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Renewable Energy Sources as the Future of the Energy Sector and Climate in Poland—Truth or Myth in the Opinion of the Society

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Abstract: The electricity sector in the 21st century should be associated with renewable energy sources (RES), which the majority of society currently equates with solar photovoltaics, wind power, and hydroelectricity, with this energy being used mainly in households. Households consume only 20% of energy, with the remainder used in various sectors of the national economy. In these sectors, the possibilities of using renewable energy sources should be sought. Many experts express the opinion that myths about renewable energy sources exist only "in our minds and opinions, that we formed years ago", mainly under pressure from the decreasing number of supporters of conventional energy sources. Currently, we observe much greater possibilities of using renewable energy sources globally, and all forecasts suggest that—by 2050—the economy, transport, and industry may become almost emission-free and rely on RES. Of course, we cannot present renewable energy sources only in terms of superlatives, because they also involve many unknowns and myths which we will present in the article. Considering the complexity of factors influencing the involvement of young people in shaping the socio-economic reality, a group of people aged between 18 and 40 was selected for the study. The aim of this study was to identify the attitudes of young inhabitants of south-eastern Poland regarding the issues of climate change and renewable energy, and to identify the level of acceptance for changes in Poland's energy mix. The conducted research shows that the studied group of people appreciated the importance of climate change and considered the anthropogenic impact on this phenomenon to be of key importance. The perception of renewable energy was positive, and respondents saw the solution to the problems of the energy deficit in increasing the use of renewable energy sources. Respondents also showed significant support for nuclear energy and expected government support programs for activities related to energy conservation. The survey shall be repeated on a random sample at the time when the energy price changes caused by the transformation of the energy mix occur—i.e., around 2025.

Keywords: renewable energy sources; climate change; energy sector; energy conservation; public opinion

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1. Introduction

Many people believe that access to domestic fossil fuels guarantees the country's economic development and low electricity prices. The possibility of using these resources is also an argument for not developing energy from renewable sources, which are considered a more expensive alternative. Oftentimes, politicians, miners, industry, and energy workers challenge scientific arguments by criticizing the evidence of climate change. Therefore, for

a large part of the Polish society, the most important factor in selecting an electricity source is the economic argument [1].

Society increasingly expresses opinions in favor of withdrawing the use of coal in the energy sector in the future, and the use of green energy based on renewable sources is interpreted as "national pride". Such an attitude is closely related to economic development, while environmental and health problems increase and decrease depending on the economic conditions and security of the society. In the general description of global threats, climate change was ranked second and 66% of the surveyed population rated it as one of five issues requiring urgent solutions [2].

Research indicates that the phenomena occurring on Earth today are alarming, as the highest temperatures since the measurements were recorded and the highest concentration of CO_2 in history has been observed over the last 20 years. According to data [3], the years 2010–2019 were the hottest in the entire history of the Earth, and 2019 was one of the top three warmest years in the entire history of measurements. As the authors of the report point out, "our planet and life on Earth are on the brink", and climate change causes a much more frequent occurrence of violent weather phenomena, which in turn also affects the existence of the world's population. However, it is important to bear in mind the two-way relationship, as climate change affects the population, but also the population contributes to this change by promoting activities related to the emission of greenhouse gases.

Increasing the use of renewable energy is one of the objectives of the EU climate policy [4–7]. At the same time, the growing share of renewable energy in the energy mix requires additional measures to ensure the stability of energy supplies [8]. The issue of renewable energy is multidimensional. It is both an engineering topic and a social one. Hence, this paper deals with the issue of the perception of renewable energy in order to verify the social image of renewable energy sources. The research was carried out in the south-eastern part of Poland, on a casually selected sample of people aged 18–40 (Figure 1).

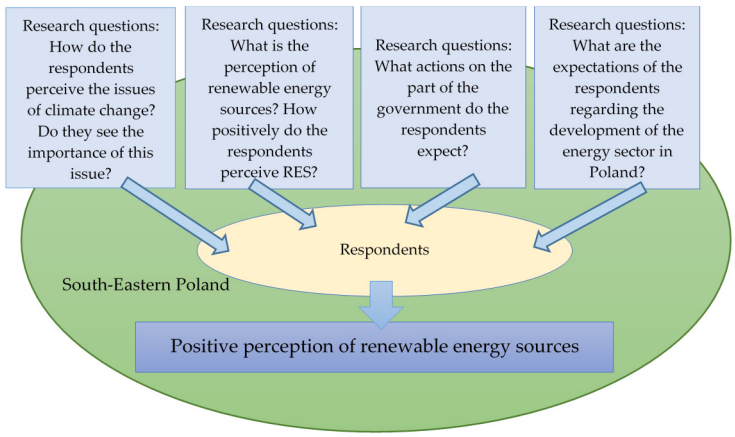

Figure 1. TOC-graph of the research.

2. Literature Review

2.1. The Energy Sector and Climate Change in the Opinion of Scientists and Society

There is a multitude of scientific studies in the field of climate change which state that humans are responsible for these changes, and that—in addition to burning fossil fuels—intensive land use, deforestation [9–14], and drainage of wetlands have contributed to the increase in greenhouse gas emissions. Therefore, one should question the thesis that climate warming is mainly the result of natural processes, because, for example, volcanic eruptions emit only 0.3 billion tons of CO_2 per year, only 1% of the total emissions [15].

The authors [16], referring to world studies, present that in order to prevent the temperature increase limit by 1.5 °C, only technological changes will not be enough, because achieving this goal depends to a large extent on the behavior of humanity, changes in the approach to everyday living and the related changes to lifestyle, aimed at lower

energy consumption or resignation from using private vehicles using fuels produced by the refining of crude oil. Scientists say that the fate of the Earth will depend on how humanity will comply with the policy of energy efficiency in the coming years.

The results of the EIB (European Investment Bank) research on climate change emphasize that 75% of Poles surveyed are concerned about climate change and its consequences. There is a greater difference in the assessment of the importance of this threat, as 40% of Poles surveyed believe that climate change is already a threat to humans, while 59% of respondents from the EU have such an opinion. Research has shown that climate change is a greater concern with the society of Southern Europe and young people, which does not coincide with the opinion of Polish youth, of whom 34% say that climate change is a threat to humans, in relation to 48% of the older generation of Poles. These results show that 19% of Poles feel anxious about climate change, 56% are concerned about the phenomenon, and 49% state that the process is the result of human activities. The results of the EIB's survey showed that more people from the EU (78%) were concerned about climate change, compared to 65% of the Chinese population, and 63% of Americans [17].

The research of the Public Opinion Research Center shows that the majority of Polish society definitely considers climate change as a phenomenon dangerous for the future of people and the Earth, but 54% of respondents claim that climate change is only one of many threats, next to terrorism and cyber-attacks. About one-third of Poles claim that climate change is by far the greatest threat to the present day. Of the respondents, 75% perceive these changes primarily as a result of human activities, and only 1% associate them with natural causes. In search of a way to slow down climate change, Polish society mainly indicates the abandonment of coal-based energy and the search for ecological methods of energy production; 72% of respondents share this opinion. On the other hand, 19% claim that hard coal will continue to be the basic energy resource in the next 20–30 years [18].

Research carried out by the Institute for Social and Market Research in 2020 shows that 61% of respondents believe that the Earth's climate is definitely changing, and 39% question this statement. The results of the research clearly show that the opinion that the climate is changing is most strongly supported by young people up to 29 years of age and the elderly over 60 years of age. Among the respondents, 80% say that global warming is an established scientific fact, and 78% each believe that human activity is the main cause of climate change and that renewable energy is the best way to protect the climate [19]. This is also confirmed by the results of the 2018 report, which show that the majority of Polish society supports the pro-climate policy of the EU, with almost 95% claiming that shortly it will be necessary to support the development of renewable energy and increasing energy efficiency [20].

When interpreting the results of the research conducted by the Market and Social Research Institute in Poland and Central and Eastern Europe in 2020, the term "green economy" is associated primarily with solar energy (41%) and wind energy (38%), and to a lesser extent with ecology and nature (17%) or care for the environment and clean air (3%). Only 7% say that pro-ecological and environmental measures are just a passing fad. Almost half of Poles believe that Poland should limit the use of fossil fuels such as coal and crude oil, but at the same time 44% believe that Poland should use its coal resources in the energy sector, and 21% believe that Poland is too poor a country to reduce greenhouse gas emissions. Renewable energy is considered to be the most modern and future-proof type of energy (82%), and it increases the country's energy security (76%) and is the best way to reduce global warming (69%). Among respondents, 37% say that renewable energy is dependent on weather conditions and does not ensure the stability of electricity supply, and 26% even say that it is imposed by the EU and the West is making money from it. As the main barriers to the development of renewable energy, the respondents considered low awareness of citizens about climate change (37%), high construction costs (33%), and insufficient knowledge about the benefits (33%). When analyzing the results of research in Central and Eastern Europe (Poland, Latvia, Estonia, Germany, Lithuania, Czech Republic, Slovakia), it should be stated that Poland leads the way in terms of the opinion that the

cause of climate change is human activity (78%), that global warming is a fact scientific research (80%), that the individual has little influence on climate change (45%), that every person should change their lifestyle to consume less and use less energy and fuel (75%), that renewable energy is the best way to protect the environment and climate (78%), and that the vast majority of electricity in the country should come from renewable sources (76%), which are the most modern and future-proof type of energy (82%) and guarantee the country's energy security (76%) [19].

When referring to RES, Poles prefer solar power plants (Table 1), mainly because they associate them with photovoltaics, which is currently developing very rapidly, and the installed capacity is gradually increasing. Taking into account the increase in installed PV capacity in the EU in 2020, an annual increase of 200% was achieved, which placed Poland in fourth place, just behind Germany, the Netherlands, and Spain. Definitely, the most dynamic growth was recorded in micro-installations [21].

Table 1. Preferred types of power plants in the opinion of the Polish society [22].

	Definitely Not	Probably Not	Neither Yes Nor No	Probably Yes	Definitely Yes	Average
Preferred types of power plants						
Solar	3	3	19	29	46	4.12
Wind	4	8	22	27	41	3.95
Water	3	6	22	30	39	3.96
Geothermal	4	5	33	27	31	3.77
Biomass	8	9	34	30	19	3.43
The ecological dimension of the method of generating energy						
Solar	2	4	18	19	58	4.27
Wind	3	4	21	24	49	4.12
Water	2	2	24	24	48	4.13
Geothermal	2	5	28	30	35	3.91
Biomass	5	9	40	28	17	3.44
The social dimension of the method of generating energy						
Solar	1	3	16	22	58	4.33
Wind	3	6	26	29	36	3.87
Water	1	3	24	29	43	4.09
Geothermal	2	5	28	29	36	3.93
Biomass	5	13	35	31	16	3.44
The economic dimension of the method of generating energy						
Solar	3	3	24	25	45	4.06
Wind	2	6	27	26	29	3.94
Water	1	6	27	28	37	3.95
Geothermal	3	6	33	33	25	3.71
Biomass	4	9	38	31	17	3.48

Solar power plants were also rated the highest in the ecological, social, and economic dimensions of energy production. In these respects, just behind solar power plants were wind and hydro power plants [22].

2.2. Renewable Energy Sources in Poland's Energy Mix and Their Impact on the Climate

EU policymakers give priority to efforts to reduce greenhouse gas emissions. Despite the lack of transnational agreements, politicians promote programs of increasing CO_2 reduction and decarbonization of the economy, and they place their hopes on unproven technologies or promotion of renewable energy sources (RES) [4]. Poland is assigned the rank of "villain", mainly due to the large share of coal in the energy economy and the large number of households firing "just about anything" due to energy poverty [23]. Poland supports the actions of community decision-makers, but cannot accept their proposed increase in the cost of living for families, deterioration in the condition of enterprises, or an increase in unemployment [24]. Decarbonization and dependence on the supply of raw

materials as well as an increase in energy prices will increase the burden on family budgets and the costs of their maintenance, and will further aggravate the phenomenon of "energy poverty" (Table 2) [25,26].

Table 2. Some features of RES in Poland and in the world in 2018 [25,26].

Type of RES	Installation Capacity in the World in MW	Installation Capacity in Poland in MW	Important Features
Water energy	1,171,612	969	Very efficient. Requires a suitable place for installation.
Wind energy	563,726	5777	It does not occupy a large area of land. Requires appropriate weather conditions.
Solar energy	485,826	486.5	Cheap and efficient. Requires proper installation. The panels can be installed anywhere.
Energy from biomass	115,731	1002	Application for the production of electricity and biofuels and for heating. Requires access to raw material.
Together with RES	2,336,895	8234.5	

The total capacity of RES installations in Poland in 2010–2019 increased from 2556 MW in 2010 to 9106 MW in 2019, with the greatest extent coming from wind energy, biomass and biogas energy, water energy, and solar energy [22]. The structure of obtaining energy from renewable sources in 2019 was dominated by solid and liquid biofuels and wind energy (Figure 2). The share of energy from renewable sources in the gross final energy consumption was 12.18%, while the share of energy from renewable sources in the acquisition of primary energy in total increased in 2015–2019 from 13.25% to 15.96% [27].

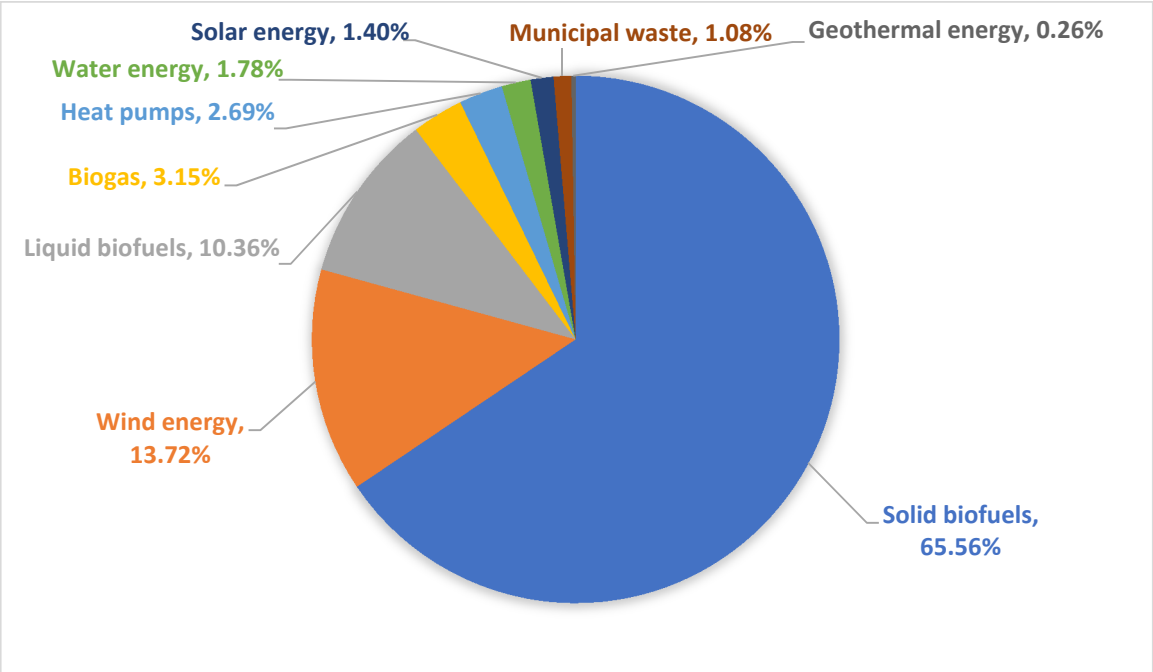

Figure 2. The structure of obtaining energy from renewable sources in Poland in 2019 [27].

Coal remains the main fuel in the Polish electricity sector, generating 77% of electricity in 2018 and—in line with the published draft of the Polish Energy Policy 2040—will remain the most important fuel in the Polish electricity sector, but with its share dropping to 60% in 2030. It is now necessary to ensure stable electricity supplies and ensure the country's

energy security. Of course, the plans envisage increasing the share of renewable energy sources in gross final energy consumption to 21% in 2030 [28]. The project also provides for the commissioning of nuclear power plants, the first in 2033 and another five by 2043, which will ensure that the growing demand for electricity is met and contribute to a significant reduction in the national emission of greenhouse gases [29].

Both energy production in Poland and the maximum capacity are based mainly on fossil fuels—hard coal and lignite (Figure 3). Of the total energy mix in Poland, 84.79% comes from non-renewable sources and only 15.21% comes from renewable sources [30].

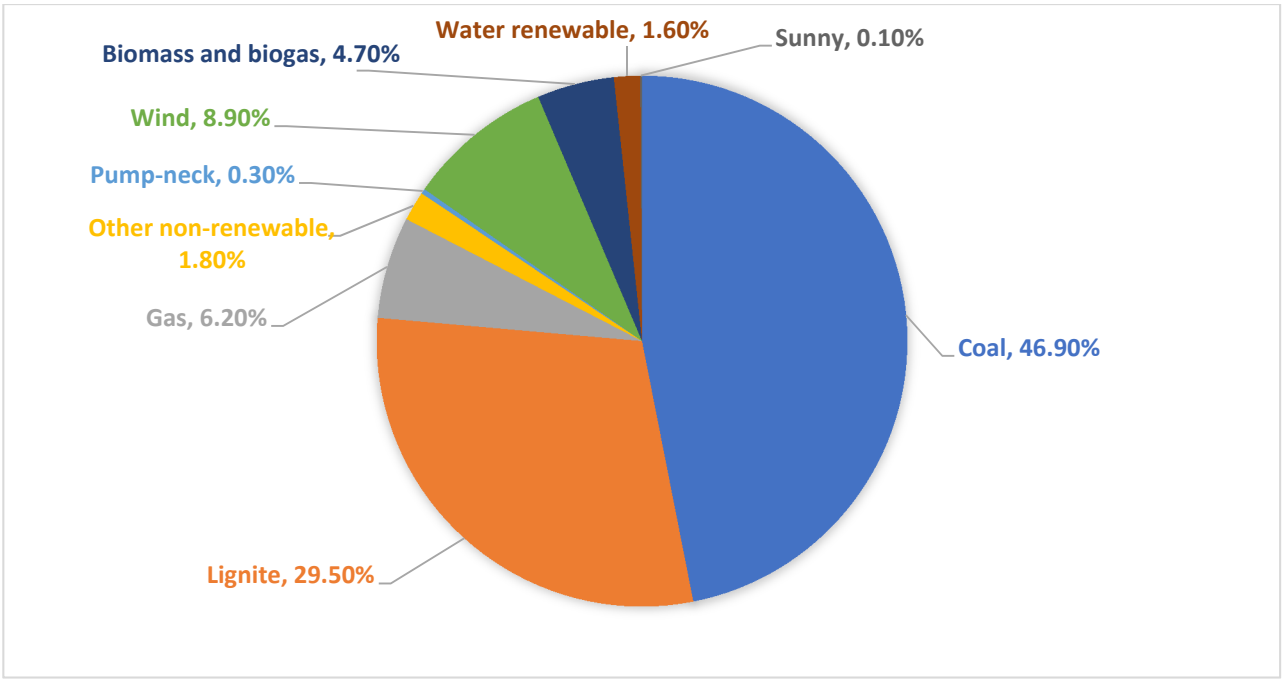

Figure 3. Structure of electricity production in Poland in 2017 [30,31].

The forecasts for the use of renewable energy in Poland include the reduction of the percentage share of energy generated with the use of coal to 60% (currently, it is over 80%). Moreover, dynamic development of offshore wind farms and an increase in the share of renewable energy sources in transport and heating to 21% are expected, as well as an increase in the share of renewable energy sources in the fuel and energy sector to 28.5% [28]. The Polish energy industry and economy are facing enormous challenges that must be taken into account:

- aging generation capacities based on coal combustion,
- the need to implement new restrictive emission reduction standards,
- limited possibilities of increasing domestic coal extraction,
- planned higher EU targets for the use of renewable energy sources,
- stopping the development of renewable energy on land,
- significant delay in the development of nuclear energy.

Climate and energy policy should be conducted in a low-carbon and competitive manner, and energy, industry, and climate should mutually reinforce each other [32].

The EU direction of European climate policy, determined, inter alia, by regulations Winter Package—Clean Energy for all Europeans, moves towards renewable energy technologies. However, it should be remembered that—due to the diverse climatic conditions—RES technologies are difficult to control, and the overriding goal of the implemented climate policy is to guarantee the country's energy security in the long-term perspective and thus to secure the continuity of energy supplies [7]. In line with the current trend, the role of coal in meeting Poland's energy needs will gradually decrease in favor of energy from

dispersed sources. However, the coal-based commercial power industry will remain the basis of energy security in the foreseeable future [31].

In the near future, monotechnologies in energy will not be possible and it is necessary to find a compromise that will help conventional energy sources survive. Sustainable development of the energy sector in the long run will only be possible on the basis of so-called 'hybrid solutions'—i.e., combining conventional, renewable, and distributed or gas sources in one place [33,34]. Poland has significant coal resources, which act as a stabilizer of the country's energy security [31,32], which is of particular importance in view of the dependence of the Polish economy on gas imports (over 70%) and crude oil (over 95%). It is worth noting that, despite the decrease in the share of coal in the energy balance, this fuel will still remain key for the energy sector, stabilizing the energy system and ensuring Poland's energy security, and will have a positive impact on the energy security of the European Union [34].

3. Materials and Methods

The beginning of the third decade of the 21st century is characterized by an intense discourse on measures that may reduce the anthropogenic impact on climate change [35]. In this context, the energy sector is facing a major transformation [36]. In order to achieve ambitious goals, social consent and public participation in the planned changes are necessary.

The aim of this study was to identify the attitude of young inhabitants of south-eastern Poland to the issues of climate change and renewable energy, and to identify the level of acceptance for changes in Poland's energy mix. In order to achieve the goal, the following research questions were formulated:

1. How do the respondents perceive the issues of climate change? Do they see the importance of this issue?
2. What is the perception of renewable energy sources? How positively do the respondents perceive RES?
3. What actions on the part of the government do the respondents expect?
4. What are the expectations of the respondents regarding the development of the energy sector in Poland?

The study was conducted in south-eastern Poland, in the Podkarpackie and Lubelskie voivodships. The research area was selected due to the high quality of the natural environment; high forest cover, higher than the national average; agricultural character of the region; and lower average monthly wages compared to the rest of the country—15th in Podkarpackie Voivodship among the 16 voivodships, and 12th in Lubelskie Voivodship [37]. At the same time, it is an area with one of the highest dynamics of solar energy development in Poland [38]. The study was partial, the Computer Assisted Web Interview (CAWI) technique was used. It was conducted from 21 June to 17 October 2021. The study was not probabilistic. At the beginning, access to the questionnaire form was given to several dozen people in both voivodships, who invited more people to the survey 1417 questionnaires were collected, of which 1066 met the research assumptions for the age of respondents and the area of residence. Due to the non-random nature of the survey sample, results should only be referred to the community surveyed.

At the conceptualization stage, the issue of public participation in democratic processes in taking up social changes that took place in the second decade of the 21st century provoke reflection on the participation of society—especially young people—in making key decisions [39,40]. Taking into account the complexity of factors influencing the involvement of young people in shaping the socio-economic reality, a group of people aged between 18 and 40 was selected for the study. As the sample was randomly selected, the inference applies only to the studied group. In order to identify the respondents' attitudes and their perception of the issues discussed in this study, a questionnaire was created containing a number of theses formulations assessed by the respondents in terms of compliance with their beliefs. The research tools were constructed in such a way as to provide data about the respondents, their environmental attitude, perception of anthropogenic impact on climate

change (nine diagnostic theses), perception of renewable energy (seven diagnostic theses), and expectations regarding energy development in Poland and the role of government institutions (five diagnostic theses) in this process. Respondents were also asked about their preferences regarding the future use of available energy sources in Poland. It was also possible to identify basic demographic characteristics—gender, age, and place of residence. The assessment was performed using a five-point, bipolar Likert scale with a neutral value [41]. The values on the scale are marked as follows: 1 definitely not; 2—probably not; 3—neither yes nor no; 4—rather yes; 5—definitely yes. Statistical analyses of the collected material were performed using the Statistica program. First, cluster analysis was performed using the Ward method [42]. It is an exploratory data analysis, thanks to which it is possible to group responses to diagnostic theses into logically related sets [43,44]. This analysis allows for the agglomeration of objects in groups of subsets that are relatively homogeneous internally and relatively differentiated from one another [45]. Basic descriptive statistics were also calculated, the structure of the scores for diagnostic theses was analyzed, the mean scores and standard deviations were calculated, and the Pearson correlation analysis between the selected scores was calculated [46].

Scope of research:

- subject—residents of the study area aged 18–40;
- subject—perception of renewable energy;
- spatial—south-eastern Poland;
- temporal—from 21 June to 17 October 2021.

The results presented here are part of larger studies scattered in time and space, which will be systematically compiled.

4. Results

Among the many reasons for the development of renewable energy, it is important to reduce the emission of pollutants, including carbon dioxide. Therefore, counteracting climate change is the main premise for the use of renewable energy. For this reason, the research raises the issue of the relationship between the ecological attitude of the respondents and their perception of climate change. In this context, an attempt was made to identify the acceptance and expectations of renewable energy.

As the survey was aimed mainly at young people under 40 years of age, the median age of the respondents was quite low, being 21 years old. The mean age of the examined people was 24.6 years, and the standard deviation was 6.8. The lower quartile Q1 = 20, i.e., 25% of the respondents were up to the age of 20, while the upper quartile Q3 = 28 years. This means that 75% of the respondents were under the age of 28. In the gender structure, women constituted 51.9% and men 48.1%.

The results of the cluster analysis performed are shown in Figure 4. The cluster analysis performed in the "binding distance to the binding stages" part showed an increase in the distance above y = 62.64. This level is the cut-off point of the dendrogram. This allowed for the determination of four clusters.

The first, most numerous group includes theses in which climate change was presented as one of the main contemporary problems, emphasizing the anthropogenic impact on this phenomenon and appreciating the importance of limiting carbon dioxide emissions and limiting consumption as a method of reducing anthropogenic pressure. This focus also includes the thesis that renewable energy will cover the growing demand for energy. This group also included all formulations containing demands for governmental institutions to support activities related to energy conservation. Thus, the general message resulting from the wording grouped in this cluster concerned the reduction of anthropogenic pressure, energy conservation, and government support for these activities.

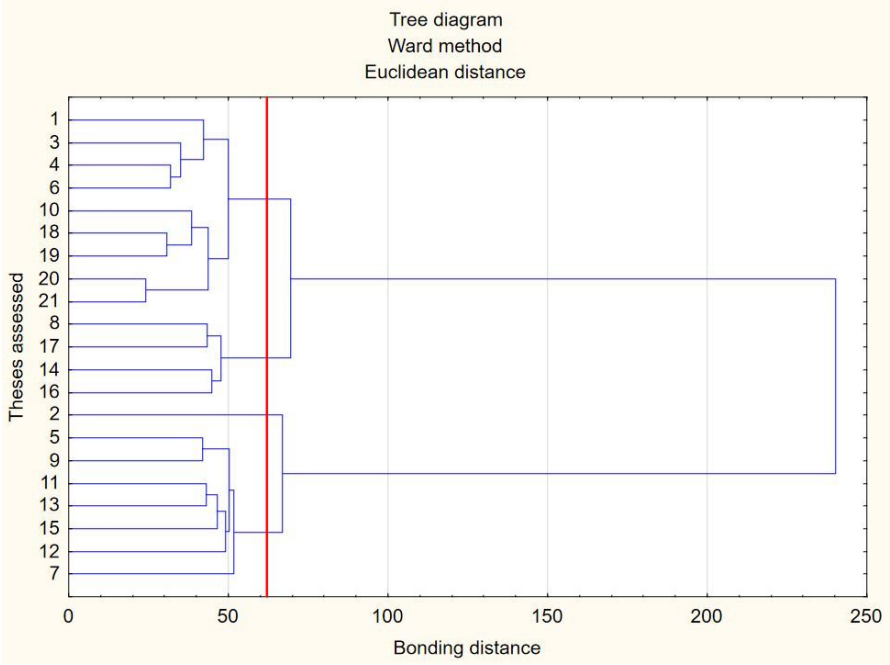

Figure 4. Cluster analysis dendrogram.

- Cluster 1: 1—It is necessary to reduce consumption because of the finite resources of raw materials, especially energy. 3—Climate change is one of the most important threats to modern civilization. 4—Human activities have a decisive influence on the climate changes observed today. 6—Reducing carbon dioxide emissions is necessary to protect the climate. 10—The increasing demand for energy can be met by developing the use of renewable energy sources (RES). 18—Government administration should support the increase of RES-based energy. 19—Government administration should require that all electrical appliances sold meet the highest energy efficiency standards. 20—Government administration should introduce tax credits for people who renovate their homes to reduce heat loss. 21—Government should give tax breaks to businesses that seek to reduce energy losses.
- Cluster 2: 8—The European Union's climate policy reduces global emissions of greenhouse gases, including carbon dioxide. 17—I accept bearing the cost of reducing carbon emissions to reduce climate change. 14—RESs create new jobs. 16—It is possible in the near future (20–30 years) to replace most conventional energy sources (coal, oil, gas, etc.) with renewable energy.
- Cluster 3: 2—It is necessary to reduce the human population due to increasing energy consumption, climate change, the problem of hunger.
- Cluster 4: 5—Climate change is mainly the business of certain groups making money by making societies fearful or guilty. 9—The European Union's climate policy is a tool in the competitive game of European economies. 11—RESs are being introduced by force and threaten coal-fired power generation. 13—RESs are an unstable source of energy (production is unpredictable and mismatched with demand). 15—Wind turbines negatively affect their surroundings through a "shadow effect" and a lot of noise. 12—The cost of obtaining renewable energy is very high (renewable energy is expensive). 7—"Global warming" is merely a stage in the natural (human-independent) cyclical nature of climate change.

The second cluster included four theses. They concerned the confirmation that the climate policy of the European Union contributes to the reduction of carbon dioxide emissions, the acceptance of incurring the costs of this policy and the belief that renewable energy sources increase the number of jobs, as well as the possibility of replacing con-

ventional energy sources with renewable energy. People who appreciated these theses were convinced that the transformations in the energy sector were right and, importantly, expressed their acceptance of bearing the costs of this process.

There was only one thesis in the third cluster. Two theses were formulated while examining the issue of the perception of reducing the pressure on the natural environment. In one, the path of reducing consumption was assessed, and in the other, the limitation of the human population. The thesis suggesting depopulation was not related to others, it was a separate cluster. This may prove that in the studied group the postulate of depopulation is axiologically alien.

The fourth cluster includes all theses the nature of which was skeptical about both climate change and renewable energy sources. The consistency of the answers to these theses is presented later in the paper.

Table 3 presents the mean scores and standard deviations, as well as the rankings of these values. Figures 5–7 present the structure of theses assessments diagnosing the perception of the analyzed issues by the respondents.

Table 3. Average scores for theses diagnosing the perception of the analyzed issues, standard deviations (SD), and rankings of these measures.

Thesis	Average	Ranking of Averages	SD	Ranking SD
It is necessary to limit consumption due to the depleting resources of raw materials, especially energy ones.	3.86	9	1.05	12
It is necessary to reduce the human population due to increasing energy consumption, climate change, and the problem of hunger.	2.52	21	1.32	1
Climate change is one of the most important threats to modern civilization.	4.04	8	1.08	11
Human activity has a decisive influence on the currently observed climate changes.	4.28	1	0.91	20
Climate change is mainly the business of certain earning groups by arousing fear or guilt in societies.	2.76	19	1.21	3
Limiting CO_2 emissions is necessary to protect the climate.	4.14	6	0.92	19
"Global warming" is only a part of the natural (non-human) cyclicality of climate change.	2.47	22	1.20	5
The climate policy of the European Union reduces global greenhouse gas emissions, including CO_2.	3.32	13	0.99	15
The climate policy of the European Union is a tool for the competitive game of European economies.	3.20	16	1.03	13
The growing demand for energy can be covered by developing the use of renewable energy sources (RESs).	4.15	4	0.93	18
RESs are introduced by force and threaten the coal energy sector.	2.55	20	1.14	7
The cost of obtaining renewable energy is very high (renewable energy is expensive).	3.23	15	1.12	10
RESs are an unstable source of energy (production is unpredictable and not adjusted to the demand).	2.97	17	1.14	8
RESs create new jobs.	3.73	11	0.98	16
Wind power plants have a negative impact on the surroundings due to the "shadow effect" and high noise levels.	2.81	18	1.16	6
It is possible in the near future (20–30 years) to replace most conventional energy sources (coal, oil, gas, etc.) with renewable energy.	3.74	10	1.13	9
I accept the cost of reducing carbon dioxide emissions to limit climate change.	3.41	12	1.20	4

Table 3. *Cont.*

Thesis	Average	Ranking of Averages	SD	Ranking SD
The government administration should support the increase in the share of energy based on renewable energy.	4.15	5	0.90	22
Government administration should require that all electrical appliances sold meet the highest energy efficiency standards.	4.07	7	0.99	14
The government administration should introduce tax breaks for people who renovate houses in order to reduce heat losses.	4.17	3	0.97	17
The government administration should grant tax breaks to companies that seek to reduce energy losses.	4.22	2	0.91	21

Figure 5 contains the structure of assessments of theses relating to the identification of the respondents' perceptions of the issues of respect for natural resources and the issues of climate change.

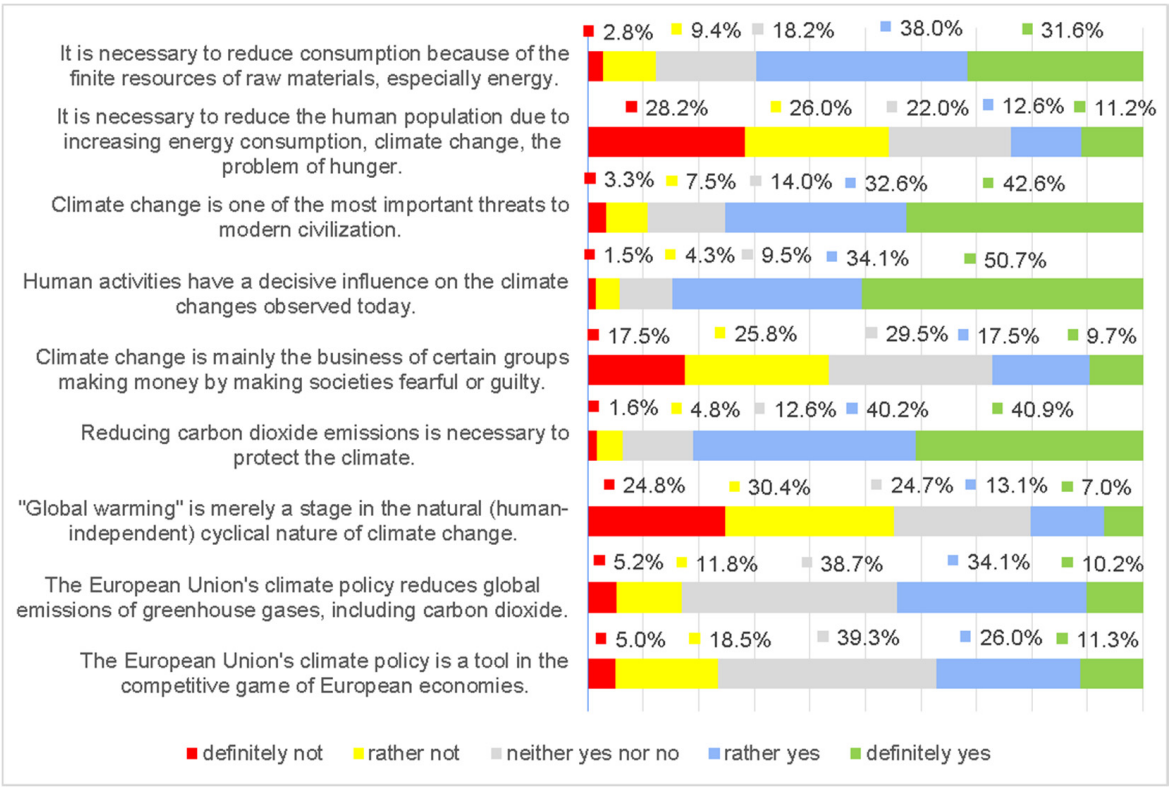

Figure 5. The structure of the assessment of theses diagnosing the perception of climate change by respondents.

The theses relating to the limitation of the use of natural resources have been formulated in two ways. In the first case, it was proposed to limit consumption; in the second, stopping the growth of the human population was proposed. In the analysis of the assessments of these two theses, the most numerous group were answers: 4 (rather yes) for the thesis about the need to reduce consumption and 2 (rather not) for limiting the human population. The highest standard deviation was calculated for the thesis concerning the necessity of depopulating people. The mean score for this thesis (Table 3) was 2.52, and SD = 1.32, so the thesis was rated low and in quite different ways (Figure 5).

The perception of climate change has been studied by evaluating theses formulated in various ways. Some of the formulations on climate change presented the issue as one of the

most important problems caused by people and possible to be limited by specific economic activities. The second part of the formulations presented climate change as a natural cyclical nature and the actions taken as an element of the competitive game of the largest economies and business groups (Figure 5). The conducted research shows that respondents perceive climate change as one of the main global problems (75.2% of responses) and recognize that human activity has a decisive influence on these changes (84.7% of responses). The thesis referring to the impact of human activity on the observed climate changes (Table 3) received the highest average score. It can therefore be concluded that the respondents are convinced about the importance of anthropogenic pressure in climate-creating processes.

Figure 6 shows the structure of assessments of theses diagnosing the perception of renewable energy by the respondents.

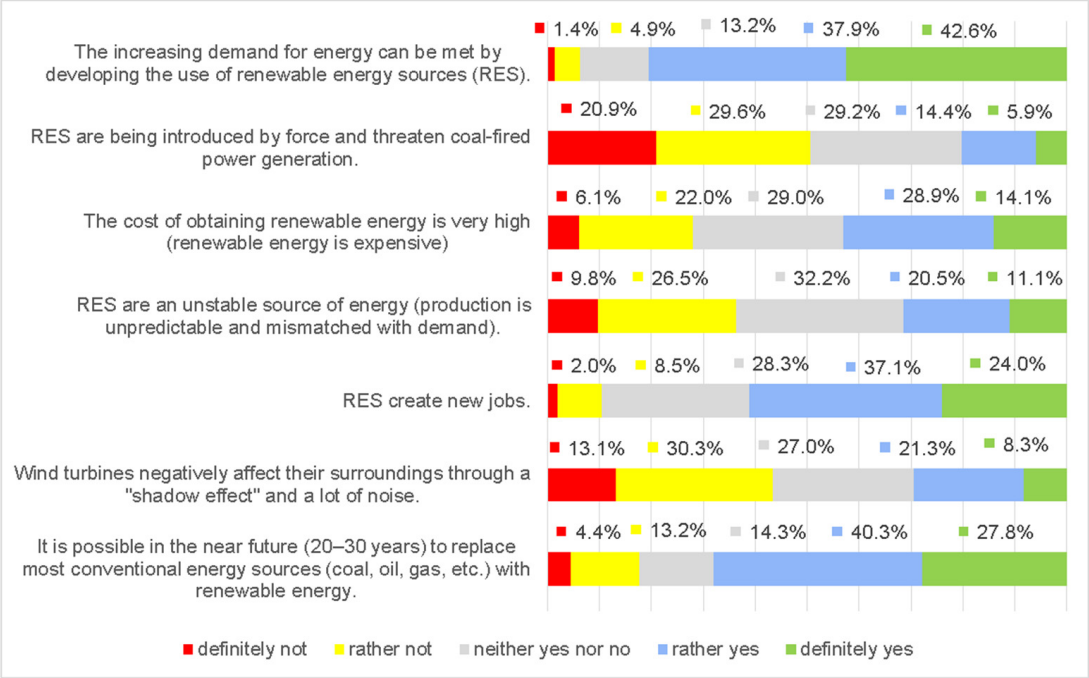

Figure 6. Structure of the assessment of theses diagnosing the perception of renewable energy sources by respondents.

The formulated research theses contained both positive and negative attitudes towards renewable energy sources. In this part of the research, the highest average score was obtained by the thesis that "the growing demand for energy can be covered by developing the use of renewable energy sources" (Table 3). In this case, 80.5% of the respondents positively assessed this statement (Figure 6). Renewable energy was also attributed with another positive impact on the economy in the form of creating new jobs (61.2% of positive opinions). Among the statements assessed in this section, the lowest average was obtained by the thesis that "RES are introduced by force and threaten the coal-based energy sector". Half of the respondents (50.6%) assessed this statement negatively. Based on the collected data, it can be concluded that the perception of renewable energy by the respondents is positive, full of hope that the energy needs of the developing economy will be met.

The theses assessed in this part of the study included: "RESs are an unstable source of energy (production is unpredictable and not adjusted to the demand)". In this case, nearly one-third of the respondents (32.2%) did not have an opinion on this subject, and 36.3% denied this thesis. It is worth noting that the research at the conceptualization level deals with the subject of the respondents' knowledge of issues related to the functioning of the power system. In the process of operationalization, it was assumed that knowledge of this subject is related to the awareness of what the operational power reserve is. From

among the respondents, 15.7% knew the term. In this group, 36.5% of respondents denied the thesis about the instability of RESs, 39.5% confirmed this thesis, and the remaining respondents answered "neither yes nor no". The presented results confirm the positive attitude of the respondents to renewable energy.

In the next part of the research, the respondents' expectations regarding the directions of institutional support through the energy transformation and social acceptance of these changes were analyzed (Figure 7).

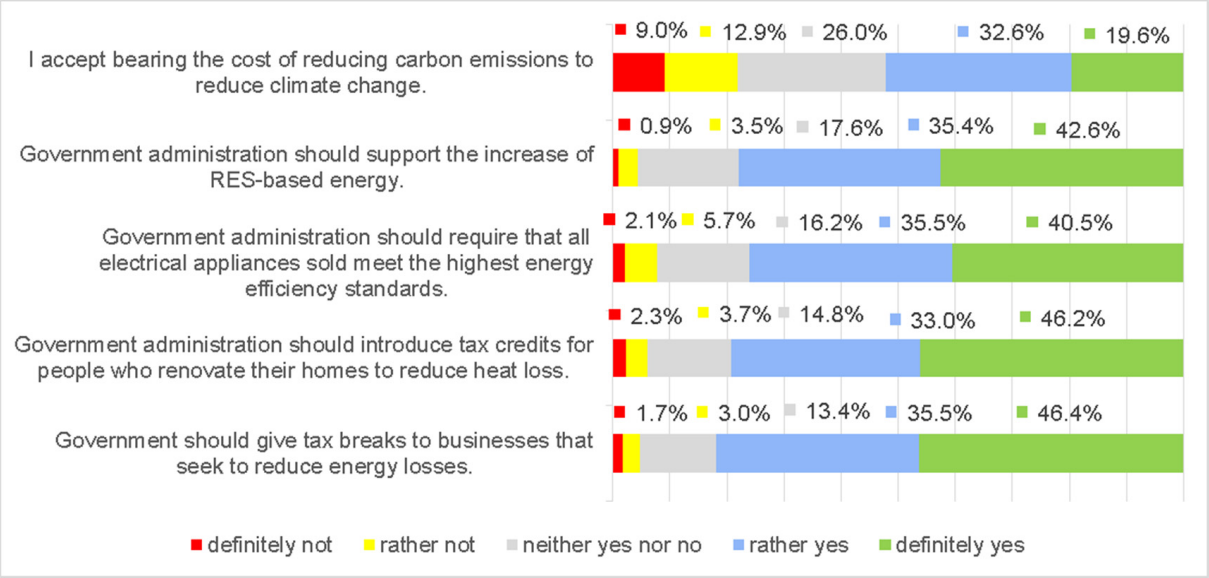

Figure 7. Structure of the assessment of theses diagnosing the expectations of respondents regarding activities related to energy conservation.

An important observation is the acceptance of more than half of the respondents (52.2%) to bear the costs of reducing carbon dioxide emissions in order to reduce climate change. The expressed acceptance was mostly moderate and the average score was 3.41, while 21.9% of the respondents did not accept the costs of limiting emissions.

High average ratings were calculated for the theses concerning government administration support for activities related to energy conservation. At the same time, the standard deviation for these ratings belonged to the group of the lowest in this study, which means slight discrepancy in the ratings. Among the forms of support, the highest rated were tax breaks for entities taking measures to reduce energy losses (Table 3).

In the collected research material, an analysis of Pearson's correlation was carried out in search of the relationship between the assessments of theses diagnosing the perception of climate change and renewable energy. The results of this analysis are presented in Table 4. Most of the calculated correlation coefficients were statistically significant. The assessments of theses positively related to renewable energy (8–10) were positively correlated with the assessments of theses recognizing the anthropogenic source of climate change and presenting these changes as the main contemporary problem. On the other hand, negative correlations were calculated with theses in which the sense of climate policy is called into question. This means that the perception of climate change consistent with the scientific consensus and presented in the climate policy of the European Union is associated with a positive attitude towards RES. The correlations of theses pointing to disadvantages of renewable energy were in the opposite way. They were negatively correlated with theses appreciating the importance of climate change and positively correlated with theses pointing to climate policy as a global competitive game.

The direction of correlation (Table 4) and the mean values of the assessment of diagnostic theses (Table 3) indicate the high sensitivity of the respondents to contemporary

ecological issues. Support for the direction of the European Union's climate policy was positively correlated with a positive attitude to renewable energy sources and with the respondents' acceptance of bearing the costs of reducing carbon dioxide emissions. This willingness to bear the costs of counteracting climate change was positively correlated with the recognition of climate change as one of the main contemporary problems and with the belief that it is an anthropogenic source.

Table 4. Pearson's correlation coefficients between the assessments of theses diagnosing the perception of climate change and the perception of renewable energy.

Thesis Numbers	Thesis Numbers						
	1	**2**	**3**	**4**	**5**	**6**	**7**
8	0.1900 *	0.2548 *	0.3069 *	0.2028 *	−0.1371 *	−0.1412 *	−0.1362 *
9	0.1505 *	0.1629 *	0.1817 *	0.1455 *	−0.0582	−0.0697 *	−0.0767 *
10	0.2200 *	0.2279 *	0.3321 *	0.1773 *	−0.0761 *	−0.1118 *	−0.1374 *
11	−0.1758 *	−0.1823 *	−0.2602 *	−0.1280 *	0.3729 *	0.2836 *	0.3109 *
12	−0.0753 *	−0.0599	−0.0309	−0.0110	0.1543 *	0.1289 *	0.1610 *
13	−0.1890 *	−0.1909 *	−0.1889 *	−0.1228 *	0.2767 *	0.2706 *	0.2823 *
14	−0.0998 *	−0.1237 *	−0.1514 *	0.0014	0.1885 *	0.2359 *	0.2231 *
15	0.3798 *	0.2992 *	0.3913 *	0.2747 *	−0.1292 *	−0.2815 *	−0.2288 *

Thesis number—1. Climate change is one of the most important threats to modern civilization; 2. Human activities have a decisive influence on the climate changes observed today; 3. Reducing carbon dioxide emissions is necessary to protect the climate; 4. The European Union's climate policy reduces global emissions of greenhouse gases, including carbon dioxide; 5. Climate change is mainly the business of certain groups making money by making societies fearful or guilty; 6. "Global warming" is merely a stage in the natural (human-independent) cyclical nature of climate change; 7. The European Union's climate policy is a tool in the competitive game of European economies. Thesis number—8. The increasing demand for energy can be met by developing the use of renewable energy sources (RESs); 9. RESs create new jobs; 10. It is possible in the near future (20–30 years) to replace most conventional energy sources (coal, oil, gas, etc.) with renewable energy; 11. RESs are being introduced by force and threaten coal-fired power generation; 12. The cost of obtaining renewable energy is very high (renewable energy is expensive); 13. RESs are an unstable source of energy (production is unpredictable and mismatched with demand); 14. Wind turbines negatively affect their surroundings through a "shadow effect" and a lot of noise; 15. I accept bearing the cost of reducing carbon emissions to reduce climate change. *—Statistically significant coefficients are marked with an asterisk.

It is worth noting that 44.3% of the respondents confirmed that "the climate policy of the European Union reduces the global emission of greenhouse gases, including carbon dioxide". However, a large group consisted of people who assessed this thesis in a neutral way, neither confirming nor denying it (38.7% of the respondents). The analysis of the correlation showed that the level of acceptance of the EU climate policy grew with growing belief in the importance of the problem of climate change for humanity.

The expectations of the surveyed group of people with regard to the direction of the development of the energy sector in Poland are presented in Figure 8. These data show that the dominant social support for solar energy and nuclear energy is dominant. It is worth emphasizing the small percentage of people waiting for the development of coal and gas power plants. Such results seem logical as the surveyed community showed a high level of concern about carbon dioxide emissions.

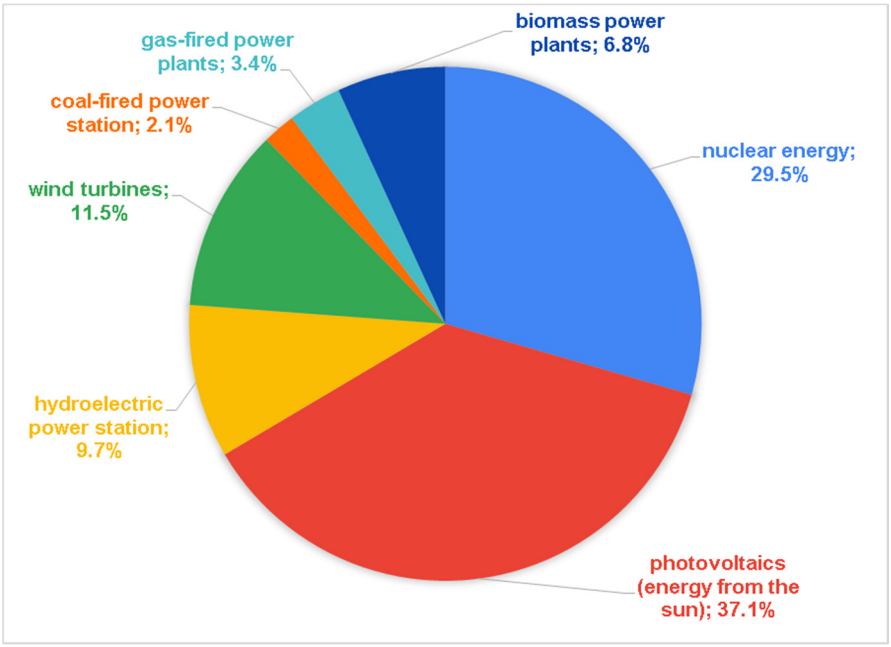

Figure 8. Respondents' expectations regarding the direction of the development of the energy sector in Poland.

5. Discussion

The Intergovernmental Panel on Climate Change (IPCC) in its report from 2021 [35] indicates the anthropogenic causes of climate change. There are also scientific reports pointing to natural causes that influence the global warming [47]. In the conducted research, the majority of respondents agreed with the hypothesis of anthropogenic causes of these changes, 84.7% of the respondents confirmed this thesis. At the United Nations Climate Change Conference in Glasgow (COP26) in November 2021, politicians called for urgent measures to save the planet [48]. The respondents expressed a similar intention, as 75.2% considered climate change to be one of the most important contemporary problems.

Among the methods of limiting anthropogenic pressure, the necessity to limit consumption is indicated. Another postulated method of limiting the exploitation of the natural environment is the gradual reduction of the human population [49]. This model of reducing anthropogenic pressure was not accepted by the study group because 54.2% negatively rated this thesis. Only 11.2% of the respondents strongly supported the idea of human depopulation. This may be due to the fact that the inhabitants of the studied region are considered to be a relatively conservative society.

The use of regulation to achieve an 80% reduction in greenhouse gases means incurring huge costs, for example in the United States it would amount to as much as USD 4.5 trillion, which would amount to USD 10,300 per person in the years 2017–2050 [50]. In the conducted research, more than half of the respondents (52.2%) declared their readiness to bear the costs of the decarbonization policy aimed at limiting climate change. At the same time, greenhouse gas pricing instruments are expected to generate income that can be reinvested to stimulate innovation, economic growth, and investment in clean technologies, and to stimulate the labor market [51]. The surveyed respondents shared such hopes as 61.2% of people believed that renewable energy increases the number of jobs.

Postulates of energy modernization, reduction of fossil fuel consumption, and energy solidarity are gaining in importance [52,53]. The path to abandon coal-based energy must be varied, depending on many social, economic, technical, and many other factors, including environmental [54]. The decarbonization of the energy sector requires intensified international cooperation. Austria proposes to phase out coal-fired power by 2025, Denmark by 2030, and the Netherlands by 2029. Belgium is the first, and so far the only, EU Member

State that has already withdrawn from coal-fired power, and the last coal-fired power plant was closed there in March 2016 [55,56]. Renewable energy seems to be of key importance in these transformations, which is confirmed by the analysis carried out by the International Renewable Energy team [57].

Renewable energy sources are positively interpreted in the public opinion, which emphasizes the increase in demand for renewable energy sources, which can guarantee new jobs [5,34,58]. This position was confirmed by the conducted research. People who considered global warming a serious problem saw renewable energy as a solution to the problem of energy deficit. This direction is also visible in the energy policy of Poland, the EU and many countries around the world and is indicated as one of the eight main strategic directions of the energy policy. In addition to the support for renewable energy sources, the implementation and development of nuclear energy is also visible. Generation of energy from renewable sources is an important element of the activities aimed at decarbonization as well as energy diversification and covering the increasing demand for energy. It is an expression of care for the natural environment and a response to the needs of promoting sustainable development, as well as strengthening the strength of regions and local communities [7,35]. This is also reflected in the Polish Energy Policy until 2040, in which the key elements refer to the increase in the share of renewable energy sources in all sectors and technologies. The document also plans to significantly increase the installed capacity in photovoltaics to 5–7 GW in 2030 and 10–16 GW in 2040. In PEP2040, it is also planned to launch the first block of a nuclear power plant with a capacity of approximately 1–1.16 GW and subsequent blocks are to be implemented every 2–3 years until the planned 6 blocks are completed [34].

In the conducted research, the respondents had high hopes for solving energy problems with state support, especially in the form of subsidies for activities aimed at saving energy. It is also worth emphasizing that a very big challenge in terms of reducing carbon dioxide emissions is the planned "Fit for 55" package of commitments, which envisages a drastic reduction of CO_2 emissions related to profound and costly changes in the economy [22]. In this context, it is worth conducting research identifying awareness and social acceptance of the planned changes.

Scientific work on social assessments has long been an important input into the development of a country's energy strategy [53,59–61]. New solar and wind power plants are becoming more and more competitive with existing coal plants [51,58]. It is also worth emphasizing that social support for certain types of energy often depends on the spatial location. Projects away from the respondents' place of residence are more acceptable. This is the so-called "not in my backyard" phenomenon. The objection does not concern photovoltaics [62].

According to Skutato and Hampl [63], people who value the common good and equality show greater acceptance of the location of renewable energy plants in their vicinity. Similar results were obtained in this study. People with greater sensitivity to the quality of the natural environment showed higher support for RES. Other studies also confirm that Poles are willing to support the construction of a wind farm in their area, if the profits from it were shared with the local community [38,62].

The results of this research confirm that social expectations regarding the future development of the energy sector in Poland were primarily related to the development of photovoltaic energy. At the same time, the knowledge of the respondents about the functioning of the power system was at a fairly low level, which may mean that respondents build their beliefs based on emotions or media messages, and not on the basis of thorough knowledge. This has its consequences, because social participation in shaping state policy is gaining in importance, and the society demands participation in making decisions, especially concerning their immediate environment [61]. Therefore, it is worth taking care to raise public awareness of both the advantages and disadvantages of renewable energy, as it may be of significant importance in shaping the future spatial development, taking into account renewable energy. At the same time, due to the features of renewable energy

sources [64–67], it will be necessary to maintain the generation potential of energy, ensuring the stability of the power system [59].

6. Conclusions

As a result of the research, answers to the research questions and theses posed were formulated as follows:

1. In the surveyed group of people, there is a belief that the observed climate changes are a serious, contemporary problem, even for three-quarters of the respondents it is one of the most important problems caused by people. They believe that all measures should be taken to reduce the anthropogenic pressure on the environment by limiting consumption, and a quarter expressed willingness to cover the possible costs of reducing carbon dioxide emissions in order to reduce climate change.
2. Renewable energy sources were positively perceived by the respondents. Increasing the use of these energy sources was seen as a solution to the problem of the energy deficit, positive impact on the economy by creating new jobs. More than half of the respondents believe that renewable energy sources are not introduced by force and do not threaten coal-based energy.
3. The surveyed group of people showed high expectations towards government support for all activities related to energy conservation. This is evidenced by the strong support for the theses relating to the forms of co-financing increasing the share of renewable energy sources in the energy mix and supporting investments that reduce energy waste.
4. The respondents saw the need to restructure the Polish power system. Nearly 40% indicated the development of renewable energy and 30% on nuclear energy.

The presented results of our research confirm the correctness of the statement made in the title of the study that renewable energy sources are the future of the energy sector in Poland (and not only), and not only a myth in the opinion of the surveyed young people. The best summary will be the repeated slogan that a sustainable energy and climate policy should pursue three equal goals: competitiveness, sustainable development, and security of supply. Therefore, striving to achieve ambitious climate goals must not adversely affect the competitiveness of the economy and the level of security of energy supplies. One goal cannot be achieved at the expense of others. The survey shall be repeated on a random sample at the time when the energy price changes caused by the transformation of the energy mix occur—i.e., around 2025.

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Informed Consent Statement: The survey of respondents' opinions was voluntary. By completing the online.

Data Availability Statement: The research results were obtained from questionnaires constructed by the Authors of this publication.

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