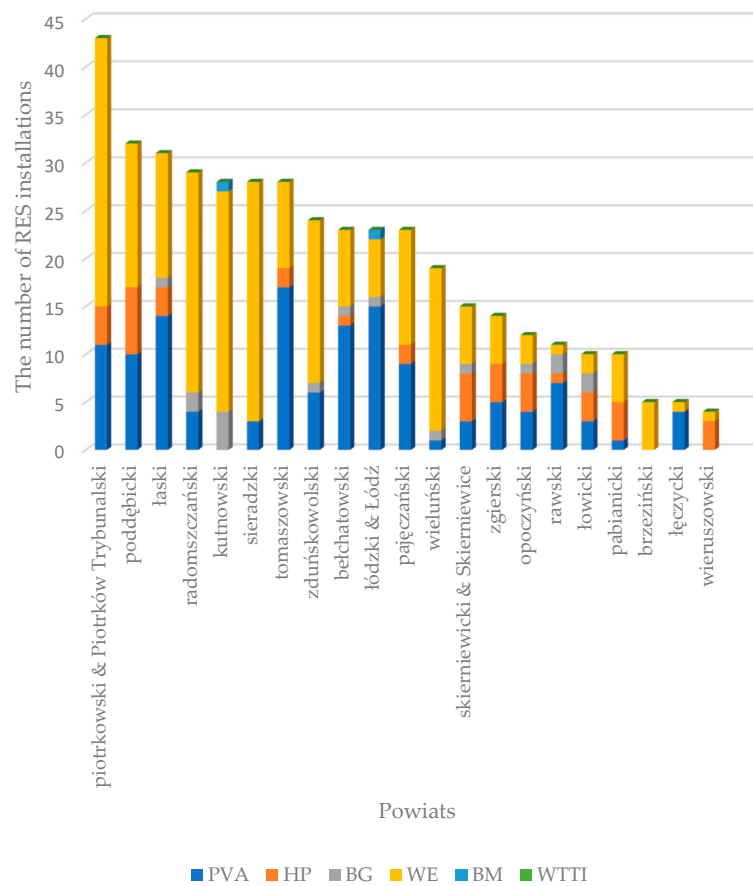


Figure 5. The number of RES installations in individual powiats in Łódzkie Region. Source: own study based on data published by the Energy Regulatory Office [78].

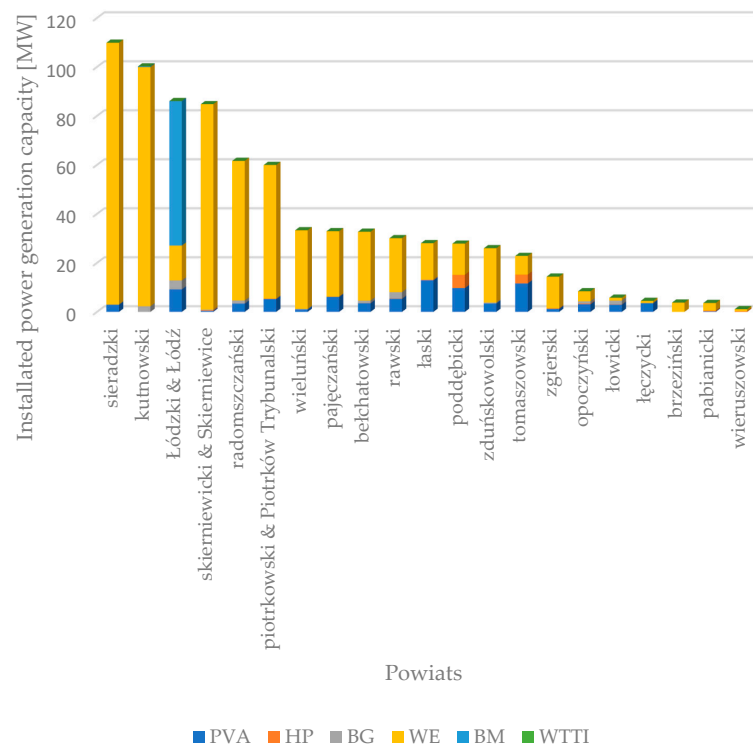


Figure 6. The power of RES installations in individual powiats in Łódzkie Region. Source: own study based on data published by the Energy Regulatory Office [78].

4.3.2. The Barriers Limiting Cooperation and Influencing the Energy Transition Process

Until recently, energy problems were the subject of discussions at the global level, and solutions were adopted in regions or industries. Attention was focused on multinational companies as producers of renewable energy [79–81], on the actors involved in institutional work [82] to improve energy accessibility [83], as well as on energy consumers with a negative environmental impact. Currently, the emphasis is on the essence of the social factors that support or hinder low-carbon and renewable energy production and consumption, i.e., individual preferences and collective behaviour of individual stakeholder groups, including consumers, companies, and investors [84].

The transformation process requires a number of actions in various spheres of socio-economic life, involving various actors and interest groups. Their effectiveness depends on creating conditions conducive to the implementation of changes, which combine legal, institutional, and economic aspects with technological, social, and cultural aspects [45] (p. 57).

This objective can be achieved by the joint implementation of integrated actions. The identification of barriers to cooperation between public actors and social, economic, and R&D partners is the first step in this process.

Undertaking joint actions at each stage of integrated management of development in different territories is conditioned by factors that can be grouped according to the management level (local, supra-local, regional, nationwide) and the nature of existing barriers (e.g., legal, systemic, financial, psychosocial, etc.). This can also be viewed from the perspective of subjects, i.e., the participants of cooperation, such as public sector entities (intra-sectoral cooperation); and from the perspective of cross-sectoral cooperation, implemented in the triad of self-government-business-science (Triple Helix [13]), or extended to include media and civil society (Quadruple Helix [13–15]).

The research carried out so far, on several stages, has allowed for the identification of problem areas (separately for intra-sectoral and cross-sectoral cooperation) that significantly affect just transformation not only in this region but in any other area subject to similar transformation. On the one hand, it reveals limitations that negatively impact the willingness of local and supra-local governments, and other stakeholder groups, to cooperate at the local and supra-local government levels (results of research conducted among local government units in Łódzkie Region, including the transformation area [11]). On the other hand, it describes the projects implemented in the Basin (or projects in the pipeline) and shows that no significant activities going beyond the boundaries of one municipality and involving various stakeholder groups have so far been implemented in the area to initiate the transformation process (Section 4.3.3). Basic groups of barriers limiting intra and cross-sectoral cooperation were identified (Table 3).

Table 3. Barriers limiting intra and cross-sectoral cooperation in the transition area.

Barriers	Intra-Sectoral Cooperation	Cross-Sectoral Cooperation		
		Entrepreneurs	NGOs	Universities Scientific and Research Units
Development and planning barriers	x			
Institutional barriers	x	x	x	
Legal, formal and systemic restrictions	x	x	x	
Financial barriers	x		x	
Politicisation	x		x	
Psychological barriers	x	x	x	
Interpersonal barriers			x	
Low quality of social capital			x	
Lack of common goals				x
Barriers impeding the development policy and building relations	x	x	x	x

Source: own study.

It should be emphasised that depending on the cooperating parties, there are fundamental differences characterising these groups. This section aims to provide a detailed description of them, including intra and cross-sectoral cooperation). Establishing the conditions of cooperation should therefore depend on the type of entities undertaking joint actions.

The Barriers Limiting Intra-Sectoral Cooperation

All discussions ought to start at the regional level, especially in order to define barriers related to development planning and programming (intra-sectoral cooperation). The directions of development set at the European level and at the level of individual member states, defined in numerous documents (presented in Sections 3.1 and 3.2), create a maze of regulations of significant complexity. Their language is often incomprehensible and difficult to interpret. Therefore, the process of finding the framework of development at the local/supra-local level and deciding on the course of action consistent with higher-order documents becomes a challenge. It should be noted that only 20% of municipalities in the transformation area have adopted a development strategy from 2021 onwards, i.e., taking into account the guidelines of the new energy and climate policy. In other local government units, these documents were adopted before 2020 or have been dismissed. An analysis of the published strategies shows that, at their core, climate and energy challenges are not the major drivers for development. In addition, considering that the regional Territorial Just Transition Plan [73] has only entered its negotiation phase (i.e., it is not in force), documents defining the objectives and areas of intervention are still scarce, and maintaining coherence between planning and strategic documents at the local and supra-local levels (i.e., for the entire transformation area) in accordance with the principle of integrated development planning becomes either difficult or, under the current conditions, outright impossible.

Cooperation among entities in the public sector in coal regions is affected by legal and systemic restrictions, including those related to the low quality of legislation, legislative inflation, the multiplicity of interpretations of legal provisions and their frequent variability [85], violations of the *lex retro non agit* principle, the complexity of the legal system (including procedures applicable to the selection of partners, especially from the private sector), lack of compliance with the law, or the duration of decision-makers' term in office. This creates a turbulent legal environment, which translates negatively into long-term actions undertaken in various partnerships. These issues are aggravated by financial challenges (including transfers, liabilities, or a decrease in the income of local government units with the gradually increasing catalogue of tasks and no additional funds to implement them), intensified by the pandemic, energy, and migration crises. These conditions may soon result in the financial collapse of local budgets and their inability to take measures beyond the simple tasks specified in constitutional acts.

Undertaking joint activities in partnerships is fraught with complications, which ultimately discourages from applying for grants. It is worth noting that joint initiatives, which go beyond the boundaries of administrative division and are important for the development of larger areas, depend on external financing. There are also problems which arise at the stage of implementation and settlement of projects, frequent staff fluctuations and the associated lack of continuity. The key issue, especially in the context of undertaking projects in partnership agreements, is the financial responsibility of the leader for the implementation of the entire project.

A particularly striking problem in the context of this analysis is a politicised administration, a legacy of the communist system and one of the greatest threats to the state and society. It manifests itself as appointments of ignorant and unqualified individuals for administrative positions [86] (pp. 88–89), and in crucial decisions, including those who are key to solving development problems, being made to suit the interests of a specific group (especially a political party).

There are also psychosocial barriers, related to a specific pattern of behaviour and attitudes, which, “although in people’s heads, function in social groups and are governed

by the laws of sociology” [87] (p. 52). The main problem areas here are the focus on one’s own interests and benefits, one’s own development, being guided by the expectations of specific social groups, general distrust towards the state, self-promotion, the breakdown of social ties, and the lack of authority figures.

At the local level, gminas and powiats, cooperation is vital for the development and solving problems both locally and within a larger territorial system. In essence, however, local governments focus on their own areas, interests, and goals, competing with other local authorities for sources of income, investment, influx of residents, higher quality of life, better environmental standards, external subsidies, and other opportunities to increase their attractiveness on the market [88]. Institutional barriers impeding the development policy are also a major challenge. In this context, the role of the regional self-government in implementing the development policy and building relations between various entities participating in development processes at the regional level has come under criticism. The regional self-government is obliged to, yet does not, integrate the activities of various stakeholders for the implementation of development policy, nor does it solve problems in its individual areas, in particular the Bełchatów Basin. Municipalities are left to their own devices, trying to achieve certain goals by applying for financing from the Structural Funds. There has been no leader for development/change at the regional level so far, nor any larger territorial arrangement activating and encouraging cooperation and coordinating processes in response to their challenges. Therefore, the measures taken so far in the region, which are in line with the directions adopted in the development strategy, were partly unplanned, and chaotic, and the areas distant from the capital of the region were treated as peripheral. Although the new challenges in the climate, energy and environmental policy, as well as the challenges related to the implementation of the Territorial Just Transition Plan for Łódzkie Voivodeship, forced the regional authorities to institutionalise the initiatives undertaken in the area of the basin (initially the Management Board of Łódzkie Region appointed a representative for the transition process of the Bełchatów region, and subsequently the Low-Emission Transformation Consulting Department was established at the Łódź Regional Development Agency), but at this stage, it is difficult to assess the effectiveness of this solution. Considering the present attitude of the voivodeship self-government and the numerous restrictions on the municipal level, this process may still be challenging and may raise many doubts and concerns.

The catalogue of barriers limiting cooperation, or negatively affecting its core, also includes staff lacking competence in integrating various institutions/groups and building “interinstitutional” and interdisciplinary teams with the knowledge and experience necessary to implement cooperation, especially in larger territorial arrangements. It is also the lack of staff who appreciate the benefits of cooperation, lack of communication, and exchange of knowledge, information, and experience.

The Barriers Limiting Cross-Sectoral Cooperation

Analysing cross-sectoral cooperation, one needs to take into account the point of view of at least three main groups cooperating with self-government: entrepreneurs, non-governmental organisations (NGOs) and universities.

Cooperation with entrepreneurs (in particular the small and medium-sized businesses, key from the point of view of the prospective transformations) is complicated, which ultimately results in little interest in undertaking public-private partnership (PPP) projects. The barriers arise not only on the side of local governments and entrepreneurs, but also local communities. Local governments predominantly fear allegations of corruption, especially in their choice of private partners. The obstacles also include unclear PPP regulations, lack of good practice, local governments’ limited knowledge and awareness of the benefits of partnership, uncertainty and unpredictability of cooperation, very narrow scope of benefits from the partnership and, finally, difficulties in settling running cooperation costs with businesses. Entrepreneurs, on the other hand, distrust local authorities and their employees, are often ignorant of the rules and regulations local governments must follow,

legal provisions relevant for cooperation and applicable laws; there is poor or no exchange of information, the principle of “an eye for an eye, a tooth for a tooth” in disputes, there is also entitlement in dealing with local authorities. The current economic situation in Poland, resulting, among others, in unstable prices of goods and services, further exacerbates the crisis in the private sector undertaking projects in cooperation with public entities.

NGOs name the following obstacles in their cooperation with local governments: lack of sufficient financial resources, complicated formal and legal requirements, inflexibility of the local government, different vision and reluctance of the authority to implement new projects, lack of understanding on the part of the government, different working methods, reluctance of the authority to accept non-standard, new ideas, interpersonal/personality problems, politicisation, difficulty in reaching officials and their unavailability [11] (p. 216). Local governments, on the other hand, draw attention to the low activity in the community (which is primarily related to the low quality of social capital), attitudes of entitlement, formal and legal restrictions (making the cooperation inflexible or even hindering it), the politicisation of non-governmental organisations, the narrow scope of their activities and low creativity in obtaining external sources of financing. As a rule, the activities of the organisations are focused on the implementation of tasks resulting from their statute [11] (p. 217). In the opinion of the officials, however, these activities are narrow in scope and often sporadic. As a consequence, the cooperation is local and limited to the administrative boundaries of municipalities (*gminas*). Local Action Groups are the exception. They form institutional three-sectoral partnerships, which must include representatives of public authorities (local government units, i.e., municipalities and districts), local social and economic partners, and local residents (physical persons). Currently, there are 20 [89] of them in Łódzkie Voivodeship, and none of these groups are active in the area of transformation.

The last of the discussed groups are universities, scientific and research units. Cooperation between these groups, especially in respect of its impact on the development of larger territorial areas, requires in-depth research. It is indisputable, however, that there are no common goals. The cooperation is not only occasional but often also illusory and focuses in particular on the development of human capital. Such a conclusion is particularly worrying given the strong link between the energy sector and new technologies revolutionising the energy generation process to make it less emission-intensive), which should be an excellent justification for involving representatives of science in the process.

As a result of the pitfalls discussed above, at the local and supra-local level, there is a lack of willingness to cooperate and take actions important from the point of view of larger territorial units.

4.3.3. Local Initiatives in the Bełchatów Basin Area

Due to the dominance of raw material economy based on rich lignite resources, electricity, and heat production, in DSLR2020 [61] the Bełchatów Area was assumed to be the one to build a strong competitive position of the region (referred to as the Bełchatów-Szczerców-Złoczew Mining and Energy Area in the document). The research conducted in 2020 via an e-mail questionnaire included several areas of activity taken to implement projects in local municipalities, including partnership projects, which were designed to develop this territory in accordance with its endogenous potential; 32% of *gminas* in the Basin participated in the research. The analysis of the answers leads to the conclusion that in most cases, local governments do not implement development projects for the entire area, nor do they intend to (66% of mentions), and the projects that are implemented by local governments are limited to single municipalities. This is caused by the barriers described in Section 4.3.2). Projects that go beyond these boundaries are rare and are carried out in intra-sectoral partnerships. This phenomenon confirms the regional trend in the area.

Projects implemented by *gminas* in the Basin are designed to:

- launch new open pit sites, by securing areas in the vicinity of the planned pit against the impact of the forecasted depression cone, and by expanding the infrastructure to service the mine's facilities, resettlements, expansion of operations;

- reduce the emission of gaseous and particulate pollutants into the atmosphere by participating in programmes aimed at replacing central heating boilers with new and environmentally friendly ones, and building or expanding the heating network;
- develop electricity generation based on renewable sources, including the use of solar, hydro, and wind energy;
- reclaim the degraded earth, soil, and water by regulating water relations and restoring vegetation;
- improve transport to facilitate external and internal accessibility of the area;
- create and develop industrial and economic zones;
- develop green industries and RES services;
- adapt local education to the needs of the predominant economic trends in the area;
- expand the water supply and sewage networks.

The factors conducive to the implementation of projects which address the regional economic profile do not vary considerably, are limited to individual and partnership projects undertaken with other local authorities, which means that cooperation with other stakeholder groups (especially entrepreneurs) is non-existent. The factors influencing the decision to implement individual projects include government policy and the establishment of national strategic documents, the need to increase the economic competitiveness of the area, limiting the negative effects of activities based on lignite resources, the possibility of obtaining external funds (e.g., the EU) and meeting the needs and expectations of the local community. In the case of partnership projects implemented with other local government units, the decisive factors were the possibility of achieving common goals for several entities, the possibility of obtaining external funds, and meeting the needs and expectations of the local community. As a rule, local authorities base their concepts of the prospective projects on the experience of other Polish municipalities and the support of external experts.

At the implementation stage, projects are financed from the local government's own revenues, transfers from the state budget (subsidies, grants), less often from the previous year's surplus and free funds in the current account, debt securities (e.g., shares, bonds, bills of exchange, mortgage bonds) and non-returnable extra-budgetary sources (understood as non-returnable subsidies from sources such as the EU funds, the European Economic Area (EEA) and Norway Grants, the Swiss Fund; subsidies granted by the National Fund for Environmental Protection and Water Management and its voivodeship counterparts). The latter category plays a key role in the case of projects carried out in partnerships.

The planned development projects in the area will in most cases be individual projects (33% of mentions) and will apply to:

- development of mine-related infrastructure;
- reduction in the emission of gaseous and particulate pollutants into the atmosphere by implementing programmes aimed at replacing central heating boilers with new ecological ones and expanding/building the gas network;
- electricity generation based on renewable sources, including the use of solar, hydro, and wind energy;
- reclamation of the degraded earth, soil, and water by regulating water relations, restoration of soil and vegetation for leisure, conference, and business tourism, and generation of electricity from RES;
- reducing noise pollution;
- support for agricultural activities, particularly considering the dryness of the soil and the decrease in the groundwater level (surface water deficit);
- improving the internal and external transport accessibility of the area;
- creation and development of parks and industrial eco-parks;
- other areas, including renovations and expansion of schools, and of water supply and sewage networks.

In the municipalities participating in the research, projects were also implemented without the participation of local governments. These were launches of new open-pit sites (PGE) and generating electricity based on renewable energy sources. Local governments, as

a rule, recognise them as important, although in some cases it was difficult for respondents to make an unambiguous assessment. Municipalities, on the other hand, often support the implementation of these projects (for example, measures to protect and shape the natural environment, adapt education to the needs of the local economy, improve internal and external transport accessibility, improve water and sewage management, use renewable energy sources, or to determine the directions and conditions of land development). However, a significant number of municipalities are not involved in this process, although they do admit that they should provide support. This situation is mainly due to a lack of financial resources.

Among the factors that have or may have an impact on the implementation of development projects in the Basin Area, local governments emphasise the climate policy of the EU and the government—a total of 32% of mentions (Figure 7). The presented research results reveal a worrying lack of readiness among the local authorities to introduce changes according to the guidelines of energy and climate policy, especially if they are not supported by funding from the EU budget.

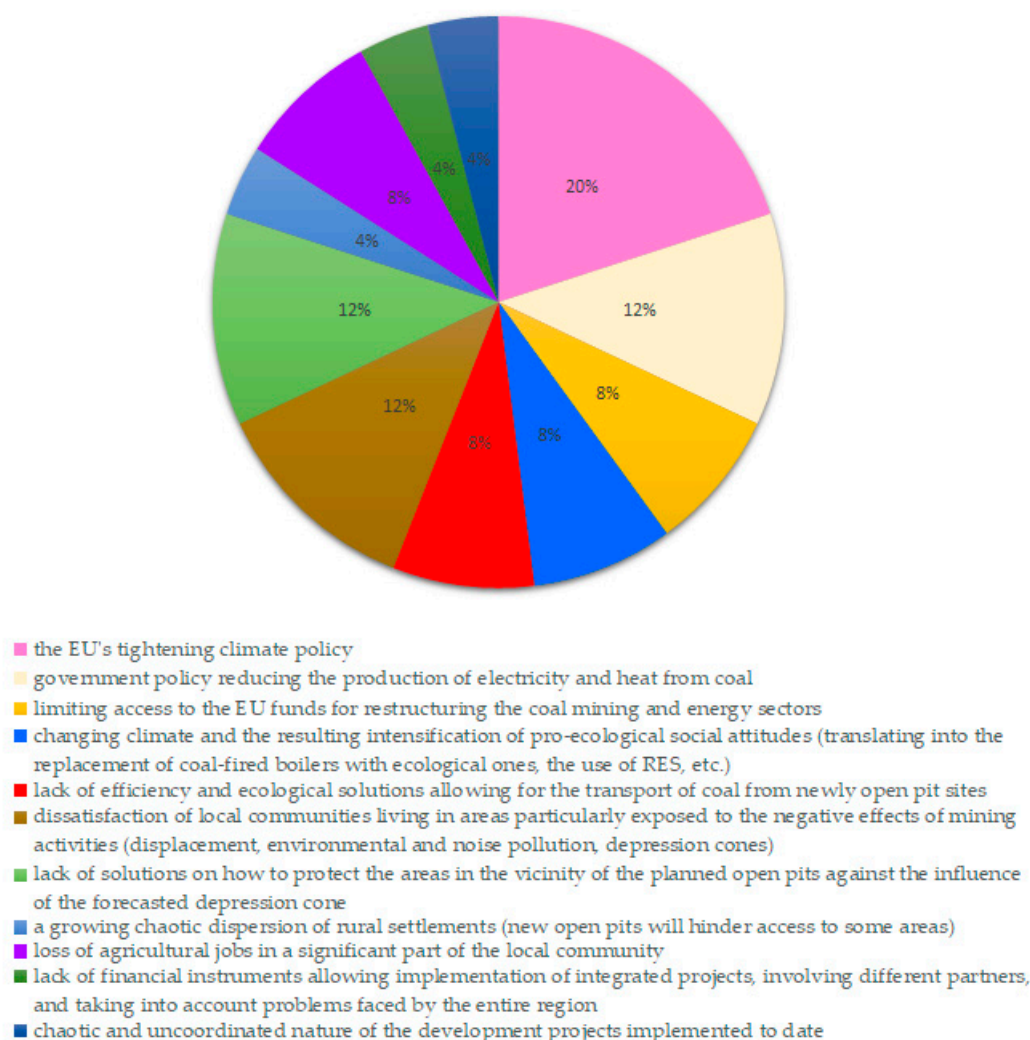


Figure 7. Problems affecting, or likely to affect, the development of the Bełchatów Basin Area. Source: own study.

Assistance and support for area development projects or projects aimed to reduce the area's problems should, in the opinion of respondents, be provided by the regional self-government and the marshal's office. It is expressed precisely in one of the statements: "The scope of cooperation between local society, local government, non-governmental organisations, business entities, and science should take place at every level and should

apply to issues that require comprehensive solutions, taking into account natural, social, economic and technological factors, which are vital for the economic development of the region and for the commercial use of the reclaimed area” (quote).

4.4. The Theory of Government Failure and the Implementation of Energy and Climate Policy

The traditional approach to the economy has been dominated by the paradigm of market failure, understood as the inability of the market, or a system of markets, to provide goods or services in general and in an economically optimal way [90] (pp. 83, 85), or as a situation in which “the allocation of products on the market and the regulation of the economy by the market does not make the economy function optimally . . . , it is the failure of a more or less idealised system of price and market institutions in maintaining the desired effects or preventing the undesirable one” [91] (p. 112). Markets in capitalist economies are inherently inefficient, therefore the intervention of public authorities in many spheres of social and economic activity is indispensable. The theory of inefficient markets raises the need for intervention to eliminate the shortcomings associated with the occurrence of externalities, public goods, monopolistic or monopsonic effects on the economy [92] (p. 27). It should not be assumed, however, that the interference of authorities is always justified and will yield positive results. Its framework is determined by the theory of government failure, understood as the inability of authorities to optimally allocate and regulate the consumption of goods and services.

These assumptions are based on public choice theory, which extends economic theory and economic tools to politics and the choice of government [93] (p. 17). The basic postulate of public choice theory is that individuals are selfish, rational utility maximisers [94] (p. 1), and that they act as rational egoists who pursue their private interests in both economics and politics [95] (p. 4).

The theory of government failure highlights the weaknesses of the system of representative democracy and public administration. Government failure, as well as the market failure mechanism, show that administrative intervention does not always yield the desired results, i.e., it does not achieve the assumed policy goals. The institutional shortcomings of the state mean that it is not fully able to perform its current socio-economic functions, such as the establishment of institutional and legal order or the functions of allocation, redistribution, and stabilisation [96].

The analysis of the implementation of climate and energy policy at the regional level indicates numerous shortcomings and dysfunctions (Figure 8) that fit into the definitions presented above.

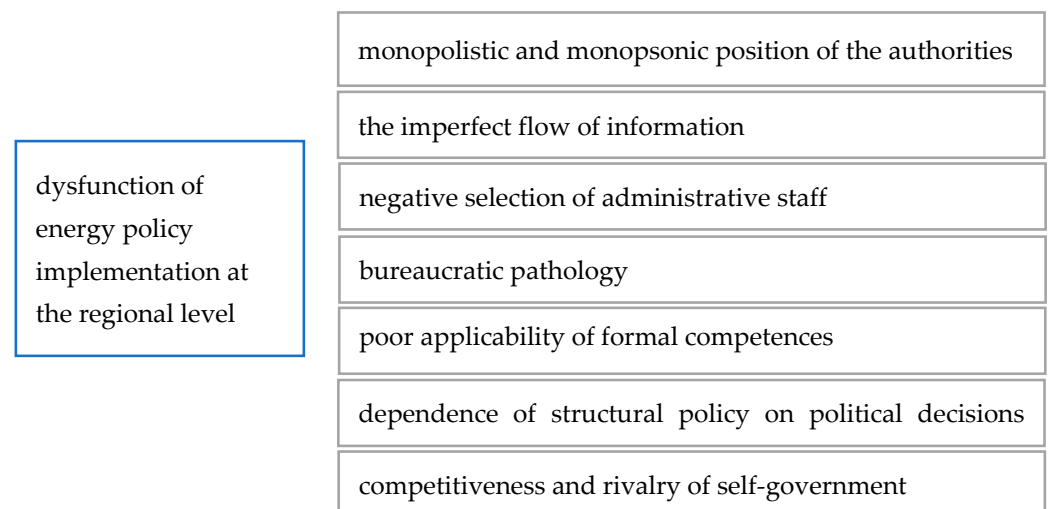


Figure 8. Dysfunction of energy policy implementation at the regional level. Source: own study.

First, it is the monopolistic and monopsonic position of the authorities in the distribution, production, and purchase of goods and services. In this discussion, the state has a monopoly on the lignite mining industry (PGE Group is the leader—its share in the domestic mining market of this raw material reaches ca. 91%) and electricity generation (PGE is the largest electricity producer in Poland, covering over 36% of the market demand for this commodity) [97]. At the same time, an analysis of the ownership structure indicates that the main shareholder in the Group is the State Treasury, holding 57.39% of the share capital. The division of the activities of mines and power plants, the revised strategy of which shifts the burden from coal to renewable energy, will certainly exacerbate this phenomenon. Changing the energy market model, in which distributed generation of RES, self-production, and self-consumption were to play an important role, requires a change in approach; in the current conditions, the market bears all the hallmarks of a monopsony.

Secondly, it is the imperfect flow of information (in particular in the area of the directions of development in voivodeships and their individual territories, the top-down flow), negative selection of administrative staff (competence deficiencies), often as a consequence of employment based on political and party obligations, as well as social and political pitfalls related to electoral mechanisms (political business cycle theory), bureaucratic pathology (noticeable, among others, in the implementation and settlement of projects co-financed from the European Union budget) and the poor applicability of formal competences.

Thirdly, it is the dependence of structural policy on political decisions, such as the politicisation of the allocation of resources from the EU Structural Funds. The voivodeship self-government is the managing authority for the regional operational programme, the aim of which is to increase the competitiveness of the region and improve the living conditions of its inhabitants. The priorities of the Programme are in line with the objectives of the EU's Europe 2020 strategy for smart, sustainable, and inclusive growth. However, the current regional development strategy has shown the reluctance of local authorities to allocate funds to designated functional areas in accordance with the principle of concentration. Social pitfalls blocked the rationalisation of the economic approach to the allocation of EU funds—because of political decisions, the interests of specific political groups were prioritised.

Fourthly, actions taken by public entities, treated here as defective institutions, are characterised by competitiveness and rivalry, which results in them focusing on their own territories, interests, and goals, and in the dispersion of funds spent on current goals in competition against other local authorities. Not only does this approach preclude development beyond administrative boundaries (including the implementation of the so-called integrated projects, implemented in larger territories, involving entities representing various sectors, taking into account the social, economic, spatial, environmental, and institutional aspects), but it also prevents any integration of activities to protect public interest at the supra-local level.

5. Discussion

The need to move away from the production and consumption of non-renewable energy sources (including fossil fuels) towards the use of low-carbon and renewable solutions has been noticed by governments of most countries, including the EU Member States, and the process of energy transition should have been initiated everywhere. The economic slowdown during the SARS-CoV-2 pandemic and the energy crisis raise concerns about the slowdown in this expensive process. However, the fundamental question is not if the transformation will take place, but when and how [98]. The research presented in this article, based on the analysis of both primary and secondary data, deepens these concerns, revealing that global threats are also followed by numerous issues on the national, regional, and local level, and calling into question the ability of local and regional self-governments to implement an energy policy that would protect global public interest. The paper focuses on Poland, but the described phenomena may also apply to other regions, especially in Central and Eastern Europe, the post-communist or developing countries.

Coal regions are characterised by a high level of industrial monoculture, manifested in the underdevelopment of other sectors of their economy. Therefore, taking into account the area's dependence on mining and coal energy, as well as the monopoly of this sector and its scale, it is vital to identify other seed industries as a transformational opportunity, around which the necessary changes can be made. This requires both horizontal and vertical joint actions.

A transparent and stable financial system should be developed to facilitate the transition. The system of financial support for public entities with a marginal involvement of their own resources and private entities, creates unfavourable conditions that inhibit the development of larger territorial systems and preclude problem solving. External financing (in particular from the EU budget) has so far focused on projects carried out by individual local government units. In fact, this funding is addressed to competing municipalities whose main purpose is to satisfy particular interests, rather than build lasting competitive advantages, or grounds for continuance and change. In this context, the discussed phenomena indicate the immaturity of local governments as economic entities whose task is to support development. In the 2014–2020 financial period, the rewarding of partnership projects was limited. Poland's identification with the global interest in the energy transition is minimal due to its reliance on coal-based economy. Equally low is the level of identification at the regional level, since the economic structure of a voivodeship is relatively weak (there are no large enterprises or other leading factors that constitute the basis for the competitiveness of the region). The lack of regulatory and financial support will result in the risk of pseudo-activities, dispersing funds and spending them on current needs and on projects which are not integrated or are integrated to a small extent.

Implementing change requires a clear and precise development vision, which considers the interests of individual subregions in the Basin. At the moment, this area faces the challenge of developing a strategy for the entire region. The fundamental question is whether the document will constitute a strategy for real transformation, or whether it will become a strategy for the absorption of populist funds. Experience shows that the power of lobbying groups and other hidden interests calls into question the effectiveness of the process under way. The problem is compounded by the lack of a transformation leader (agent of change), which poses a significant threat to the success of the planned changes. It should be emphasised here that it is not the municipality that should be responsible for initiating, coordinating, and managing the process. This analysis shows that it is the regional self-government that needs to lead the transformation, and it has yet to fulfil its expected role. The lack of a leader calls into question the chances of the Bełchatów region to carry out an effective and efficient transformation that would allow it to achieve sustainable competitive advantages. This thesis requires consideration of the scenario of inclusion of state institutions in the regional transformation process, as they are in fact responsible for the implementation of the Green Deal. The government can formulate better tools to stimulate energy transition only if it recognises the modus operandi of public authorities. This is currently the most serious challenge facing the world.

On the other hand, it should be stressed that both the adaptation to climate change and the energy transformation are global issues. The Bełchatów mine is a pollutant not only on a European but also on a global scale. Therefore, from the point of view of the entire EU community, this area is of particular importance. Considering the global public interest, a policy actor should emerge who will take charge. If it is assumed that any government's goals are at odds with the protection of global public interest, while at the same time it displays a controlling attitude, then a higher level actor must lead (characterised by a lower level of institutional inefficiency), and take a long-term action to produce a system of regulations and management which will optimise the necessary processes. This entity should not be selected at the level of a given country, in which, as a rule, private interests, often of a short-term nature, rule and result in resistance to change (which is visible at the time of energy crisis in the attitude of the Polish government, e.g., in actions advocating freezing the costs of CO₂ emissions in the EU ETS for the period of two years). The

challenges of climate change and the related objectives of the EU's energy policy require detachment from the particular interests of any group (national, public, or private) and a higher supranational level of protection of public interest.

6. Conclusions

The complexity of energy transformation, as well as its strong ties with the EU and national policies, prompted the author to address the issue in a broader context. The European Climate and Energy Policy, evolving since the 1970s, enabled not only the identification of the key documents at the EU level, but also to signal problems with achieving the goals defined by the Community at the subsequent stages of the transformation process. This was partly due to the autonomy of the individual member states in shaping their internal climate policy (the principle of sovereignty). Poland has been among the countries demonstrating a separateness of interests in this area for years. The Member States' commitment to the development of integrated plans and long-term strategies in the field of energy and climate, as well as financial support mechanisms facilitating the intended reforms, can be considered a breakthrough in the Polish climate and energy policy. Following the principle of integrated development planning [99], the relevant documents have been prepared both at the governmental and the regional level. Unfortunately, governmental failure has led to vagueness in the provisions of the regional strategic documents.

The area of the Bełchatów Basin exemplifies the complexity of the issues faced by the regions dominated by a lignite-based economy. The challenges of energy transition in the area are social, economic, spatial, and environmental. It is therefore vital to create the conditions conducive to the introduction of the prospective changes in conjunction with the various stakeholders.

This article fills a gap, providing an in-depth analysis of the barriers affecting cooperation in the public sphere, and in the arrangements involving representatives of other groups. The barriers are predominantly legal, formal, systemic, financial, political, psychosocial, and institutional, but can also be related to the low quality of social capital, development and planning, as well as the implementation of regional development policy. The added value is the identification of barriers to the intra- and cross-sectoral cooperation. The current absence of conditions supportive of and stimulating cooperation, causes the Bełchatów Area to implement local initiatives single-handedly. Hence the catalogue of planned activities includes [73]:

- production investments in the SMEs sector, leading to economic diversification, modernisation and restructuring;
- investing in the generation of new enterprises;
- investing in research and innovation activities (including those carried out by universities and public research institutions), supporting the transfer of advanced technologies;
- investing in technologies, systems and infrastructures providing affordable clean energy;
- investing in renewable energy and energy efficiency;
- investing in smart and sustainable local mobility;
- renovation and modernisation of heating networks;
- investing in digitalisation, digital innovation and digital connectivity;
- investing in regeneration, decontamination and restoration of degraded areas, and in green infrastructure;
- promotion of a circular economy;
- upskilling and reskilling of staff and jobseekers (including job search assistance).

The above-mentioned measures will be particularly challenging when multiple actors become involved in the process.

The transition to a climate-neutral economy means that the Bełchatów Basin Area faces a great challenge of introducing social, economic, environmental [100] (p. 15), technological, institutional and organisational [101] (p. 20) changes. The integration of activities at the institutional level is the basic condition for the success of the transition. To this end, it is crucial to create stable conditions for the implementation of the transition process,

conducive to the involvement of the various actors representing public administration (on local, regional and national level), the private sector, and the social partners, who will together create a network of links between the cooperating parties to facilitate the energy transition. It is important to conduct an in-depth analysis and describe the phenomenon of competing gminas (subjective competitiveness in a horizontal system) to identify their limitations in building sustainable competitive advantages for the area. The reluctant involvement and low awareness of the need for joint action in regional authorities are among the most important obstacles to change, which requires redefining the approach to transformation and the environment in which it is to take place. The key role in the transition to a low- and zero-emission economy will be played by private entities, not only in their use of RES, but also in their identification of other industries important for the development of this area. Following the concepts of place-based development policy [4,102] and integrated management of development [3], assuming the cooperation of different groups of stakeholders (multilevel governance [103]) and taking into account the complexity of the challenges in the area of energy transformation, society, scientific and educational units (including non-governmental organizations and individuals) also play an important role in the process.

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