



Bogusław WACŁAWIK • Joanna POPŁAWSKA • Stanisław BIELSKI •
Karolina BABUCHOWSKA

REPORTING OF ENVIRONMENTAL INFORMATION BY POLISH LISTED COMPANIES ON THE EXAMPLE OF ENERGY SECTOR COMPANIES LISTED ON THE WARSAW STOCK EXCHANGE FOR 2022-2023

Bogusław **Wacławik** (ORCID: 0000-0002-2583-2386) – *The Department of Financial Accounting,
Krakow University of Economics*

Joanna **Popławska** (ORCID: 0009-0004-4293-292X) – *SGH Warsaw School of Economics*

Stanisław **Bielski** (ORCID: 0000-0003-3602-3549) – *University of Warmia and Mazury in Olsztyn*

Karolina **Babuchowska** (ORCID: 0000-0002-9053-7842) – *University of Warmia and Mazury in Olsztyn*

Correspondence address:

Rakowicka Street 27, 31-510 Krakow, Poland

e-mail: boguslaw.waclawik@uek.krakow.pl

ABSTRACT: The purpose of the article is to discuss the reporting of environmental information on sustainability and ESG regulations in companies from the energy sector listed on the Warsaw Stock Exchange. The article presents the results of the authors' own research on the extent of disclosure of environmental information among 14 companies in the energy sector listed on the Warsaw Stock Exchange in 2022-2023. The methodology was based on a review of the literature on the subject, legal acts and own research, which used non-financial reports of listed companies in the energy sector on environmental information and indicators. The research problem undertaken by the authors was to investigate whether companies in the energy sector disclosed environmental information in the period before mandatory regulations in this regard. The results of the conducted research confirmed the authors' supposition that these companies published such information. At the same time, the scope of disclosed information differed quite significantly between companies. According to the authors, the article adds value to the literature on the subject, especially in terms of the collection of source material, its presentation and discussion. The information gathered in the empirical chapter can be used, among other things, to compare the scope of disclosure of environmental information of companies from Poland with companies from other countries in the energy sector. The topics of the article can form the basis for further detailed empirical research in this area.

KEYWORDS: carbon footprint, energy transformation, ESG, non-financial reporting

Introduction

Reporting of environmental information, as part of ESG reports, is already mandatory as of January 1, 2024. The obligation of non-financial reporting in 2024 mainly applies to public trust entities (i.e., listed companies, banks, insurance companies, investment funds, etc.), whose average annual employment in the fiscal year exceeds 500 people (Zabawa & Łosiewicz-Dniestrzanska, 2023). Sustainability reports are part of the management report, which means increased responsibility of corporate bodies for this area of reporting. Interested user groups will have greater access to comparable and reliable sustainability data. This will also provide them with a tool that will enable them to have a greater impact on business entities operating in their local community.

The term ESG (Environmental, Social, Governance) refers to issues related to the environment, social responsibility and corporate governance. These are key areas of information for any company stakeholder. Its activities in these areas generate significant risks and opportunities and are subject to evaluation by investors and other stakeholders. ESG/sustainability reporting involves companies making information available to stakeholders on environmental, social employee and corporate governance issues. It is an expression of contemporary changes related to the growing importance of the concept of sustainable economic development (Sustainable Development) and the increasing importance of ESG factors in investment decisions (Sustainable Finance).

The ESG concept defines the scope of non-financial reporting, which a growing group of European companies are required to do, estimated to be about 50.000 companies from 2026. ESG defines specific areas and risk groups that should be included in a non-financial report. EU legal acts that create the regulatory context for the ESG concept include:

- Regulation of the European Parliament and of the Council (EU) 2020/852 of June 18, 2020, on establishing a framework to facilitate sustainable investments, amending Regulation (EU) 2019/2088,
- Regulation of the European Parliament and of the Council (EU) 2019/2088 of November 27, 2019, on disclosure of information related to sustainable development in the financial services sector,
- Directive of the European Parliament and of the Council (EU) 2022/2464 of December 14, 2022, on the amending Regulation (EU) No. 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU with regard to reporting companies with regard to sustainable development,
- European Sustainability Reporting Standards (United Nations, 2024a).

The EU's taxonomy distinguishes six main environmental goals, the achievement of which allows the assessment of activities economic activity as sustainable (Zieliński, 2023):

- climate change mitigation (reducing greenhouse gas emissions),
- climate change adaptation (offsetting the harmful effects of climate change on people and nature),
- protection of water and marine resources,
- transition to a closed-loop economy,
- pollution prevention,
- protection of ecosystems and biodiversity.

The purpose of this article is to introduce the concept of sustainability and ESG regulation and the issue of environmental information reporting by companies in the energy sector listed on the Warsaw Stock Exchange. The methodology was based on a review of the literature on the subject, legal acts and own research, which used non-financial reports of listed companies in the energy sector on environmental information and indicators. The research problem undertaken by the authors was to investigate whether companies in the energy sector disclosed environmental information in the period before mandatory regulations in this regard. The survey was conducted against the background of determining whether these companies reported environmental information before January 1, 2024, and to what extent.

Literature Review

The environment is an immanent part of the world around us. It also plays an important role in the operation and development of businesses. Corporate environmental responsibility has become a key issue in today's world. As companies grow and expand, their impact on the environment becomes more significant. From resource extraction to waste generation, corporate actions can have far-reaching consequences for the planet. In response to growing environmental concerns, many companies are adopting more environmentally responsible business practices. Companies should strive to minimise their direct negative impact on this environment by optimising the social and environmental benefits of modern and environmentally friendly technical and technological solutions. Above all, companies should operate in such a way as to have as little negative impact on the environment as possible. Companies operating in such a way are seen as socially responsible (Majchrzak, 2013).

Disclosure of non-financial information, including environmental information, by large companies has long become an increasingly popular practice. According to a KPMG report (KPMG, 2020), 76% of the G250 companies surveyed have included such disclosures in their financial statements despite the lack of mandatory regulations in this area before 2024, among other things. As Shimshack (2013) points out, disclosures must be very carefully designed ex-ante to take into account the psychological and behavioural realities of users' reactions to information. Disclosures must be evaluated and adjusted ex-post to maximise their effectiveness and social efficiency. Environmental disclosure policies aimed at consumers, activists and public regulators may be more likely to achieve socially desirable results than those aimed at company managers, investors and employees (Shimshack, 2013). The veracity of the information provided is also becoming a key issue, including the possibility of verifying it for, among other things, so-called greenwashing, i.e. dishonest practices used by companies to portray themselves as pursuing sustainability principles by creating a false impression or providing misleading information about a product/service.

At the summit in New York, held on September 25-27, 2015, the document "Transforming Our World: Agenda for Sustainable Development – 2030" was signed. The document contains 17 Sustainable Development Goals and associated 169 actions to be achieved by all parties – national governments, international organisations, non-governmental organisations, the scientific and business sectors, as well as citizens.

They are centred around 5 areas: people, planet, prosperity, peace, and partnership. The plan identifies the most important challenges of our time. The Sustainable Development Goals are a continuation of the Millennium Goals and were decided by representatives of UN member states at the United Nations Conference on Sustainable Development held in Rio de Janeiro in June 2012. Figure 1 shows The 17 Sustainable Development Goals (SDGs).



Figure 1. The 17 Sustainable Development Goals (SDGs)

Source: <https://sdgs.un.org/goals> [30-09-2024].

Additional detailed steps are being taken within EU structures to ensure an even smoother transition to a greener economy. Among the most outstanding undertakings in recent years is the adoption of the European Green Deal program, which aims to achieve climate neutrality by 2050 (Krawczyńska et al., 2024). Many proposed and existing EU policies aim to achieve these goals, even if they are not explicitly formulated in terms of the Sustainable Development Goals (Krasodomska et al., 2023).

The European Green Deal is a development strategy to transform the European Union into a climate-neutral area. It is a response to the climate crisis and strong processes of significant environmental degradation. According to the general principles of the Green Deal, the European Union is to become a climate-neutral, equitable and prosperous area with a modern, resource-efficient and environmentally friendly economy (European Commission, 2023).

Sustainable development has long been at the centre of European Union (EU) policy, anchored in European treaties (EU, 2020). According to a Eurostat report (Eurostat, 2021), over the past few years – based on the average performance of selected indicators – the EU has, on average, made progress on almost all 17 Sustainable Development Goals.

Sustainability reports are becoming a part of the management report, which means increased responsibility of the company's governing bodies for this area of reporting. Sustainability reporting is measuring, disclosing, and being accountable to internal and external stakeholders for organisational performance toward sustainable development (Agama & Zubairu, 2022). Sustainability reporting uses sustainability reporting standards to transparently show how companies have contributed (or intend to contribute) to sustainable development (GRI, 2024).

As Rosati and Faria (2019), voluntary disclosure of sustainability information in accordance with recognised standards, such as GRI, among others, may indicate that companies already have the skills and mindset necessary to include sustainability goals in their reports. On the other hand, it is also worth noting that many companies do not see sustainability policies as an important part of their financial and operational priorities (Sullivan & Kim, 2018).

A source of information on the company's sustainability efforts is the ESG report. The acronym refers to three factors analysed by investors and considered in investment strategies: environmental (E), social (S) and sustainability and corporate governance (G). The report primarily targets key stakeholders such as investors, financial institutions, customers, employees or local communities. ESG reporting obligation applies to:

- for 2024 – large public entities and companies with more than 500 employees and meeting 1 of 2 financial criteria: balance sheet total above €20 million and/or revenues above €40 million,
- for 2025 – all large companies (including private companies) meeting 2 of the 3 criteria: employment of more than 250 employees in a given fiscal year; balance sheet total of more than €25 million and/or annual revenues of more than €50 million,
- for 2026 – small and medium-sized companies (SMEs), with the option to postpone data collection and reporting until 2028 and 2029, respectively, meeting 2 of 3 criteria: average number of employees in the fiscal year of more than 10; balance sheet total of more than €350,000 and/or revenues of more than €700,000.

Applicability to non-EU Companies broadly, the CSRD will apply to non-EU companies (Norman et al., 2023):

- that have securities listed on an EU-regulated market (excluding EU multilateral trading facilities) or,
- that exceed one or both of two revenue thresholds (Turnover Test):
 - annual net turnover in the EU at the consolidated or individual level exceeding €150 million for each of the last two consecutive financial years and/or,
 - a qualifying EU subsidiary or branch that generated annual net turnover in excess of €40 million in the preceding financial year.

Non-EU companies caught by the first test must report starting in 2025, 2026 or 2027, depending on their size. Non-EU companies that satisfy the Turnover Test must report starting in 2029.

ESG environmental reporting enables public companies to disclose their environmental impacts, thereby promoting transparency and accountability in environmental practices (Darnall et al., 2022). Studies in the EU and the US have shown that ESG disclosure has a positive impact on financial performance. ESG performance increases company value (Khan, 2022).

ESG regulations can contribute to better energy management and reduce fuel and electricity consumption. For many industries, among ESG indicators, the area of environmental reporting appears to be important. In this area, the most relevant is the entity’s impact on the environment and the potential challenges that environmental issues may pose to the company. The scope of reporting in this area mainly concerns greenhouse gas emissions, greenhouse gas intensity, energy consumption and sources, and environmental policies. Climate change reporting is suggested as a mechanism to mitigate the impact of companies on climate change, particularly carbon emissions (Baboukardos et al., 2024). Figure 2 shows the evolution of ESG reporting in Poland.



Figure 2. Evolution of ESG reporting in Poland 2009-2023

Source: authors' work based on GRW (2023).

An economic field of key importance to the national economy is energy. This sector is particularly important due to its functions, as well as its impact on the environment, which is one of the elements of corporate social responsibility. Due to their special and important role in the country’s economy and strategic importance, companies in the energy sector must focus not only on building their value but also on increasing it. As such, their overriding goal is to generate value for all stakeholder groups. And the provision of environmental information in ESG reporting undoubtedly plays a key role in this regard. Energy companies implementing the concept of social responsibility towards the environment should strive to, among other things, (a) optimise the social and environmental benefits of modern and environmentally friendly technical and technological solutions and (b) minimise their direct negative impact on the environment. In the case of energy companies, this is particularly important due to the fact that this sector has been recognised as one of the main contributors to pollution and loss of natural resources (Majchrzak, 2013). In the case of companies in the energy sector, the environment provides these companies with energy resources but at the same time accepts the by-products of energy production in return.

In a review of the literature, Braga et al. (2015) point out that there has been an increase in environmental disclosure in Brazil's electricity sector, in line with trends set in other parts of the world. Constantinescu's research indicates that disclosure levels were also high among the 61 largest European companies in the energy sector (Constantinescu, 2021). A study conducted by Czaja-Cieszyńska and Kordela for 2017-2021 on WIG-Energy companies in the energy sector showed that the companies showed an increase in environmental disclosures (Czaja-Cieszyńska & Kordela, 2023). Very interesting research results were presented by Sandberg and Holmlund on sustainability reports published by companies in the automotive and energy industries. The results indicate that the companies studied presented their operations in an overly favourable light, using a specific writing style that was subjective. Above all, the issues presented in the reports were described in such a way as to emphasise the positive aspects of operations "through the use of positively charged vocabulary," the use of vocabulary with unclear meaning, or the use of "words that at first appear to have a clear meaning, but which, upon closer inspection, do not give the reader a clear understanding of the company's activities" (Sandberg & Holmlund, 2015). Qureshi et al. (2019) also point out that after their evaluation of both shareholder and stakeholder theories, it can be concluded that the latter argues in favour of including sustainability efforts in the scope of corporate focus.

The Polish power industry, primarily due to historical conditions and access to domestic fuels, is based mainly on units powered by hard coal and, to a lesser extent, lignite. More than 70% of the installed capacity in the National Electric Power System dates back 30 years. Their technology is much less efficient than the current state-of-the-art allows; moreover, they require relatively frequent and capital-intensive overhauls. In this state and with the growing demand for electricity, multi-billion dollar investments in new generation sources are needed. The transformation of the energy system must ensure energy security and economic efficiency for decades to come, which is why it is based on low- and zero-carbon sources. The main electricity generators in Poland are subsidiaries of state-owned companies: PGE Polska Grupa Energetyczna SA, ENEA SA and TAURON Polska Energia SA. They have more than 30 GW of installed capacity in the National Power System, accounting for 62% of the total capacity in the system. At the same time, these are the power groups most heavily burdened by the carbon footprint associated with the production of energy in units powered by traditional fuel. The current structure of generation assets limits the investment potential of these companies in the segment of low- and zero-carbon sources and slows the pace of the country's energy transition (Ministerstwo Aktywów Państwowych, 2023).

Poland's energy sector requires PLN 1.3-1.7 trillion in investments by 2030. This is an effort comparable to the reconstruction of Poland after World War II (PAP, 2022). Figure 3 shows the carbon intensity of electricity generation in Poland and selected countries of the world from 1990 to 2023. As the data shows, the carbon intensity in Poland, while declining, nevertheless remains very high.

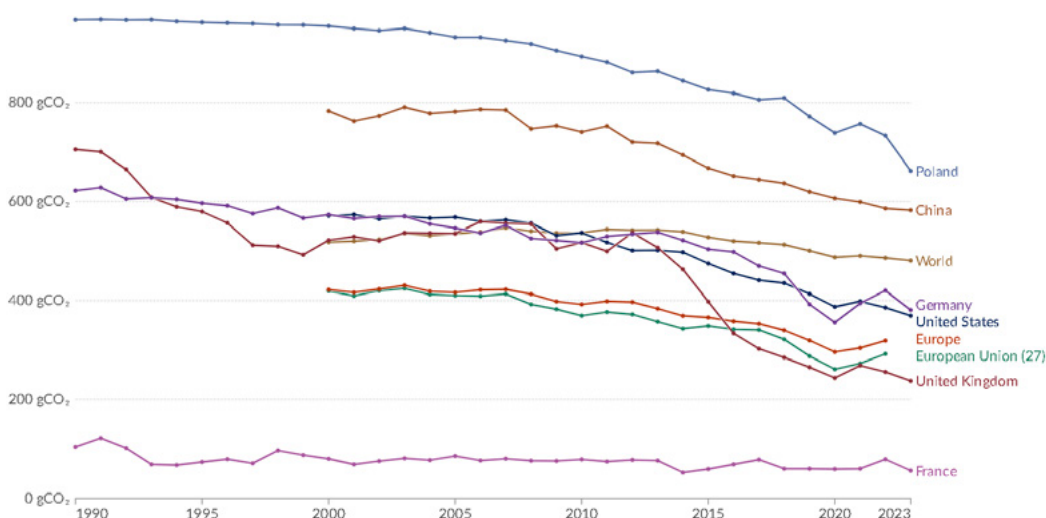


Figure 3. Carbon intensity of electricity generation, 1990-2023, in Poland and selected countries of the world

Source: authors' work based on Our World in Data (2024).

Figure 4 shows the level of greenhouse gas emissions in Poland against the background of the European Union and significant countries, i.e. Germany, France, Greece and Italy, from 1990 to 2023.

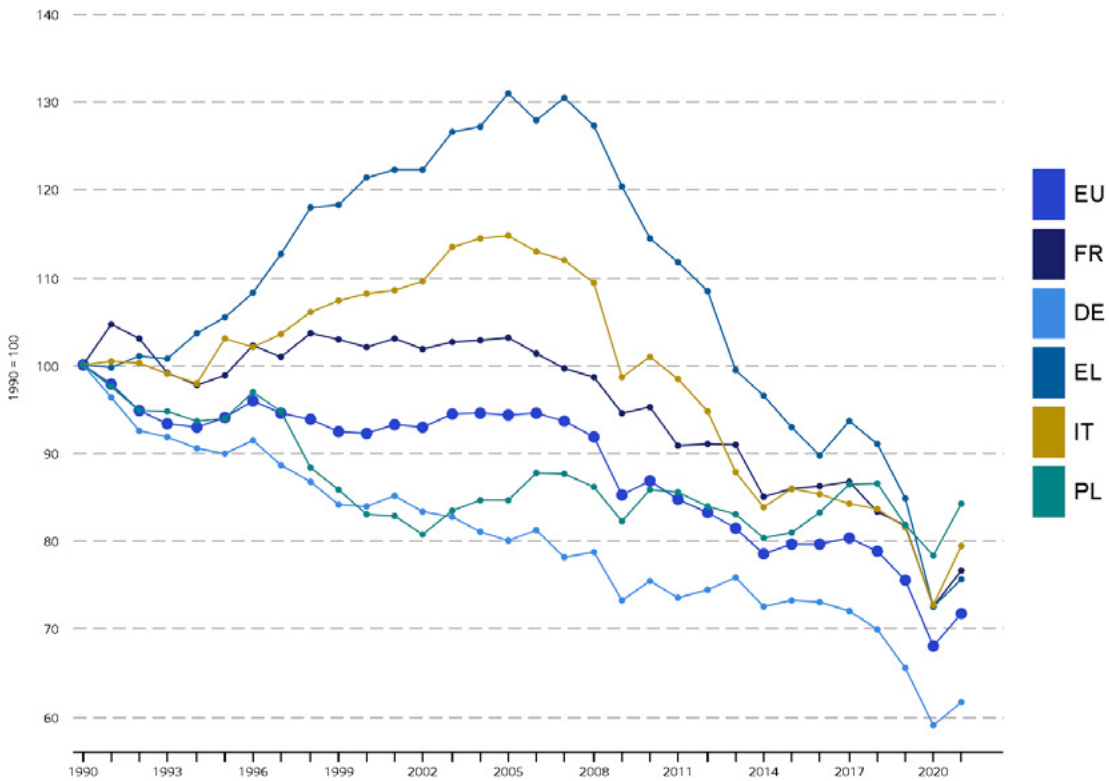


Figure 4. Greenhouse gas emissions, 1990-2023, in Poland and selected countries of the EU
Source: authors' work based on Eurostat (2024).

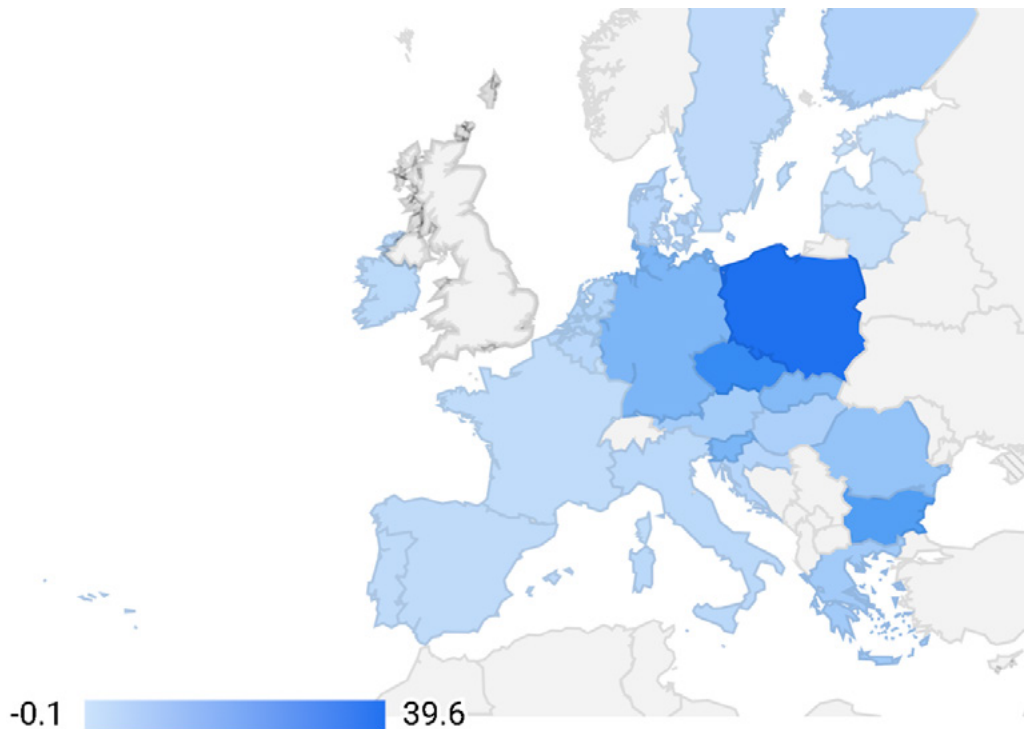


Figure 5. Energy mix in Poland based on fossil fuels and EU countries
Source: authors' work based on Forsal (2022).

Also very key in the analyses is the so-called energy mix (Marks-Bielska et al., 2020), i.e. the structure of energy production and consumption according to the criterion of energy carriers (e.g., electricity or diesel) or modes of generation. The energy mix is one of the indicators useful in studying energy security. Figure 5 shows the energy mix of the Polish economy in terms of the use of fossil fuels in comparison with the countries of the European Union.

Responsible management of non-financial risks is becoming an indispensable part of business strategy, including in the energy sector. The energy sector faces a crucial choice: develop existing technologies incrementally or make revolutionary changes that would respond to growing social, regulatory and climate pressures? The scale of energy companies' operations makes it necessary for them to take a multidimensional approach to sustainability. Today's energy sector companies cannot afford to ignore ESG. The biggest challenge of implementing the European Green Deal in Poland will be the transformation of the energy system. A system that nowhere in Europe, and almost nowhere in the world, is so dependent on coal.

ESG reporting environmental indicators

As already mentioned, climate change is one of the greatest challenges of the current times, creating both significant risks and opportunities for both companies and investors. Regulatory changes are therefore contributing in practice to the market's growing demand for information and indicators to assess how companies are managing climate-related issues. Among other things, investors want to know whether companies (GPW, 2023):

- it may be threatened by tightening regulations and prices for CO₂ emissions trading, for example, as a result of regulatory penalties or asset impairment,
- include physical climate risk as part of processes to ensure business continuity and increase the company's resilience to external risks,
- taking advantage of opportunities related to climate change, such as investing in innovative technologies or developing new products and services.

Companies currently disclosing ESG information and related issues use a variety of standards and reporting frameworks, which typically include both qualitative and quantitative information. Current qualitative information focuses on sustainability, core values, net-zero emissions targets, and commitments to show how these factors generate value for both shareholders and stakeholders. Ongoing quantitative disclosures include metrics used for reporting and measurement, progress toward targets set in qualitative information, safety data, energy used in production, water management data, and air quality and greenhouse gas and energy data, covering Scope 1, 2 and 3 greenhouse gas emissions. Further quantitative disclosures include energy use and other environmental data, such as water use, waste management and social performance data.

Table 1 shows the environmental indicators of ESG reporting in terms of their compliance with EU regulations and other reporting frameworks. The following list of indicators includes environmental indicators proposed by the Warsaw Stock Exchange in its publication "ESG Reporting Guidelines. A Guide for Companies" (GPW, 2023), which can be used by companies listed on the Warsaw Stock Exchange, including energy companies of interest to the empirical chapter on environmental reporting, when initiating communication on ESG issues with the business community. The recommended indicators were prepared based on relevant regulations such as CSRD and ESRS, as well as Good Practices of Companies Listed on the Warsaw Stock Exchange (GPW, 2021). In addition, to meet the growing data needs of investors, they have also been aligned with the mandatory PAI indicators for investments in companies required under the SFDR. It should be emphasised that the Guidelines do not contain an exhaustive list of indicators and topics. Rather, their purpose is to provide companies with a core set of selected indicators to help them prepare for the upcoming CSRD and ESRS requirements and to better meet investors' ESG data needs. Companies subject to the CSRD should use the ESRS to prepare their disclosures on important sustainability topics.

Table 1. Relevant environmental indicators of ESG reporting

Indicator	Type of indicator (expressed in units of measurement or descriptive)	Alignment with EU regulations		Alignment with other reporting framework
		European Sustainability Reporting Standards	Sustainable Finance Disclosure Regulation	Global Reporting Initiative
Environmental indicators directly linked to climate change:				
E-P1 Managing climate change issues	Descriptive	YES	NO	YES
E-P2 Greenhouse gas emissions	Tons of CO ₂ eq.	YES	YES	YES
E-P3 Intensity of greenhouse gas emissions greenhouse gases	CO ₂ eq. tons / revenue	YES	YES	YES
E-P4 Energy consumption and its sources	MWh	YES	YES	YES
Environmental indicators on environmental issues other than climate change:				
E-P5 Environmental policy	Policy description	YES	NO	YES
E-D1 Water consumption	m ³	YES	NO	YES
E-D2 Water resources management	Descriptive	YES	NO	YES
E-D3 Impact on biodiversity	Descriptive	YES	YES	YES
E-D5 Waste management	Descriptive	YES	-	YES

Source: authors' work based on GPW. (2023). *Wytyczne do raportowania ESG. Przewodnik dla spółek.*

Table 2 presents the Environmental Indicators related to climate change in terms of ESG reporting and synthesizes the definition of each indicator and the minima of information disclosure.

Table 2. Synthesizes the key disclosures for the indicators presented

Environmental indicators directly linked to climate change:		
Indicator	Definition	The minimum disclosure applies to:
E-P1 Managing climate change issues	In preparing climate-related disclosures, companies should make use of materials such as TCFD recommendations, ESRS standard E1 Climate Change and/or IFRS S2	<ul style="list-style-type: none"> Climate-related disclosures that provide detailed explanations for aspects such as governance, strategy, risk management, and targets and indicators.
E-P2 Greenhouse gas emissions	Greenhouse gas emissions represent the total sum of direct and indirect greenhouse gas emissions. They can be divided into Scope 1, Scope 2 and Scope 3 emissions.	<ul style="list-style-type: none"> Methods and assumptions used in calculating emissions. Scope 1, 2, and 3 emissions (if relevant) for the last 3 years to allow evaluation of the trend over time. A relevant explanation if there has been a significant change in the value of the issue (both increase and decrease). It is recommended that companies use international standards for calculating and disclosing greenhouse gas emissions, such as the GHG Protocol or the ISO 14064-1:2018 standard.
E-P3 Intensity of greenhouse gas emissions greenhouse gases	Greenhouse gas intensity is the amount of greenhouse gas emissions per unit of economic activity.	<ul style="list-style-type: none"> Methods and assumptions used in the calculations. The ratio of greenhouse gas emissions intensity to revenue.
E-P4 Energy consumption and its sources	Energy consumption is the total amount of energy used in an organization. It includes both energy purchased from suppliers and generated internally.	<ul style="list-style-type: none"> Methods and assumptions used in calculating energy consumption. Total energy consumption in the organization (in MWh). Percentage (%) of energy consumed by energy type (i.e., renewable and non-renewable sources, energy).

Environmental indicators directly linked to climate change:		
Indicator	Definition	The minimum disclosure applies to:
E-P5 Environmental policy	An environmental policy is a formal document that sets out a company's commitments and approach to managing environmental aspects	<ul style="list-style-type: none"> • Has the company adopted an environmental policy. • Compliance with relevant environmental laws and regulations. • Commitment to manage and mitigate adverse environmental impacts. • Implementation of a management system for environmental issues. • Monitoring of results. • The company's expectations of suppliers and business partners in managing environmental issues.
E-D1 Water consumption	Water consumption means the total amount (in m ³) of water used in the enterprise.	<ul style="list-style-type: none"> • The total amount of water used in the enterprise (in m³). • Percentage of water recycled and reused in relation to total water withdrawal.
E-D2 Water resources management	Water stewardship refers to the process a company has implemented to optimize water consumption and thereby minimize its environmental impact. It includes measures to reduce water consumption, increase water circulation (through reuse and recycling) and conserve water resources.	<ul style="list-style-type: none"> • Whether the company has adopted and implemented a water management program and what activities comprise it. • Companies operating in water-scarce areas should also disclose how they are identifying and mitigating the associated risks.
E-D3 Impact on biodiversity	Biodiversity, according to the United Nations Convention on Biological Diversity, is defined as "a term for the diversity of life forms on Earth in their natural shape and form." It includes species, genetic and ecosystem diversity.	<ul style="list-style-type: none"> • Does the company's operations negatively impact biodiversity (directly or indirectly through the supply chain) and what are the main reasons for this. • Has the company implemented a policy to protect and restore biodiversity and counter deforestation, and does it extend to suppliers.
E-D5 Waste management	Waste management refers to a range of activities to monitor, manage and reduce waste (including reuse or recycling) generated within a company.	<ul style="list-style-type: none"> • Amount of hazardous waste and other waste produced (in tons). • Percentage of waste (%) by disposal method (e.g., recycled, landfilled). • A description of the measures taken to manage waste and comply with relevant regulations.

Source: authors' work based on GPW. (2023). *Wytyczne do raportowania ESG. Przewodnik dla spółek*.

Environmental indicators are measures of an organization's impact on animate and inanimate natural systems mainly in quantitative terms, such as electricity or heat consumed in joules, watt-hours, the volume of water withdrawn from various sources in cubic meters, or the gross volume of direct greenhouse gas emissions in metric tons equivalent. These indicators are a proposition for organisations to measure their activities and their impact on the environment (Piłacik, 2017).

Due to the volume of CO₂ emissions, it is the largest contributor to global warming. According to the GHG Protocol methodology, we can distinguish the following gases that create the greenhouse effect (Załęgowski et al., 2013): Carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O), Sulfur hexafluoride (SF₆), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCS). Therefore, we can define carbon footprint as the total sum of greenhouse gas emissions caused directly or indirectly by a person, organisation, event or product. The carbon footprint is measured by a ton of carbon dioxide equivalent – tCO₂e. This indicator allows comparison of emissions of different greenhouse gases using the same measure, i.e. including carbon dioxide content (Popławski & Rutkowska, 2017).

Environmental indicators undoubtedly provide very important and crucial information about a company's impact on the environment.

Research and results

As part of the empirical chapter, the authors analysed 14 companies listed on the Warsaw Stock Exchange to determine whether they externally disclosed ESG information between 2022 and 2023. In the case of PGE SA and TAURON SA, analysis of reports and information on websites gives grounds to conclude that these companies have a sustainability strategy in place (PGE, 2022). In their reports, companies strongly emphasise raising employees' awareness of their environmental impact. Among

the main actions taken by companies to reduce GHG emissions are the development of a climate policy, expansion of the catalogue of environmental indicators, development of the Scope 3 approach to GHG emissions, building a green offering to attract customers, development of local communities, and strengthening the transparency of ESG policies. In view of the research cited, the authors also want to check the extent of disclosure in energy companies from Poland.

Table 3 presents basic financial data describing the economic and financial potential of these entities, which is important because of the environmental impact of these entities, among other business activities, and the market position in the Polish market of these entities.

Table 3. Important financial data characterising the analysed companies for 2022-2023

Company	Year's	Sales revenues (in thousands of PLN)	EBITDA (in thousands of PLN)	Balance sheet total (in thousands of PLN)
Polska Grupa Energetyczna SA	2022	73 435 000	8 661 000	105 778 000
	2023	95 964 000	10 024 000	113 443 000
Tauron Polska Energia SA	2022	36 311 000	3 157 000	45 320 000
	2023	42 657 000	6 107 000	49 798 000
ENEA SA	2022	30 076 258	2 163 231	37 434 972
	2023	44 020 952	2 607 599	39 110 745
Polenergia SA	2022	7 089 231	354 024	6 247 334
	2023	5 615 412	543 311	6 711 616
CEZ SA	2022	47 779 010	23 560 470	188 254 600
	2023	57 185 280	20 995 510	140 380 050
Zespół Elektrociepłowni Wrocławskich KOGENERACJA SA	2022	1 812 201	363 762	3 530 838
	2023	3 164 375	519 665	4 720 543
Zespół Elektrowni "Pątnów-Adamów-Konin" SA	2022	2 740 990	323 846	4 539 455
	2023	3 105 807	697 990	3 589 708
Columbus Energy SA	2022	603 433	(53 137)	782 976
	2023	459 324	(15 364)	644 580
Onde SA	2022	1 092 852	28 100	618 019
	2023	1 083 819	61 890	661 491
ML System SA	2022	281 664	36 505	431 190
	2023	193 265	25 678	578 676
Photon Energy SA	2022	380 544	103 736	1 014 776
	2023	282 596	23 392	1 109 696
Novavis Group SA	2022	9 448	4 698	18 404
	2023	10 580	6 506	31 145
EC Będzin SA	2022	322 081	(188 395)	214 625
	2023	244 114	(186 222)	199 809
Raen SA	2022	3 441	1 096	3 433
	2023	22 457	5 262	15 638

Source: authors' work based on Polska Grupa Energetyczna SA. (2023), Tauron SA. (2023), Enea SA. (2023b), Polenergia (2023b), CEZ (2023), Kogeneracja (2023), ZE PAK SA. (2023), Columbus Energy SA. (2023b), ONDE (2023a), ML System SA. (2023b), Photon Energy Group (2023b), Novavis (2023b), EC Będzin SA. (2023b) and Raen (2023).

Table 4 presents, in summary, the results of the authors' research on the reporting by the companies in the research sample of the value of environmental indicators directly related to climate change (E-P1 – E-P4).

Table 4. Values of environmental indicators directly related to climate change reported by companies in the survey sample

Company	Year's	E-P1 Managing climate change issues	E-P2 Greenhouse gas emissions CO2 eq. tons / revenue	E-P3 Intensity of greenhouse gas emissions greenhouse gases	E-P4 Energy consumption and its sources MWh
Polska Grupa Energetyczna SA	2022	YES	70 010 418	0.95	298 775 987
	2023	YES	56 950 618	0.59	372 140 346
Tauron Polska Energia SA	2022	YES	32 434 000	0.89	136 292 099
	2023	YES	18 516 000	0.43	106 473 431
ENEA SA	2022	YES	42 649 027	1.42	2 819 327
	2023	YES	45 243 781	1.03	2 483 147
Polenergia SA	2022	YES	69 493	0.01	-
	2023	YES	98 894	0.02	-
CEZ SA	2022	YES	-	-	-
	2023	YES	-	-	-
Zespół Elektrociepłowni Wrocławskich KOGENERACJA SA	2022	YES	-	-	-
	2023	YES	-	-	-
Zespół Elektrowni "Pątnów-Adamów-Konin" SA	2022	YES	-	-	-
	2023	YES	-	-	-
Columbus Energy SA	2022	YES	-	-	-
	2023	YES	22 797	0.01	209
ONDE SA	2022	YES	5 762	0.01	871
	2023	YES	10 463	0.01	1 425
ML System SA	2022	YES	-	-	-
	2023	YES	-	-	-
Photon Energy SA	2022	YES	409	0.01	469
	2023	YES	670	0.01	495
Novavis Group SA	2022	YES	-	-	-
	2023	YES	-	-	-
EC Będzin SA	2022	YES	-	-	-
	2023	YES	-	-	-
Raen SA	2022	YES	-	-	-
	2023	YES	-	-	-

Source: authors' work based on Polska Grupa Energetyczna SA. (2023), Tauron SA. (2023), Enea SA. (2023b), Polenergia (2023b), CEZ (2023), Kogeneracja (2023), ZE PAK SA. (2023), Columbus Energy SA. (2023b), ONDE (2023a), ML System SA. (2023b), Photon Energy Group (2023b), Novavis (2023b), EC Będzin SA. (2023b) and Raen (2023).

In terms of disclosures regarding the management of climate change issues (E-P1), each company indicated that it takes such measures internally. In the available reports of the analysed companies, one can see statements from the boards of directors that the managers are aware of the climate

impact on the companies' operations, as well as the impact of the threats of climate change itself on the companies' operations. The managers emphasise that they have a good understanding of stakeholder expectations regarding the reporting of the environmental impact of the company's operations. Managers thus consider climate risk management a key element of strategic management. The companies analysed indicate that climate-related risks are analysed both in terms of the impact of climate change on business and the impact of business on climate change. For example, the management of the PGE SA Group indicates that it has intensified efforts to meet regulatory requirements, both domestic and European. This primarily relates to the EU Taxonomy, preparation for the Corporate Sustainability Reporting Directive (CSRD), as well as the expectations of financial institutions, investors and customers. It should be noted that the key information confirming this fact is information (hard data) on whether the company has environmental goals it has set as part of its adopted business strategy, as well as whether it has a sustainable development strategy in place and whether responsibilities for the implementation of sustainable development goals, including climate goals, have been assigned to the management. Only in the case of a few companies, including PGE SA, Tauron SA, and ENEA SA, can we speak of the existence of such a situation (which is confirmed by non-financial data), while in the case of the remaining companies, the available reports do not allow an unambiguous answer as to whether these companies actually implement the described activities in a real way.

Regarding disclosures of greenhouse gas emissions (E-P2), only 6 companies have made full disclosures for 2022-2023. Companies in the energy sector (Enea SA, PGE SA, Tauron SA) have shown stable emissions in Scope 1 and 2, and a significant increase in Scope 3 (more than 40%). The main CO₂ reduction measures taken at these companies, according to the reported data (which can be found in the reports), are: reducing energy consumption, reducing water consumption, sustainable energy consumption, waste management and new energy-saving investments. The reports provide information that companies have actively and consciously taken steps to implement the carbon footprint calculation standard. However, only in the case of large companies such as PGE and Tauron, among others, both internal steps have been taken within the framework of the established carbon footprint counting team, as well as external steps – in cooperation with the Polish Association of Combined Heat and Power Plants (PTEZ), which resulted in the development of a joint guide for calculating the carbon footprint for the power industry. The guide was developed in accordance with ISO 14064 and GHG Protocol standards and is designed to calculate the carbon footprint at different levels of the organization.

As for greenhouse gas emissions intensity (E-P3), also only 6 companies disclosed full data for 2022-2023. There is a noticeable decrease in carbon intensity. In non-financial reports, the companies that have disclosed data indicate that this is due to, among other things, the commissioning of more RES installations and the replacement of coal with a less carbon-intensive fossil fuel – natural gas in the power industry. The companies also indicate that they will increase the share of RES capacity in the generation mix, which will allow them to decarbonize in the future. It may be worrying that the remaining companies lack emissions data in this regard, bearing in mind that they were not required to do so during the period for which the analysis was conducted.

As for the disclosure of information on energy consumption (E-P4), only 5 companies disclosed full information during the period analysed. For those companies that did disclose information, there was a decrease in energy consumption during the period under analysis. This should be regarded as a positive aspect of, among other things, the strategies implemented in these companies to reduce energy consumption. In the case of the remaining companies, although in their ESG reports, these companies indicate that they are trying to reduce energy intensity, there is no hard figures in their reports to confirm this fact.

Table 5 shows, in summary, the authors' findings on the reporting of environmental information on other environmental issues by the companies in the research sample (E-P5, E-D1, E-D2, E-D3, E-D5).

Table 5. Values of environmental indicators regarding other environmental issues

Company	Year's	E-P5 Environmental policy	E-D1 Water consumption	E-D2 Water resources management	E-D3 Impact on biodiversity	E-D5 Waste management
Polska Grupa Energetyczna SA	2022		804 740			
	2023		738 839			
Tauron Polska Energia SA	2022		69 745 441			
	2023		35 619 935			
Enea SA	2022		2 942 127			
	2023		2 490 594			
Polenergia SA	2022		-			
	2023		-			
CEZ SA	2022		-			
	2023		-			
Zespół Elektrociepłowni Wrocławskich KOGENERACJA SA	2022		-			
	2023		-			
Zespół Elektrowni "Pątnów-Adamów-Konin" SA	2022		-			
	2023		-			
Columbus Energy SA	2022					
	2023		2 197			
ONDE SA	2022		-			
	2023		-			
ML System SA	2022		-			
	2023		-			
Photon Energy	2022		-			
	2023		-			
Novavis Group SA	2022		-			
	2023		-			
EC Będzin SA	2022		-			
	2023		-			
Raen SA	2022		-			
	2023		-			

Source: authors' work based on Polska Grupa Energetyczna SA. (2023), Tauron SA. (2023), Enea SA. (2023b), Polenergia (2023b), CEZ (2023), Kogeneracja (2023), ZE PAK SA. (2023), Columbus Energy SA. (2023b), ONDE (2023a), ML System SA. (2023b), Photon Energy Group (2023b), Novavis (2023b), EC Będzin SA. (2023b) and Raen (2023).

With regard to the disclosure of environmental policy management (E-P5), each company indicated that it has implemented such a policy. The companies indicate that it is implemented by, among other things: (a) responsibly fulfilling requirements related to environmental aspects, including both those prescribed by law and those resulting from the nature of the investment in question, (b) planning development on the basis of modern and environmentally friendly technologies that meet the criterion of best available techniques, (c) minimising negative environmental impact through appropriate management in the areas of water and wastewater management and air emissions, reducing the amount of waste generated and using it as efficiently as possible, (d) raising the qualifications,

awareness and involvement of employees in environmental protection. It should be noted that this is a descriptive criterion, and thus, it should be stated that the results of the implemented strategies, from this scope, will begin to bring tangible benefits only over a period longer than the scope of the reports analysed. Thus, the actual, measurable benefits should become apparent in the future. It seems that this information is important, but nevertheless it is difficult to verify it at present.

Regarding water consumption disclosures (E-D1), only 4 companies reported estimated water consumption. This is realized by closing water circuits and diverting relatively good water to other production processes with lower reuse requirements. Within the remaining companies, despite the fact that their ESG reports indicate that they are guided by the principle of conservation and that they monitor and optimise the consumption of water used for technological purposes on an ongoing basis, in the absence of figures, it is difficult to say conclusively whether the measures described have actually been transformed into lower consumption of water resources.

Regarding disclosures on water management (E-D2), each company indicated that it was taking action in this area. For most companies, the description was very general rather than detailed, and there were no figures or indications of specific activities. Only a few companies in the sample analysed (e.g., Tauron SA) described this issue in a comprehensive manner. For example, TAURON Group's management indicates that, guided by the principle of resource efficiency, it monitors and optimises the consumption of water used for technological purposes on an ongoing basis. This is realized by closing water circuits and returning water with relatively good parameters to other production processes with lower requirements for reuse.

In terms of impact on biodiversity (E-D3), every company indicated that it is taking action in this regard. Most of the companies in the research sample indicate in their ESG reports that they are actively working to preserve and develop biodiversity. Companies indicate that they care about forests, animals and vegetation, taking specific actions to protect these resources. They implement a number of partnerships and their own projects to monitor, protect and develop ecosystems. Companies co-sponsor and collaborate with conservation and ecological partners. This partnership is a kind of voucher for the implementation of contracted activities.

Regarding waste management (E-D5), every company indicated that they take measures in this area. Large energy companies (PGE SA, TAURON SA, among others) indicate that the production of electricity and heat at power plants and combined heat and power plants produces waste, which the companies try to reuse and manage. The dominant direction of the management of substances generated in the process of fuel combustion is the storage of combustion waste in landfills. The management of PGE SA points out that the minerals accompanying lignite deposits play an important role in the sustainable supply chain of raw materials and materials. All waste generated that is not managed on the companies' premises is transferred to external companies that have the appropriate permits and authorisations in this regard.

Conclusions

Reporting environmental information is of great importance to company stakeholders today. Indeed, corporate environmental responsibility has become a key issue in today's world. With the growth and expansion of companies, their impact on the environment is becoming more and more significant. Above all, companies should operate in such a way as to have the least negative impact on the environment. In response to growing environmental concerns, many companies are adopting more environmentally responsible business practices. Given current European Union policy, companies' provision of comprehensive and factual information on their environmental impact enables them to access EU funding tools.

The study conducted by the authors had a practical aspect on the reporting of environmental information by companies in the energy sector listed on the Warsaw Stock Exchange. The survey was conducted for the years 2022-2023 in terms of whether energy companies, despite the absence of mandatory regulations during the period of analysis, nevertheless reported such data and whether the extent of disclosure was satisfactory or not. All analysed companies created ESG reports during the analysis period. These reports focused on finding selected information in the field of environmental indicators. The companies in the research sample produced ESG reports, and these reports dis-

closed information in the field of environmental indicators proposed by the Warsaw Stock Exchange for companies listed on the Warsaw Stock Exchange.

It should be stated that the results of the research conducted in the empirical chapter allow us to conclude that the companies in the analysed research sample, despite the lack of mandatory requirements for reporting ESG environmental information and indicators in 2022-2023, in the vast majority presented such data in their non-financial reports, which should be considered a positive aspect. Nevertheless, it should be noted that only in the case of three companies, PGE SA, TAURON SA and ENEA SA, can we speak of a very high level of detail in the disclosed data. In the opinion of the authors, this may be indicative of the high awareness of the management boards of these companies regarding the information needs of external stakeholders on the impact of these companies on the environment, as well as measures taken by them to reduce the negative impact of their operations on the environment. The scope of information and descriptive detail in these three companies was at a very high level. The scope of disclosures of these three companies supports the results of the research presented in the review of domestic and foreign literature and confirms the high information scope of the ESG reports prepared for 2022-2023.

For the remaining companies, the scope of disclosure, in the authors' opinion, was at a satisfactory level. Often in the reports of these companies, despite indicating that the companies were, for example, reducing energy consumption, water consumption or greenhouse gas emissions, there was a lack of hard figures to confirm these actions. Whether a company can be said to have a stewardship approach depends on hard facts – often having environmental goals in the adopted business strategy, developing a sustainability strategy, assigning sustainability responsibility to the board, or holding management accountable.

In the research sample analysed, full information coverage occurred in the case of 3 companies (PGE SA, Tauron SA, ENEA SA). In the case of the remaining 11 companies (Polenergia SA, CEZ SA, Kogeneracja SA, PAK SA, Columbus SA, ONDE SA, ML System SA, Photon Energy SA, Novavis SA, EC Będzin SA, Rean SA), information coverage occurred, but with varying degrees of detail, with a preponderance of general information.

The results of the analysis can be used by the Reader to synthesize the scope of disclosures in terms of the companies' reporting of environmental information to the environment, during the period when such disclosures were not mandatory. The results presented can be used to compare in terms of the detail of these disclosures by companies from Poland with companies in the energy sector from other countries.

The contribution of the authors

Conception, B.W. and J.P.; literature review, B.W., J.P., S.B. and K.B.; acquisition of data, B.W., J.P., S.B. and K.B.; analysis and interpretation of data, B.W., J.P., S.B. and K.B.

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Bogusław WACŁAWIK • Joanna POPŁAWSKA, Stanisław BIELSKI, Karolina BABUCHOWSKA

RAPORTOWANIE INFORMACJI ŚRODOWISKOWYCH PRZEZ POLSKIE SPÓŁKI GIEŁDOWE NA PRZYKŁADZIE SPÓŁEK SEKTORA ENERGETYCZNEGO NOTOWANYCH NA GIEŁDZIE PAPIERÓW WARTOŚCIOWYCH W WARSZAWIE ZA LATA 2022-2023

STRESZCZENIE: Celem artykułu jest omówienie raportowania informacji środowiskowych dotyczących zrównoważonego rozwoju i regulacji ESG w spółkach z sektora energetycznego notowanych na Giełdzie Papierów Wartościowych w Warszawie. W artykule przedstawiono wyniki badań własnych dotyczących zakresu ujawniania informacji środowiskowych wśród 14 spółek z sektora energetycznego notowanych na Giełdzie Papierów Wartościowych w Warszawie w latach 2022-2023. Metodologia została oparta na przeglądzie literatury przedmiotu, aktów prawnych oraz badaniach własnych, w których wykorzystano raporty niefinansowe spółek giełdowych sektora energetycznego dotyczące informacji i wskaźników środowiskowych. Problemem badawczym podjętym przez autorów było zbadanie, czy spółki sektora energetycznego ujawniały informacje środowiskowe w okresie przed obowiązkowymi regulacjami w tym zakresie. Wyniki przeprowadzonych badań potwierdziły przypuszczenia autorów, że spółki te publikowały takie informacje. Przy czym zakres ujawnianych informacji dość istotnie różnił się pomiędzy spółkami. Zdaniem autorów artykuł wnosi wartość dodaną do literatury przedmiotu, szczególnie w zakresie zebrania materiału źródłowego, jego prezentacji i omówienia. Informacje zebrane w rozdziale empirycznym mogą posłużyć m.in. do porównania zakresu ujawnień informacji środowiskowych spółek z Polski ze spółkami z innych krajów z sektora energetycznego. Tematyka artykułu może stanowić podstawę do dalszych szczegółowych badań empirycznych w tym obszarze.

SŁOWA KLUCZOWE: ESG, raportowanie informacji środowiskowych, ślad węglowy, transformacja energetyczna