
Energy Sectors on Capital Market – Financing the Process “Towards Sustainability”

Submitted , 1st revision , 2nd revision , accepted

Leszek Dziawgo¹

Abstract:

Purpose: The world economy continues its energy transformation towards sustainability. It is a complex, costly and time-consuming process. The transition of energy sectors towards sustainability will require enormous financial outlays. The use of the capital market and gain of public support will be the basis of any successful Polish energy transformation. The objectives of the article are: presentation of experiences and possibilities of using Polish capital market in financing the transformation of the energy sector towards sustainability and to identify risk limit of this process. The article hypothesis is, usage of capital market by the energy sector in Poland is essential for financing of transformation energy towards sustainability.

Design/Methodology/Approach: In the article, the following research methods were used: analysis of the literature of the subject, analysis of the legal acts and desk research as well. The theory was complemented with empirical studies using: case study, comparative analysis and questionnaire methods. Activity on capital market from key energy companies listed on WIG-Energy was analysed. Afterwards, questionnaire methods were applied on sample of individual investors and representative sample of the Polish society.

Findings: Capital market is key source in financing energy transformation towards sustainability. Source of capital are both issue of shares and bonds. The awareness and attitude of investors and consumers regarding CSR, including RES, are not satisfactory. Promotion of the energy transformation of the economy is necessary.

Practical Implications: Four key applicable conclusions were formulated: promote the CSR concept, including RES; reduce political risk; use of capital market in wider scale; control the cost of RES for society.

Originality/value: Activity of energy sector companies was presented on capital market to obtain financing for transformation towards sustainability. Another advantage is consideration of attitude of both individual investors and representative sample of consumers. Investments in financial instruments of energy companies and consumption of goods and services connected with energy, could impact the process of energy transformation towards sustainability.

Keywords: Sustainable finance, capital market, energy listed companies, CSR, renewable energy sources.

JEL classification: D14, D22, G15, O16, Q43.

Paper Type: Research study.

¹Prof. Finance Department, Faculty of Economic Sciences and Management, Nicolaus Copernicus University, Poland, e-mail: ldziawgo@econ.umk.pl;

1. Introduction

The energy transformation of the global economy towards sustainability is a complex, costly and time-consuming process. The challenge of energy transformation is both global and local in nature. For each of the countries involved, it is a social, political and also financial effort. The European Union is consistently implementing the process of energy reconstruction. Poland, as a member of the EU, is also obliged to take specific actions.

However, the Polish economy is in a special situation. It should be emphasized that 75% of energy is produced from coal. The effect is, among others, poor air quality. It is known that out of 50 European cities with the highest air pollution, as many as 33 are located in Poland. Another key problem is the ownership structure of the Polish energy sector. The vast majority of the energy sector remains under state control, which means a political risk due to the activity of the mining lobby. Another major issue is getting social support for energy transformation towards sustainability. It concerns demand for energy from RES (Renewable Energy Sources) due to cost of such energy. Moreover, investors engagement in energy sector companies on capital market is also important, due to potential profits from investment in shares and bonds of these companies. It seems therefore, that such usage of capital market and getting social support will eventually be the foundation of potential Polish success in energy transformation towards sustainability.

It therefore seems that it is the use of the capital market and gaining public support that will be the basis for the possible Polish success in the energy transformation towards sustainability. The aims of the article are:

- presentation of experiences and possibilities of using the Polish capital market in financing the transformation of the energy sector towards sustainability;
- identification of risks limiting the energy transformation process in Poland.

The article hypothesis is as follows: usage of capital market by the energy sector in Poland is essential for financing of transformation energy towards sustainability. In order to achieve the indicated goals and verify the hypothesis, adequate and diverse research methods were used in the research process. The analysis covered:

- major Energy companies on domestic capital market in terms of activity in RES;
- sample of individual investors;
- representative sample of Polish society,

in terms of the opinions and attitudes of these groups of respondents in the issues of Corporate Social Responsibility (CSR), which also applies to RES.

The conducted research process made it possible to achieve the goals and positively verify the hypothesis. The results allow for a positive assessment commitment to the

energy sector in the capital market. Energy companies have raised significant capital for day-to-day operations and energy transformation towards sustainability.

The research hypothesis has been positively verified: the use of the capital market by the energy sector in Poland is necessary for financing the energy transformation towards sustainability. This is evidenced by the value of financial operations of companies from the energy sector on the capital market through issues of shares and bonds.

However, there are risks limiting the energy transformation process. These are risks of a financial and economic, social and political nature (also in international terms). There is also a technological risk of applying appropriate solutions with appropriate energy efficiency. Moreover, application conclusions were formulated that may be useful in the process of transformations in the energy sector, both in Poland and in countries with similar energy situation. The conclusions can also be useful for the EU in targeting support to selected countries. Conclusions are included in section 6.

2. Background

There is no doubt that the energy reform of the economy and society towards sustainability is necessary. The process is of interest to policy, economy, society and science. This applies on both public finances and the financial market (Aboltins and Blumberga, 2019; Ziolo *et al.*, 2019; Alinska *et al.*, 2018). An important part of the financial market is capital market, which is an important source for financing energy transformation. First of all, it should be noted that the financing of the energy transformation process is a part of the broad activity of companies for Corporate Social Responsibility - CSR (Sachs *et al.*, 2019). For decades, some institutional and individual investors have been taking into account ethical and environmental issues (Dziawgo, 2004; 2014; Oeko-Invest 2002; 2020). Contemporary energy challenges are therefore part of the broad process of socially responsible investment (SRI - Socially Responsible Investment). In many scientific studies is the perceived role of the capital market in financing energy transformation (de Jager and Rathmann, 2008; Donastorg *et al.*, 2017; Trotta *et al.*, 2018; Masini and Menichetti, 2012).

Attention is paid to financial institutions and financial instruments. Both shares (Ottinger and Bowie, 2015) and bonds (Yildiz, 2014; Franczuk, 2014; Ng and Tao, 2016) are distinguished. In the case of shares, companies from specific sectors are indicated, for example, Clean-Energy (Rezec and Scholtens, 2017) or in the synthetic scope specialized stock exchange indices (Shaydurova *et al.*, 2018). Bonds are another fundamental instrument of the capital market. A very popular subject of analyzes on the international bond market are "Green Bonds", i.e., issues of bonds of public entities and enterprises, issued to finance environmental projects, including in RES (Laskowska, 2019; NG, 2015; Tao 2015; Yoshino and Taghizadeh-Hesary, 2018). It should be noted that also other and numerous issues of bonds financing the energy transformation, although they are not referred to as "Green Bonds", are

nevertheless used to finance modern energy is a matter of accepting the new terminology "Green Bonds".

Equities and bonds issued by companies operating in the energy sector in transformation towards sustainability, are the subject of investment for many financial institutions worldwide (Soelton *et al.*, 2020; Mangantar, 2017). Among those institutions, many specialize in the field of Socially Responsible Investment (SRI), also in energy sector. Of course, all standards of economic analysis are complied with in the process of investing in the securities of energy companies. Attention is drawn, inter alia, to capital structure, and financial results (Chojnacka and Wisniewska, 2015). Communication with investors is also taken into account - Investor Relations IR (Dziawgo, 2012).

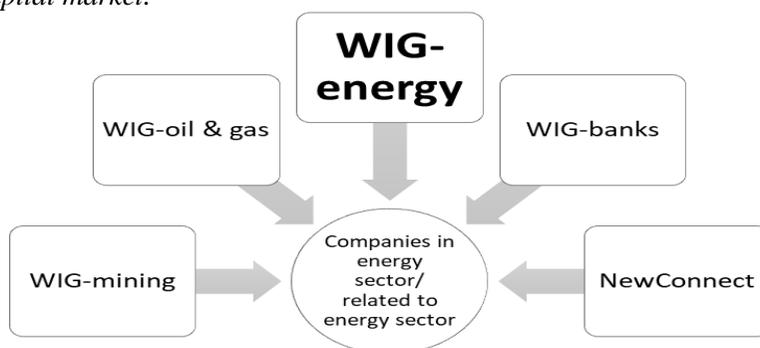
Social, political, economic and also scientific pressure on sustainability forces to take specific actions both at the level of the European Union and individual EU countries. For many years, the European Union has been working for RES (Ollier, 2020). The most recent of the initiatives undertaken in 2020 should be indicated. The European Union has announced the "European Green Deal 2050" program (A European Green Deal). It concerns the transformation of the European energy sector towards sustainability. Pursuing the policy of the European Union, Poland (as an EU member) is also obliged to undertake specific actions in this regard. Therefore, in February 2021, Polish government adopted the program, "Energy Policy of Poland until 2040". According to the program, share of coal in the Polish energy sector will be reduced to 56%. Also important and expected is the development of local and civil energy projects. At the same time, the need for broad social acceptance for changes in the Polish energy sector was emphasized (Ministry of Climate and Environment), considering also the real risk of higher energy prices.

Therefore, there is need to take into account social attitudes regarding sustainability (Ksiezopolski *et al.*, 2020). The Polish policy makers' intentions in the field of energy transformation are also confirmed by the National Reconstruction Plan announced in February 2021. This EU-backed program deals with the recovery of the national economy after Covid-19 outbreak. It is initially anticipated that the largest expenditure will be allocated to transformation in the energy sector towards sustainability. The program highlights the social factor (Krajowy plan odbudowy). It should be emphasized that the ongoing cooperation between Polish and EU energy transformation emphasizes the crucial importance of households (Walczak *et al.*, 2021; Widyastuti *et al.*, 2019).

However, in the case of Poland, negative realities of the energy, environmental and capital should be indicated. The above conditions can be described as an extremely difficult situation in the Polish energy sector. Being limited only to the issue of ethical and environmental energies, it is enough to indicate two examples. The energy sector in Poland is based in approx. 75% on coal (approx. 50% hard coal, approx. 25% lignite). Another example is air pollution. The data shows that out of 50

cities in the European Union with the highest air pollution, as many as 33 are located in Poland (www.sharpdirect.pl). The examples indicated above can be considered sufficiently convincing to justify actions in the field of energy transition towards sustainability. Undoubtedly scale of the threat forces therefore political activities, social, business and research in the field of transformation of the Polish energy sector. When analyzing the process of energy transformation in Poland and the importance of the capital market, 5 categories of energy companies and companies related to the energy sector should be distinguished (Figure 1).

Figure 1. Energy companies and companies related to the energy sector on the Polish capital market.

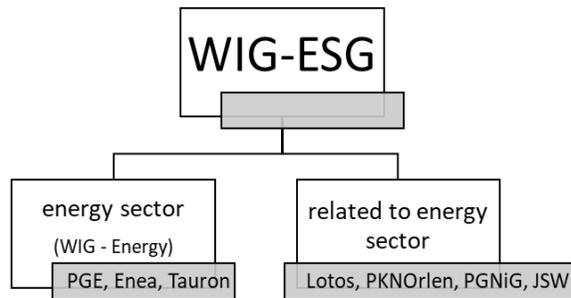


Source: Own elaboration.

Core energy companies are included in the WIG-Energy stock exchange index. It includes shares of the most important 11 energy companies. Other companies related to the energy sector are included in the sub-indices WIG-Paliwa (WIG-oil & gas), which includes shares of 7 companies, and WIG-Gornictwo (WIG-mining) with 5 companies, including 4 in the field of coal mining. Due to the processes of financing the energy sector, the WIG-Banki (WIG-banks) index on the stock exchange can also be mentioned. Banks, as listed companies, not only finance the energy sector, but also participate in issue of shares and bonds of energy sector companies. Yet another group of energy companies are companies listed on the NewConnect market, specializing in the production of Clean-Energy.

On the other hand, independently on the industry indices or other classifications indicated above, socially responsible companies, including energy companies, should also be distinguished. The shares of such companies included in the WIG-ESG index (Environmental - Social - Governance), which the entered for the EEZ in 2019 years. The index is replaced by a functioning since 2009 year index WIG-RESPECT (Respon-sibility – Sustainability – Ecology – Participation – Community – Environment - Transparency). Importantly, while the previous index included only few companies, the new index already includes 60 companies. This group includes energy companies, such as PGE, Enea, Tauron and others related to energy. The above is presented in Figure 2.

Figure 2. Energy companies and companies related to energy sector included in the index ESG.



Source: Own elaboration.

3. Materials and Methods

Due to the subject of the study, as well as the goals and hypotheses, attention was focused on the functioning of the leading companies in the energy sector with an indication of the ongoing and planned energy projects towards sustainability using the capital market. In order to achieve the purposes of this document and verify the hypothesis, the following procedure test was adopted, that consists of three stages.

Firstly, critical analysis of domestic and foreign scientific publications as well as domestic and international legal acts.

Secondly, the activity of energy sector companies on the Polish capital market was analyzed. In the case of the case study, attention was paid to the key energy companies for the Polish economy, which are also listed companies. The analysis is primarily based on financial issues, shareholding structure, value of share capital, value of as-sets, revenues and financial result. Emphasizing the importance of the capital market, attention was also paid to the bond issues of selected companies. It was considered important to indicate the energy projects of selected companies in the field of towards sustainability. When focusing on the transformation of the Polish energy sector and sources of financing, it should be noted that financial issues are the basis for energy investments. The presented results allow to assess the scale, quality and value of the presence of the energy sector in the capital market. The activity of the companies in the field of energy projects towards sustainability was emphasized. At this stage of the research, the following sources were used, publications of en-ergy companies, the WSE (Warsaw Stock Exchange), public institutions and economic analysis institutions.

Thirdly, the sample individual investors was analyzed (investing in the stock market) and representative sample of the Polish society. The research was conducted in 2020. Their aim was to establish awareness on Corporate Social Responsibility (CSR), including RES. It was considered that preferences of individual investors can affect the financial commitment and supervisory positions in energy companies

(Shareholder’s meetings, Investor Relations). Moreover, individual investors are also consumers of energy goods and services. Likewise, consumer preferences in a representative sample may influence choices regarding goods and services, including energy use. At this stage, the results of own research were used as a source: on a sample of in-dividual investors and on a representative sample of Polish society.

The study on a sample of individual investors was conducted in cooperation with the renowned Individual Investors Association in which 306 individual investors replied. However, in the case of a representative sample of Polish society, 1,033 people were asked. The PS Imago Pro program was used to analyze the research results on the sample of individual investors and on a representative sample.

In summary, in the article the following research methods were used; analysis of the literature of the subject, analysis of the legal acts and desk research as well. The theory was complemented with empirical studies using, case study, comparative analysis and questionnaire methods. Own research on leading energy companies in the field of the analysis of towards sustainability activity and research conducted both on the sample of individual investors and on a representative sample of Polish society can be considered coherent. With the integration of energy companies active in the capital market with the awareness and attitude of investors and consumers will facilitate the transformation of the Polish energy sector towards sustainability.

4. Results of Research

4.1 Publicly Listed Companies vs. Energy Sector

The capital market in Poland is widely used by the energy sector in Poland. More than a dozen companies whose business is energy are listed on the Warsaw Stock Ex-change (WSE). As mentioned, key companies are included in the sub - index WIG - En-ergy (Figure 2). Three major energy companies were analyzed due to their significance on the energy market, financial position, capital market operations (issues of shares and bonds) and activity in the field of RES. The following energy companies were considered key: PGE, Tauron, Enea.

4.1.1 Stock Exchange Market: Finance – Shareholder Structure

As mentioned, the basic index for energy companies involved in the production and distribution of electricity is WIG-Energy. Table 1 presents basic financial data on the companies included in this index.

Table 1. *WIG Energy companies – financial data 31.12.2020 (million PLN).*

Company name	Key state shareholders (%)	Share capital	Total assets	Revenue	Net income
Bedzin*	State Treasury: 5.00	15.7	466	223	-105
	BGK: 9.88				
CEZ	Ministry of Finance, Czech Republic: 69.77	233,871	702,574	209,522	5,468

Enea	State Treasury: 51.50	12,037	29,980	18,177	-2,234
Interaolt	-	25	50	163	12
Kogeneracja	PZU OFE: 8.02	1,680	2,854	1,183	126
	PGE: 58.00				
ML System*	-	77	304	127	10
Polenergia	-	1,418	3,018	1,811	110
PGE	State Treasury: 58,38	42,518	81,594	45,766	148
Photon	-	40	160	28	- 9
Tauron	State Treasury: 30.06	15,519	39,411	20,367	- 2,488
	KGHM: 10.39				
ZEPAK	PZU OFE: 9.12	1,744	2,879	2,207	- 226

Note: *Financial data for 31.12.2019 (Financial data for 31.12.2020 not available)

Comments: 1. Public Shareholders: shares under the control of political entities - State Treasury or entities dependent on the State Treasury. 2. Data based on consolidated balance sheets for 2019 (the latest audited data).

Source: <https://biznes.interia.pl/gieldy/notowania-gpw/>.

Table 1 presents the general financial situation of the energy sector in Poland, the most important companies of which are listed on the WSE. Particular attention was paid to:

- ownership relations in companies (public shareholding);
- acquired share capital (share issues);
- financial standing of companies.

In many companies, it must be noted the presence of shareholders associated with the policy. Such entities include not only the State Treasury, but also enterprises dependent on the State Treasury (BGK Bank Gospodarstwa Krajowego, PZU OFE, KGHM). Is particularly evident is in the largest energy companies: Enea, PGE, Tauron. Nevertheless, the presence of these companies on the stock market requires a certain transparency of operation.

Moreover, foreign companies such as CEZ and Interaolt are also listed on the WSE. The case of the CEZ company is special. The shares of the Czech company are listed in the dual listing system simultaneously on the Prague and Warsaw stock exchanges. Moreover, the vast majority of CEZ's assets are located in the territory of the Czech Republic. The importance is that only a small part of the financial data relate to activity in Poland. However, first of all, it should be emphasized that CEZ announced in 2020 its readiness to resell five energy subsidiaries in Poland (Money(a)). In turn, the company Interaolt registered in Lithuania is not a significant entity in the Polish energy sector.

4.1.2 Bond Market

Companies in the energy sector in Poland also raise capital through bond issues. Issues in PLN and in EUR should be indicated. Table 2 presents the most important bond issues of the three analyzed companies. The value of the issues demonstrates the capital needed to function and transform the energy sector towards sustainability.

Table 2. Selected bond issues of major energy companies in Poland – PGE, Tauron, Enea.

Company name	Value	Period	Credit rating (Fitch)
Enea	1,000 million PLN	2019-2024	BBB
Enea	1,000 million PLN	2019-2024	BBB
PGE	400 million PLN	2019-2026	BBB+
PGE	1,000 million PLN	2019-2029	BBB+
PGE	2,000 million EUR	2014-2041	BBB+
Tauron	1,000 million PLN	2020-2025	BBB-
Tauron	750 million PLN	2018-2030	BBB-
Tauron	500 million EUR	2017-2027	BBB-
Tauron	190 million EUR	2016-2034	BBB-

Source: www.gpwcatalyst.pl.

The bond market is very important for the energy sector in Poland, as evidenced by both the number of issues and their value. It should also be noted that the buyers of energy bonds are, inter alia, BGK (Bank Gospodarstwa Krajowego) and EIB (European Investment Bank). From the data indicated in Table 2, we can distinguish, for example, the issue of Tauron in 2020 for the amount of PLN 1 billion. The purpose of the issue was to finance the company's "Green Turn" project. Among the buyers of bonds it is among EBRD (European Bank of Reconstruction and Development). In conclusion, it should be noted that the buyers of the bonds are policy-dependent financial institutions (BGK, EIB, EBRD).

4.1.3 Activity Towards Sustainability of Key Companies from Energy Sector

Activity of energy sector in terms of sustainability will be shown in examples of the three largest companies Polish energy PGE, Tauron, Enea. These companies dominate the Polish energy market (Table 1). It can be assumed that the actions of the indicated companies in the field of sustainability will set the standards for the functioning of the energy sector in Poland. These companies dominate the Polish energy sector (Table 1). It can be assumed that actions of the indicated companies in the field of sustainability will set the standards for the functioning of the energy sector in Poland. These companies own several wind farms, hydropower plants and photovoltaic plants.

However, energy production from Renewable Energy Sources is not significant yet (PGE and Enea with approx. 2%, Tauron with approx.. 10%). These are not satisfactory results. Companies informed about specific plans of increasing investments in RES, to the point that energy production from RES in 2030, would account for: 25% in PGE, 65% in Tauron, 33% in ENEA. New energy projects will be also conducted in cooperation with foreign companies. For example, PGE and Swedish company Orsted, came to the agreement of building wind farms in the Baltic Sea (www.fitchratings.com). These are offshore wind energy projects "Baltic 2" and "Baltic 3". Similar offshore wind energy projects will be conducted in Tauron

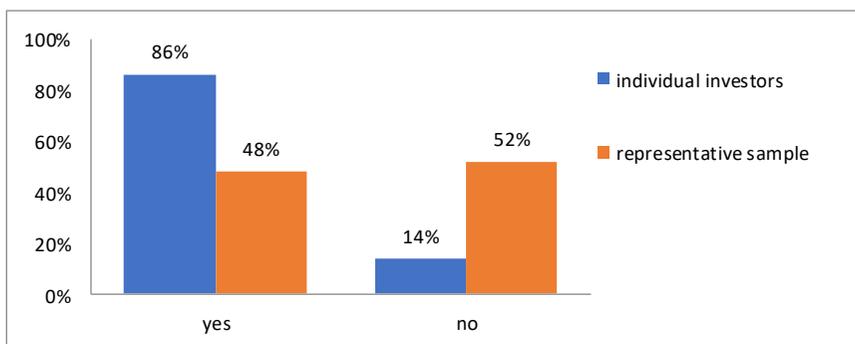
company in cooperation with Portuguese company EDP Renovaveis and the French company Engie, as well as in Enea company in cooperation with Spanish company Iberdrola Eólica Marina. Summing up the examples of activity of the indicated companies towards sustainability, one should also point to examples of team activities. The three largest energy companies on the Polish energy market signed a joint letter of intent in January 2021 for cooperation in the construction of offshore wind farms.

4.2 Own Research: Investors and Consumers

Two questionnaire surveys were conducted in 2020. One of the studies was conducted on a sample of individual investors (investing in the stock exchange). Another study was conducted on a representative sample of Polish society. The research concerned the awareness and attitude of the respondents in the issues of Corporate Social Responsibility (CSR), which also applies to RES. In the research process, individual investors were recognized as an important group not only because of stock exchange investments, but also because they are also consumers. It should be emphasized that the share of individual investors in turnover on the WSE in 2020 was as much as 25% (GPW).

However, the main motive for the research on a representative sample was precisely the role of the consumer. In both cases, it was indicated that consumption also applies to the consumption of energy goods. Results are presented below.

Figure 3. *Have you heard of Corporate Social Responsibility or Socially Responsible Investment?*



Source: *Own surveys.*

The conducted research shows that the awareness of the subject of investing in accordance with the principles of corporate social responsibility among individual investors is much higher than in the representative sample (Figure 3). Of course, the mere awareness on this subject does not prejudice investment decisions. However, the results obtained in the representative sample are all the less optimistic. The above data can be supplemented with information on the experience of individual

investors measured by the investment period and awareness on CSR (Table 3).

Table 3. Have you heard about "Corporate Social Responsibility"? * years of investing in the stock market

Specification	Number of years of investment				Total
	up to 3 years	3-5	6-9	10+	
Have you heard about "Corporate Social Responsibility"?					
Yes	39	44	35	144	262
No	7	8	3	23	41
Total	46	52	38	167	303

Source: Own survey.

The presented data show that the awareness of the subject of CSR is at a high level among individual investors. However, in the highest degree among the most experienced investors (at least 10 years of experience). When analyzing the awareness of the respondents of the group of individual investors and the representative group about CSR, the criterion of age and education can be taken into account. It was assumed that both age and education may influence the perception of environmental protection and social responsibility in business. The obtained data are presented in Tables 4, 5, 6 and 7.

Table 4. Have you heard about "Corporate Social Responsibility"? * age of respondents (individual investors).

Specification	Age (years)						Total
	18-24	25-34	35-44	45-54	55-64	65+	
Have you heard about "Corporate Social Responsibility"?							
Yes	6	83	77	42	29	24	261
No	1	12	12	8	5	3	41
Total	7	95	89	50	34	27	302

Source: Own survey.

Table 5. Have you heard about "Corporate Social Responsibility"? * age of respondents (representative sample).

Specification	Age (years)						Total
	18-24	25-34	35-44	45-54	55-64	65+	
Have you heard about "Corporate Social Responsibility"?							
Yes	47	112	108	68	72	82	489
No	51	83	96	95	113	103	541
Total	98	195	204	163	185	185	1030

Source: Own survey.

In the group of individual investors in each age group, the dominant position of the groups of respondents who have heard about CSR is dominant. The result was a score of 261 "Yes" and 41 "No". It should be noted that in the 25-44 age group the results are the highest. In contrast, the representative sample gave an overall score of 489 "Yes" and 541 "No". However, there are some similarities to the sample of individual investors in the 25-44 age bracket. In these age groups, there is an

advantage of those who have heard about CSR. Moreover, in the 18-24 age group, the distribution of answers is almost equal. On the other hand, in the age range of the representative sample 45-65+, the respondents confirming the awareness of the concept of CSR are in the minority. Tables 6 and 7 below present the results concerning the education of the respondents in both groups.

Table 6. Have you heard about "Corporate Social Responsibility"? * education (individual investors).

Specification	Education level			Total
	Vocational	Secondary	University degree	
Have you heard about "Corporate Social Responsibility"?				
Yes	0	26	239	265
No	2	8	31	41
Total	2	34	270	306

Source: Own survey.

Table 7. Have you heard about "Corporate Social Responsibility"? * education (representative sample).

Specification	Education level					Total
	Basic	Junior high school	Vocational	Secondary	University degree	
Have you heard about "Corporate Social Responsibility"?						
Yes	3	68	144	180	94	489
No	9	80	153	200	99	541
Total	12	148	297	380	193	1030

Source: Own survey.

In the sample of individual investors, it should be noted that the high level of awareness of the concept of CSR in respondents with higher education. On the other hand, in the representative sample, the level of education does not play a major role, indicating the lack of awareness about CSR. Table 8 summarizes the responses of the respondents from both the sample of individual investors and the representative sample regarding the assessment of the involvement of banks, financial institutions and listed companies in environmental protection.

Table 8. What is your opinion on the involvement of banks, financial institutions or listed companies in environmental protection? [multiple choice]

Specification	Individual investors sample	Representative sample
needed	48%	43%
not needed	8%	3%
reliable	8%	11%
non-reliable	22%	10%
serious	8%	12%
superficial	35%	18%
notable	14%	14%
to show off	48%	15%
difficult to say	10%	14%

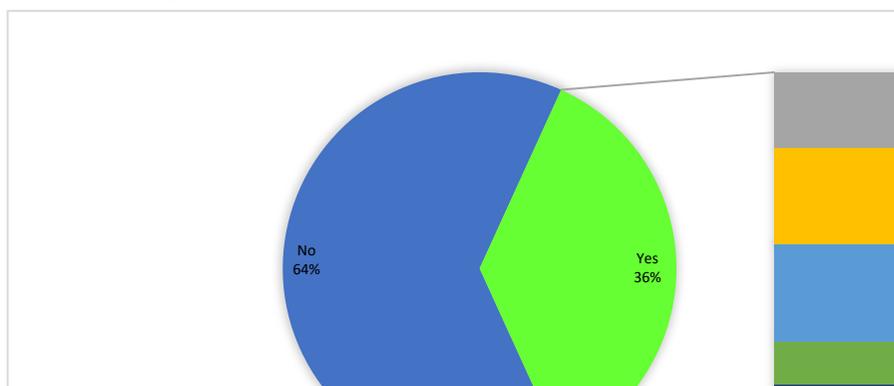
Source: Own survey.

The responses obtained from both groups of respondents allow for a preliminary assessment of the perception of the involvement of banks, financial institutions and listed companies in environmental protection, which also means involvement in RES. It is a matter of the ecological and energy image of listed companies in the opinion of both individual investors and respondents of the representative sample. It should be remembered that the leading energy companies are listed companies. Moreover, banks and other financial institutions cooperate with the energy sector.

When commenting on the research results, it is possible to indicate both the convergence and the discrepancy of the answers obtained. In both groups of respondents it was admitted that the activities of financial market companies for environmental protection (and thus also in the field of RES) are needed. The level of indications can be considered high, especially due to the level of counter indications. On the other hand, the price of the lack of credibility of actions indicates a greater level of criticism in the sample of individual investors. In turn, both samples show a low and rather consistent assessment of activities in the categories of "serious" and "notable". Again, the higher level of criticism from individual investors is once again felt in the "superficial" and "to show off" questions. The indicated differences are significant.

In the presentation of the results of further research, special attention was paid to a representative sample of Polish society. Figure 4 shows the distribution of answers to the question "Have you ever made a decision concerning the pro-ecological actions which was connected to your private finance?"

Figure 4. Have you ever made a decision concerning pro-ecological actions which was connected to your private finance?



Source: Own survey.

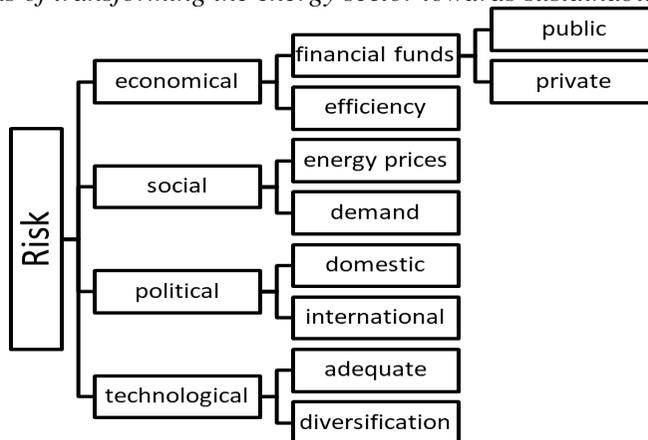
Unfortunately, the obtained answers clearly indicate a negative social attitude towards environmental protection in the case of financial issues. Environmental issues are also, of course, RES. On posed the question "Have you ever made a decision concerning the pro-ecological actions which was connected to your private finance?", and the desired 64% of respondents granted answer "No". By contrast,

specifically on energy, only 4% of respondents answered "Yes", and on financial market transactions even fewer respondents answered "Yes" - only 1%. Certainly, these data are not satisfactory for energy companies in terms of RES activity, especially in connection with obtaining financing on the capital market.

The energy transformation in Poland towards sustainability is a serious social, political, economic and also scientific challenge. Presented in article review of the publication and analysis of activity of energy companies and its own research on the individual investors sample and on the representative of Polish society sample does not allow for full optimism. Unfortunately, Poland is an excellent example of the complexity of the energy transition towards sustainability. Figure 5 shows the basic risks of transformation.

So far, the achievements of leading energy companies in Poland are small in the field of RES. The energy assets of these companies are generally small hydro, wind and solar power plants. Moreover, the energy companies in question own the coal mines. They are also under the dominant influence of politics due to the public sector shares in the shareholding structure (Table 1). The above-mentioned conditions constitute a significant socio-political risk. The combination of coal mine ownership and public shareholding means real socio-political pressure of the mining trade unions for energy companies. The latest example of a real threat to the government's RES strategy is the agreement concluded in April 2021 in the listed coal company JSW (WIG-mining, WIG - ESG), which is 55.17% owned by the State Treasury. It was agreed that the miners would be guaranteed 10-year employment (StockWatch).

Figure 5. Risks of transforming the energy sector towards sustainability.



Source: Own elaboration.

However, in terms of financial risks, one should also distinguish the risks of obtaining funds from public sources, divided into domestic and foreign (European

Union). Currently, the exact conditions and value of financial support from the indicated public sources are not known.

Therefore, particular emphasis should be placed on capital market, on which long term capital can be raised through issue of bonds and shares.. Raising funds from the capital market is also subject to risk. The reason may be, among others unknown financial value of public support, shareholding structure (public shareholding – State Treasury) and low profitability of energy companies. Uncertainty may limit the activity of investors, which in turn may limit activity of energy companies on the capital market. It should be recognized that social acceptance is necessary for the transformation of the Polish energy sector towards sustainability.

However, the results obtained from both samples (individual investors and representative) in terms of awareness and attitudes towards CSR, including RES, do not encourage optimism due to the criterion of age and education. Another type of social risk of the energy transition is price risk. The likely higher energy prices from RES may discourage households - energy consumers, all the more so as awareness of environmental challenges may be insufficient for social commitment towards sustainability.

Political risks, both domestic and foreign, cannot be ruled out. Political domestic risk was indicated both on the example of the mining lobby and the influence of political authorities on the functioning of energy companies (see Table 1). Into account should be taken also the risk of changes in legal regulations. On the other hand, foreign risk is related to meeting the requirements of the European Union in the field of sustainability and potential sanctions. Moreover, there is also a technological risk. It refers to it appropriately selected design of adequate energy efficiency as well as the diversification of the use of individual small renewable energy sources.

However, leading companies are developing activities in the field of renewable energy. It is currently not a significant part of their business activities. It should be emphasized that these companies emphasize this activity and inform about their own development plans in the field of RES. In addition, attention should also be paid to consistent activities related to RES energy generation, also in cooperation with recognized foreign companies.

5. Conclusions

Considering the necessity of the energy transformation towards sustainability and the obtained research results, it should be stated that the capital market is indispensable for financing the energy transformation process of the Polish economy and society. At the same time, coherence of actions in the social, political and economic spheres should be maintained. Due to the efficiency of the energy transformation process in Poland, four basic application conclusions can also be formulated:

- promote the CSR concept, including RES;
- reduce political risk - reduction of the public shareholding (State Treasury) in energy companies;
- use of capital market in wider scale;
- control the cost of RES for society.

The awareness and attitude of investors and consumers regarding CSR, including RES, are not satisfactory. Promotion of the energy transformation of the economy is necessary. Reducing or even eliminating the public shareholding in listed energy companies may increase investors' confidence in the rationality of actions of companies based on an economic calculation. This could mean an increased demand for stocks and bonds issued by energies' companies. Cost control energy production of RES is important for the social acceptance of the energy transformation towards sustainability.

To sum up, the energy transformation towards sustainability in Poland will require more efforts and capital.

References:

- Aboltins, R., Blumberga, D. 2019. Key Factors for Successful Implementation of Energy Efficiency Policy Instruments: A Theoretical Study and the Case of Latvia. *Environmental and Climate Technologies*, 23(2), 187-206. DOI: 10.2478/rtuect-2019-0063.
- Alinska, A., Filipiak, B.Z., Kosztowniak, A. 2018. The Importance of the Public Sector in Sustainable Development in Poland. *Sustainability*, 10, 3278. DOI:10.3390/su10093278.
- Chojnacka, E., Wiśniewska, J. 2015. Ocena zakresu informacji dotyczących źródeł kapitału w sprawozdawczości wybranych publicznych spółek z sektora energetycznego. *Zeszyty Naukowe Uniwersytetu Szczecińskiego*, 855, 49-60. DOI: 10.18276/frfu.2015.74/2-04.
- Donastorg, A., Renukappa, S., Suresh, S. 2017. Financing Renewable Energy Projects in Developing Countries: A Critical Review. *Earth and Environmental Science*, 83, 1-9. DOI: 10.1088/1755-1315/83/1/012012.
- Dziawgo, D. 2012. Investor Relations & Importance In The Global Financial Market. *Equilibrium*, 7(2), 59-76. DOI:10.12775/EQUIL.2012.011.
- Dziawgo, L. 2004. Eco- offers of banks and investment funds. UMK, Toruń, Poland, 17-33.
- Dziawgo, L. 2014. Greening Financial Market. *Copernican Journal of Finance & Accounting*, 2, 9-23. DOI: 10.12775/CJFA.2014.014.
- Franczuk, M. 2014. Emisja obligacji jako metoda finansowania rozwoju przedsiębiorstw z sektora energetycznego. *Zeszyty Naukowe Uniwersytetu Szczecińskiego*, 804, 629-642.
- de Jager, D., Rathmann, M. 2008. Policy instrument design to reduce financing costs in renewable energy technology projects. *Ecofys International*, Utrecht, Netherlands, 7-46.

- Ksiezopolski, K., Drygas, M., Proninska, K., Nurzynska, I. 2020. The Economic Effects of New Patterns of Energy Efficiency and Heat Sources in Rural Single-Family Houses in Poland. *Energies*, 13. DOI:10.3390/en13236358.
- Laskowska, A. 2019. Zielona obligacja skarbowa jako perspektywiczny instrument rynku długu. *Studia Ekonomiczne. Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach*, 382, 109-122.
- Mangantar, M. 2019. The Influence of Corporate Social Responsibility and Corporate Governance on Banking Financial Performance. *European Research Studies Journal*, 22, 95-105.
- Masini, A., Menichetti, E. 2012. The impact of behavioral factors in the renewable energy investment decision making process: Conceptual framework and empirical findings. *Energy Policy*, 40, 28-38. DOI: 10.1016/j.enpol.2010.06.062.
- Oeko -Invest 2002, 265, 2-11.
- Oeko -Invest 2020, 686, 2-11.
- Ollier, L., Melliger, M., Lilliestam, J. 2020. Friends or Foes? Political Synergy or Competition between Renewable Energy and Energy Efficiency Policy. *Energies*, 13(23). DOI:10.3390/en13236339.
- Ottinger, R.L., Bowie, J. 2015. Innovative Financing for Renewable Energy. *Pace Environmental Law Review*, 32(3), 701-754.
- Ng, T.H. 2015. Bond Financing for Renewable Energy in Asia. In *Financing Renewable Energy Development in East Asia Summit Countries. A Primer of Effective Policy Instruments*. Kimura, S., Chang, Y., Li, Y. Eds., ERIA, Jakarta, Indonesia, 321-342.
- Ng, T.H., Tao, J.Y. 2016. Bond financing for renewable energy in Asia. *Energy Policy*, 95, 509-517. DOI: 10.1016/j.enpol.2016.03.015i.
- Rezec, M., Scholtens, B. 2017. Financing energy transformation: The role of renewable energy equity indices. *International Journal of Green Energy*, 14(4), 368-378. DOI: 10.1080/15435075.2016.1261704.
- Sachs, J.D., Woo, W.T., Yoshino, N., Taghizadeh-Hesary, F. 2019. Importance of green finance for achieving sustainable development goals and energy security. In *Handbook of Green Finance. Energy Security and Sustainable Development*, Sachs J.D., Woo, W.T., Yoshino, N., Taghizadeh-Hesary, F., Eds., Springer, Singapore, 3-12. DOI: 10.1007/978-981-13-0227-5_13.
- Shaydurova, A., Panova, S., Fedosova, R., Zlotnikova, G. 2018. Investment Attractiveness of “Green” Financial Instruments. *Journal of Reviews on Global Economics*, 7, 710-715. DOI:10.6000/1929-7092.2018.07.65.
- Soelton, M., Ramli, Y., Anggraini, D., Khosasi, D. 2020. Implementing Good Corporate Governance to Engage Corporate Social Responsibility in Financial Performance. *European Research Studies Journal*, 23(1), 239-258.
- Tao, J.Y. 2015. Utilising Green Bonds for Financing Renewable Energy Projects in Developing Asian Countries. In *Financing Renewable Energy Development in East Asia Summit Countries. A Primer of Effective Policy Instruments*. Kimura, S., Chang, Y., Li, Y. Eds., ERIA, Jakarta, Indonesia, 343-381.
- Trotta, G., Spangenberg, J., Lorek, S. 2018. Energy efficiency in the residential sector: identification of promising policy instruments and private initiatives among selected European countries. *Energy Efficiency*, 11, 1-25. DOI: 10.1007/s12053-018-9739-0.
- Walczak, D., Dziawgo, L., Dziawgo, D., Buszko, M., Pawłowski, J., Zoładkiewicz-Kuzioła, A., Krupa, D. 2021. Attitudes and Behaviors Regarding Environmental Protection in the Financial Decisions of Individual Consumers. *Energies*, 14, 1934. DOI:10.3390/en14071934.

- Widyastuti, S., Said, M., Siswono, S., Firmansyah, D.A. 2019. Customer Trust through Green Corporate Image, Green Marketing Strategy, and Social Responsibility: A Case Study. *European Research Studies Journal*, 22(2), 83-99.
- Yildiz, O. 2014. Financing renewable energy infrastructures via financial citizen participation - The case of Germany. *Renewable Energy*, 68, 677-685. DOI: 10.1016/j.renene.2014.02.038.
- Yoshino, N., Taghizadeh-Hesary, F. 2018. Alternatives to Private Finance: Role of Fiscal Policy Reforms and Energy Taxation in Development of Renewable Energy Projects. In *Financing for Low-carbon Energy Transition. Unlocking the Potential of Private Capital*. Anbumozhi, V., Kalirajan, K., Kimura, F. Eds., Springer, Singapore, 336-357. DOI: 10.1007/978-981-10-8582-6_13.
- Zioło, M., Filipiak, B.Z., Bąk, I., Cheba, K., Tırca, D.M., Novo-Corti, I. 2019. Finance, Sustainability and Negative Externalities. An Overview of the European Context. *Sustainability*, 11, 4249. DOI:10.3390/su11154249.
- A European Green Deal. Striving to be the first climate-neutral continent. Available online: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en.
- GPW. Available online: https://www.gpw.pl/aktualnosc?cmn_id=110721&title=Udzia%C5%82+inwestor%C3%B3w+w+obrotach+instrumentami+finansowymi+na+GPW+w+2020+r.
- Interia. Available online: <https://biznes.interia.pl/gieldy/notowania-gpw/profil-akcji-zep,wId,7585,tab,finance>.
- Krajowy plan odbudowy. Available online: <https://www.gov.pl/web/planodbudowy>.
- Ministry of Climate and Environment. Available online: <https://www.gov.pl/web/klimat/polityka-energetyczna-polski>.
- Poland's Offshore Wind Boosted by PGE-Orsted Transaction. Available online: www.fitchratings.com.
- Sharp Direct. Available online: <https://www.sharpdirect.pl/aktualnosci/przerazajacy-raport-ws-jakosci-powietrza-polskie-miasta-na-czele-listy/index.html>.
- StockWatch. Available online: <https://www.stockwatch.pl/wiadomosci/jsw-przedluzyla-gwarancje-zatrudnienia-dla-wszystkich-pracownikow-o-10-lat,akcje,286850>.
- Witrualne Media. Available online: <https://www.wirtualnemedial.pl/artykul/cyfrowy-polsat-sprzedaje-7-letnie-obligacje-za-1-ml-d-zl-oprocentowane-na-wibor-6m-plus-1-65-proc>.

