

Barbara **KRYK** • Małgorzata **KOŻUCH**

EU REGULATIONS ON REPORTING SUSTAINABLE DEVELOPMENT AS A DETERMINANT OF LIMITING THE ENVIRONMENTAL PRESSURE OF CHEMICAL ENTERPRISES IN POLAND

Barbara **Kryk** (ORCID: 0000-0003-1269-3142) – *University of Szczecin*

Małgorzata **Kożuch** (ORCID: 0000-0002-6867-7996) – *Krakow University of Economics*

Correspondence address:

Mickiewicza Street 64, 71-101 Szczecin, Poland

e-mail: barbara.kryk@usz.edu.pl

ABSTRACT: The period of validity of Directive 2014/95/EU, which imposed on enterprises the obligation to present non-financial information in separate non-financial reports, the so-called ESG was aimed to check its effects, complementary regulations and actual actions in the environmental area. Numerous works have analysed various aspects of non-financial reporting in the context of the directive, including several on ESG reporting in relation to air pollution emissions. However, it has not been examined yet whether there is a relationship between the level of reporting and the effects of pro-environmental activities in the context of the impact of regulations on it. A research gap in this area was identified, and therefore, the aim of the paper is to examine how selected chemical companies in Poland adapt to the EU guidelines on ESG reporting in the environmental dimension and whether it has an impact on reducing their pressure on the environment. The research period is 2010-2022, and the three-stage study used a quantitative-qualitative methodological approach. In the first and third stages, descriptive statistics and time series analysis methods were used. The second one includes methods such as content analysis, case analysis, GES Risk Rating, and expert analysis. The research carried out made it possible to conclude on the impact of non-financial reporting regulations on the environmental pressure.

KEYWORDS: ESG reporting, Directive 2014/95/EU, chemical sector, pro-environmental activities, environmental effects

Introduction

Large enterprises in Poland, in accordance with the EU regulations, are obliged to provide non-financial information, including environmental information, in separate non-financial reports. They may take the form of reports: management reports, integrated reports, CSR (Corporate Social Responsibility), environmental reports, sustainable development reports (this name is hereby to be preferred) or corporate governance reports (the so-called ESG – Environment, Social, Government – this name is used hereinafter). The obligation of non-financial reporting was imposed by the EU by Directive 2014/95 (Directive, 2014), the main purpose of which was to increase the transparency, consistency and comparability of disclosed social and environmental information in the area of CSR (Caputo et al., 2019; Cuomo et al., 2022; Breijer & Orij, 2022; Bayne, 2022). According to among others, with the concept of CSR and sustainable development (Aguado et al., 2023; Agostini et al., 2022; Zarzycka & Krasodomska, 2021), only transparent, pro-social, pro-ecological and ethical entities will have a chance to gain an advantage in the international arena. Providing information about the natural environment, pro-ecological activities, and enterprise management is particularly important. Environmental information contained in financial statements is unfortunately insufficient in conditions of increased demand for it, which is why an increasing span of attention is paid to the possibilities offered by reporting non-financial information in this regard (Kryk, 2017; Kryk, 2021). Directive 2014/95/EU has undoubtedly fulfilled its function in terms of its dissemination (Friede et al., 2015; Stolowy & Paugam, 2018; Dinh et al., 2023). However, over time, it turned out to be insufficient (Stolowy & Paugam, 2023; Bayne, 2022; Cuomo et al., 2022; Kumar & Prakash, 2019; Panfilo & Krasodomska, 2022). It did not ensure that users' needs for information on sustainable development were met (Directive, 2022). Therefore, additional regulations have been developed: in 2017, non-binding reporting guidelines for companies were developed (European Commission, 2017), and in 2019 additional guidelines for reporting climate-related information were developed (European Commission, 2019). However, they have not sufficiently improved the quality of information disclosed by companies under Directive 2014/95/EU. The consequence of this was the publication of further regulations:

- Regulation Sustainable Finance Disclosure 2019/2088 (Regulation, 2019), the so-called: "The SFDR" has been in force since March 2021, and the aim is to reduce the asymmetry of information between the principal and the contractor in relation to the introduction of sustainability risks into the business, taking into account adverse effects on sustainable development, promoting environmental or social aspects and sustainable investments. The act distinguishes between financial products that promote an environmental or social aspect and financial products that aim to achieve positive environmental and social impacts,
- Taxonomy Regulation (Regulation, 2020) establishing a framework to facilitate sustainable investment. The aim is to ensure uniform qualification of sustainable economic activities as environmentally sustainable while ensuring protection against the so-called greenwashing. Entities must provide information on how and to what extent the enterprise's activities are related to economic activities that qualify as environmentally sustainable,
- The 2022 Taxonomy Delegated Act (European Commission, 2023) specifies the content form and presentation of the information to be disclosed, including the method used to ensure compliance with it,
- Directive (EU) 2022/2464 on corporate sustainability reporting (CSRD) (Directive, 2022) replaced Directive 2014/95/EU and has been valid since January 2023. ESG reports prepared in accordance with its guidelines should be presented in 2024. It expands the group of companies that are obliged to report non-financial reports and unifies reporting standards by introducing one mandatory type of standard – European Sustainable Reporting Standards (ESRS). It clarifies the form of publishing information by recommending a mandatory separate section within the activity report. It imposes a number of obligations, including those related to identifying the resilience of the business model, developing a transformation plan and determining, based on a "science-based approach", the possibility of achieving climate reduction goals for 2030 and 2050. The Directive requires the inclusion of ESG issues in the strategy and internal processes.

Since the period of validity of Directive 2014/95/EU has ended, it was decided to check its effects in relation to reporting and real activities in the environmental area. There are many works that

analyse how the Directive influenced the quantity, quality, homogeneity, comparability, credibility, and significance of the presented non-financial information or the correctness of ESG reporting and its functions, e.g. in management. A significant number of them have been published in accounting magazines. Typically, all areas covered by the report were analysed together. There has been little work in specific areas e.g., the social area (Belay et al., 2023; Temiz & Aca, 2023; Cahayo et al., 2023) and non-financial reporting in relation only to air pollution emissions (Datt et al., 2019; Datt et al., 2020; Datt et al., 2018; Wedari et al., 2021; Demaria & Rigot, 2021; Rodríguez et al., 2022; Cahayo et al., 2023). There have been no studies on the relationship between the level of reporting and the effects of pro-environmental activities of enterprises in the context of the impact of regulations on it, neither strictly relating to the chemical sector nor dynamically assessing the evolution of the level of reporting. It was decided to fill the identified research gap in this area, and therefore, the aim of the paper is to examine how selected companies from the chemical sector in Poland adapt to the EU guidelines on ESG reporting in the environmental dimension and whether this had an impact on reducing their pressure on the environment. Additionally, an attempt has been made to answer the following questions:

1. What changes have occurred in the reporting of environmental information of selected chemical sector enterprises?
2. Is there a convergence between the reporting of environmental information and changes in environmental pressures?
3. Were the regulations on non-financial reporting a factor motivating enterprises to pro-environmental activities?

Due to its specificity, the chemical sector exerts significant pressure on the environment. Poland is responsible for the emission of approximately 10% of the total amount of industrial dust, 5% of gases, 4% of sewage and 5% of waste per year (GUS, 2012, 2020, 2022, 2023). Therefore, adopting enterprises from this sector as examples is fully justified. The study covered 6 enterprises in this sector, from the production of chemicals and chemical products to the production of fertilisers and chemical plastics, listed on the Warsaw Stock Exchange under the so-called WIG-Chemia Index. Some of them were also listed in the Respect Index (Azoty in Tarnów, PCC Rokita), now replaced by the WIG ESG index (Azoty and CIECH). The surveyed entities were subject to the ESG reporting obligation. The research period covered 2010-2022. To check what the situation had been before the introduction of Directive 2014/95/EU, the authors of the research started in 2010. At that time, The Europe 2020 Strategy announced the intensification of activities related to enforcing the publication of environmental information by enterprises in the context of achieving established ecological goals. This resulted in Regulation (2013) obliging large institutions that had issued securities admitted to trading on a regulated market to disclose information on environmental, social and corporate governance risks since 28 June 2022, Directive 2013/34/EU on the annual financial statements, consolidated financial statements and related reports of certain types of undertakings and its replacement Directive 2014/95/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups (Regulation, 2013). It should be mentioned that already then, some chemical sector companies had attempted to disclose information on pro-environmental activities, which was related to participation in the "Responsible Care Programme" addressed to them, and then the adoption of ISO 14001 series standards and the implementation of environmental management systems. The end of the research period is 2021 in the case of departmental data on environmental loads (no further data in this area). In relation to selected entities, it is 2022, when there were noticeable changes in non-financial reporting related to the application of Regulation (2013), the taxonomy regulation and its delegated acts. The study was conducted in three stages, using a quantitative-qualitative methodological approach. First, the size of environmental pressure and environmental outlays of the department to which the surveyed entities belong were assessed. Then, the level of reporting of environmental issues of selected chemical companies was assessed based on the following methods: content analysis, case analysis, GES Risk Rating, and expert analysis. Subsequently, the effects of their pro-environmental activities were assessed using time series analysis in relation to the evaluation of reports. At each stage, the deduction was carried out in the context of entities' adaptation to ESG reporting regulations. This made it possible to conclude on the impact of non-financial reporting regulations on the environmental pressure. The added value of the study and research was to examine the relationship between the level of reporting of environmental issues and changes in the envi-

ronmental pressure of chemical enterprises, as well as to dynamically assess the evolution of the reporting level. Typically, assessments were made for a single point in time.

The rest of this study is divided into 5 parts: a literature review to demonstrate the research gap, research methodology with a description of the research sample, research results, discussion and conclusion.

An overview of the literature

Reporting of non-financial information had existed in some EU countries in an optional form even before the implementation of Directive 2014/95/EU, for example, in France (Chelli et al., 2018), Italy (Agostini et al., 2022), but they were characterised by different requirements regarding disclosure of this information in individual EU countries and limited availability and different quality of non-financial information. It was similar in Poland, where accounting principles included in the Accounting Act (Article 49) were implemented. According to them, all events that had a significant impact on the company's financial results and image were subject to disclosure, including social and environmental events. Despite the formal lack of obligation to report non-financial data, according to Rubik (2018), by the end of 2016, over 300 CSR reports were issued voluntarily, including over 200 according to the GRI standard (Piłacik, 2017). This demonstrated the growing awareness of enterprises that considered non-financial information reports to be an element of their strategy and image-building on the market. The adoption of Directive 2014/95/EU and its implementation into Polish law only emphasised the importance and inevitable necessity of non-financial reporting by certain entities. This Directive was implemented by the amendment to the Accounting Act of 15 December 2016 (Act, 2016) and the regulation of the Minister of Finance of 25 May 2016, amending the regulation on current and periodic information provided by issuers of securities and the conditions for recognising as equivalent information required by the law of a non-member state (Regulation, 2016). In Poland, these regulations were supposed to cover about 300 entities, but in fact, they mainly concerned the largest of the big public trust entities (148) (Mućko et al., 2021).

Directive 2014/95/EU has played an undisputed role in the reporting of non-financial information, including environmental information, which was reflected in numerous scientific studies on this topic conducted in various EU countries. There are even separate bibliometric publications in this field (Ventera & van Eck, 2021; Cho et al., 2022). However, for the scientific sake and the publication framework, only synthetic groups of the issues analysed in the context of the Directive were presented in the paper, which made it possible to confirm the existence of a research gap. Thus, the following was examined and researched:

- the impact of the Directive on the quantity and quality of information presented in ESG reports, including Carini et al. (2018), Mio et al. (2021), Ventera and van Eck (2021), di Tullio et al. (2019), Ottenstein et al. (2022), Hummel and Szekely (2022), Aguado-Correa et al. (2023), Jastrzębska (2023). The publications show that the Directive had a positive impact on the quantity, but not the quality, of non-financial information presented in thematic reports. There are also no forward-looking disclosures,
- reliability of the presented non-financial information, including Krasodomska and Zeniuk (2021), Agostini et al. (2022), and Jaber (2021). The publication shows that ensuring credibility requires the development of standards for reporting and auditing the information provided,
- the impact of the Directive on the transparency and comparability of presented information, among others: Moggi et al. (2023), Venturelli et al. (2022), Doni et al. (2019), Aguado-Correa et al. (2023), Bauer et al. (2020). The results reflected diversity rather than uniformity in disclosures,
- factors determining differences in the quality and quantity of disclosures, including: Zarzycka and Krasodomska (2021), Krasodomska et al. (2021), Panfilo and Krasodomska (2022), Dyczkowska and Fijałkowska (2022). Various factors influence these differences. Features at the company and market level are also of significant importance – both significant involvement in sustainable development issues and the industry's sensitivity to the environment,
- the relationship between influencing factors and the quality of non-financial reporting, among others: Albu et al. (2021) – proved the role of imprint dynamics in the institutionalisation of ESG reporting logic; Dragomir et al. (2022) – according to them, the quality of ESG reporting is posi-

tively correlated with the corporate governance score, company size, environmental impact, monopoly position and strategic state interest, but negatively correlated with the concentration of state ownership,

- the relationship between the quantity and quality of disclosed information and the financial results of enterprises, including Agostini et al. (2022) and Aguado-Correa et al. (2023). Their research shows that the quality of ESG reporting in accordance with the directive does not show a significant relationship with the financial results of enterprises. Similar results were obtained by da Silva Oliveira et al. (2019),
- barriers to the implementation of the Directive: La Torre et al. (2018), – help policymakers and practitioners understand practical concerns related to the implementation of the Directive and other mandatory NFR policies,
- the impact of the Directive on the disclosure of non-financial risks, including Szczepankiewicz et al. (2022),
- impact of the Directive on the insurance market, among others: García-Sánchez et al. (2022),
- effectiveness of the Directive in relation to sustainable development goals, including Pizzi et al. (2023), Stefanescu (2022), Baumüller and Sopp (2022), Krasodomska et al. (2023), Hummel and Szekely (2022), Mućko et al. (2021), Aguado-Correa et al. (2023), Jastrzębska (2023). The publications critically assessed the effectiveness of the directive, highlighted the need to pay special attention to the actual contribution of companies to achieving the Sustainable Development Goals, and indicated the need to understand the differences in reporting on the Sustainable Development Goals in the EU.

Yet there is no publication that analyses the relationship between the level of reporting of environmental issues and changes in the environmental pressure of chemical enterprises, taking into account regulations complementary to the given Directive and the time and method used. Therefore, it was decided to investigate further into the domain.

Research methods

One of the most important sectors of the Polish economy is the chemical industry, which is characterised by a significant diversity of manufactured products and the complexity of the processes implemented. Its main sub-sectors/divisions include the production of chemicals and chemical products. In 2021, 770 enterprises operated there, with a share in sold production of 4.8% (GUS, 2023). They vary in size, from small processing plants to large capital groups. Their activities put pressure on the environment. These include some of the largest enterprises in Poland that are subject to non-financial reporting obligations. That is why they were chosen as the subject of research in the article. The research group was narrowed down to leading companies in the chemical industry that have been listed on the Warsaw Stock Exchange for years, forming the WIG-CHEMIA index and belonging to the above-mentioned section. In August 2023, these were Grupa Azoty SA in Tarnów, Grupa Azoty Zakłady Chemiczne Police SA, CIECH SA, PCC Rokita SA, POLWAX SA. The companies (except the last one) were part of the capital groups. Only in the case of the first two companies was it possible to analyse reports for both the entire capital group and its entities. Therefore, ultimately, 6 entities were subjected to ESG report examination. All entities (except the last one) met the guidelines of the NFRD (they achieved a balance sheet total of at least EUR 20 million or a net turnover of at least EUR 40 million and the condition of employing, on average, at least 500 employees in a financial year).

The research was carried out in three stages. In the first stage, division 20 (according to the Polish Classification of Activities) of the production of chemicals and chemical products and the entities examined were first synthetically characterised. Then, statistical and mathematical analyses of the size of their environmental pressure and expenditure on environmental protection were carried out in 2010-2021, with particular emphasis on 2018, when large enterprises had to submit non-financial reports for the first time in accordance with the previously mentioned Polish provisions on the transposition of Directive 2014/95 /EU. This enabled the assessment of the rate of change in emissions of gases, dust, industrial sewage discharged and waste generated in chemical enterprises of division 20 in relation to the rate of change in their sold production. It was assumed that production is accompa-

nied by emissions of pollutants. This analysis provides a background to show the change in the environmental burden of a given department, including the entities selected for the study. This directly reflects the commitment to activities aimed at achieving this goal and the implementation of the objectives of the EU ecological policy, and indirectly compliance with the ESG reporting obligation resulting not only from Directive 2014/95/EU but also subsequent regulations mentioned in the introduction. In order to prepare a report, one needs to have reliable data to present in it, and this requires taking appropriate actions.

In the second stage, a qualitative approach was used in the form of a multiple case study. To check how selected companies adapt to the EU guidelines on ESG reporting in the environmental dimension, the analysis of the content of ESG reports of selected 6 entities from 2018-2022 was carried out, focusing on the environmental area. The level of reporting of environmental issues was assessed using the GES Risk Rating method used to value listed companies. It is based on international standards for sustainable development, combined with the UN Principles for Responsible Investment. It involves assessing enterprise management systems in terms of the environment, employee rights, ethics and anti-corruption, social issues and human rights. Using criteria selected taking into account the risks relevant to the industries in which a given company operates, GES Risk Rating assesses its level of preparation and performance in each of the above-mentioned areas. The map of key sector risks used in this method was created based on a grid of material aspects for individual sectors and the risk matrix published in the Non-Financial Information Standard. The basic source of information in the GES Risk Rating analysis are documents published on the company's website, such as the annual report, CSR report, code of ethics, ESG reports and environmental and social management policies. The specificity of this method also makes it suitable for assessing the level of environmental reporting. It was used by the Association of Stock Exchange Issuers to prepare the ESG Analysis of Companies in Poland in 2017 (Burger, 2017).

In accordance with the GES Risk Rating, a list of 14 environmental criteria was prepared, to which weights were assigned using the expert method. For each criterion, the entity could receive points adequately on a scale of 0-3.

A value of 3 indicates a high level of environmental reporting and, therefore, a high ability of the company to reduce environmental pressure, among others, by implementing appropriate procedures and actions to adapt to the EU requirements. A value of 0 means a low level of environmental reporting, i.e. lack of information or preparation to reduce environmental pressure/deal with potential risk in a given area. Knowledge of the partial values of individual criteria was the basis for calculating the average value in one year. The average value was assigned a grade from the a-c range. Each value corresponds to a specific level and its descriptive explanation (Table 1).

Table 1. Methodology for assessing the level of reporting quality

Value	Rating	Level	Assessment description
0-0.29	c	low	No information or failure
0.3-0.74	C+	relatively low	Clues to the existence of politics
0.75-1.19	b-	medium	An extensive policy or strategy
1.20-1.79	b	medium	Policy+program or policy+management system
1.80-2.24	b+	relatively high	Policy + program + management system
2.25-2.60	a-	relatively high	Assessment of progress or results
2.7-3	a	high	External verification

Source: authors' work based on Burger (2017).

The third stage examines the relationship between the level of environmental reporting of enterprises and the effects of pro-environmental activities, i.e. whether the obligation to prepare ESG reports reduces their pressure on the environment. An analysis of internal secondary data (contained in strategies, financial statements, non-financial reports and on the websites of the surveyed entities) was carried out in order to identify pro-environmental activities undertaken by the surveyed entities

and their effects measured by the rate of change in the amount of pollutants emitted. The size and dynamics of sales revenues, pollutant emissions, and investment outlays in the environmental protection of the surveyed entities were analysed. Due to the lack of previous source materials, the research period was shortened to 2018-2022. 2018, as already mentioned, is the first year in which large enterprises had to submit non-financial reports for the first time in accordance with Directive 2014/95 EU. However, since 2022, they have had to prepare reports in accordance with the above-mentioned Regulation (EU) 575/2013 on the disclosure of information on environmental, social and corporate governance risks and the Taxonomy Regulation. The change in reporting methodology influenced the method and level of reporting, which prompted the authors to extend the research period by this year compared to the first stage of the study. This also served to confirm that entities were adapting to the ESG reporting regulations imposed after Directive 2014/95.

Results of the research

Analysis of the extent of environmental pressure and pro-environmental activities of the production of chemicals and chemical products department and entities selected for the study

The production of chemicals and chemical products is one of the leading and dynamically developing industries in Poland. Between 2010 and 2021, the number of enterprises increased by 27% from 607 to 770 units. In 2021, this division included 20 enterprises employing 500-999 people and 10 employing more than 1,000 people. These companies were subject to Directive 2014/95/EU. The value of sold production increased from PLN 44 billion in 2010 to PLN 90.8 billion in 2021, i.e. by 105%. Its share in the value of total industrial production sold increased slightly from 4.5% in 2010 to 4.7% in 2021 (GUS, 2023).

Production activities are accompanied by emissions of pollutants into water, air and soil. In the years 2010-2021, sewage discharge decreased by 7% from 302 hm³ to 282 hm³, and the amount of untreated sewage discharged by 60% (Table 2). During this time, dust emissions dropped from 4.8 thousand tons up to 2.2 thousand tons (over 50%). The share of enterprises producing chemicals and chemical products in industrial emissions increased from 7.9% to 10.2%. Gas emissions increased by 13%. The share of the 6 surveyed entities in the total dust emission from the department in 2018 was approximately 36%, but in 2020, it increased to almost 60%, and in 2021, it decreased to approximately 30%. Their share in gas emissions was at a high level (quite similar in the years examined). In the years examined, the reduction of emitted pollutants, both dust and gas, improved. This is related to an almost threefold increase in expenditure on fixed assets for environmental protection, of which approximately 80% were investments for air and climate protection. The expenditures of this division constituted only 4-5% of the investment expenditures incurred by all industrial enterprises. The amount of industrial waste generated in the department was at a similar level, approximately 5 million tons per year. In the years 2010-2021, the growth rate of sold production of enterprises producing chemicals and chemical products was much faster than the growth rate of gas emissions and waste generated, which indicates progress in reducing them. This was accompanied by a reduction in dust emissions. In 2018-2021, the increase in sold production was accompanied by a decrease in discharged sewage, emitted dust and gases, and industrial waste. During the entire period under review, the department's expenditure on fixed assets for environmental protection more than doubled (unfortunately, 6 surveyed entities did not disclose information about them).

To sum up, during the period under study, the environmental pressure of a given division in the area of sewage, dust and waste generated partially decreased, which proves the effectiveness of the actions aimed at this purpose. The visible reduction in these burdens in 2018 compared to 2010 suggests that this may be related not only to the pursuit of the applicable climate and energy policy goals but also to the obligation to report progress in this regard. In the case of 6 surveyed entities, the conclusions are even more positive. The data indicate that their share in the environmental burden of a given department in terms of emissions of dust, gases and waste generated during the year has decreased. However, the share of gases retained in gas reduction devices has increased, which is positive. This data directly confirms the correctness of the selection of entities for further examination and the effectiveness of the actions taken to protect the environment. Indirectly, the effects visi-

ble since 2018 reflect the adaptation to the stricter ESG reporting regulations, appearing since 2017, as previously mentioned.

Table 2. Burden and environmental protection in chemical and chemical products manufacturing companies in Poland in 2010-2021

Specification	2010	2018	2020	2021	2021 2010 [%]	2021 2018 [%]
Number of entities, including the number of employment:	607	710	754	770	127	109
500-999 people	14	12	19	20	143	167
over 1000 people	13	11	10	10	77	91
Sold production [in billion PLN]	44.1	66.3	69.6	90.8	206	137
Share of surveyed entities in the department's sold production [%]	NA	14.6	12.5	12.9	-	-
Industrial wastewater discharged [hm ³], of which untreated wastewater [hm ³]	302.7 1.8	289.8 0.6	281.6 0.7	282.3 0.7	93 39	97 117
Division's share of total industrial wastewater [%]	3.8	4.2	4.6	4.4	+0.6	+0.2
Dust emissions [in thousand tonnes]	4.8	2.6	2.3	2.2	46	85
Division's share in total industry dust emissions [%]	7.9	8.4	10.4	10.2	+2.3	+1.8
Share of surveyed entities in the division's dust emissions [%]	NA	35.5	59.7	29.4	-	-
Gas emissions [in thousand tonnes]	8486.2	9764.5	9522.4	9626.3	113	98
Division's share in total industry gas emissions [%]	3.9	4.6	5.1	4.6	+0.7	0
Share of surveyed entities in the division's gas emissions [%]	NA	53.3	50.8	47.9	-	-
Pollutants of the division retained in pollution reduction facilities [as % of generated pollutants]:						
particulate	99.3	99.4	99.6	99.5	+0.2	+0.1
gaseous	74.9	86.7	84.7	91.0	+16.1	+4.3
Industrial waste generated during the year [in million tonnes]	5.4	5.4	5.3	5.4	0	0
Division's share of total industrial waste generated during the year [%]	4.8	4.9	5.3	5.3	+0.5	+0.5
Share of surveyed entities in the division's industrial waste generation [%]	NA	17.2	25.9	11.9	-	-
Outlays on fixed assets in environmental protection [in million PLN], of which outlays for air and climate protection	136.4 102.9	115.1 87.2	280.5 236.9	392.3 335.1	287 325	341 384

Source: authors' work based on GUS (2012), GUS (2022), GUS (2023) and data of Table 5.

The challenge for chemical companies is to look for new solutions in the field of sustainable development and reduce the negative impact of chemical production and products on the environment. For this purpose, enterprises introduce modern, safe and low-emission technologies and certified products and adapt to a number of international and national standards and legal regulations.

A special role in the chemical industry is played by the companies selected for the study, which are included in the WIG-CHEMIA stock exchange sector index. The specific nature of these entities, mainly engaged in the production of chemicals and chemical products, and the environmental initiatives they undertake are presented in Table 3. Among the surveyed companies, Grupa Azoty SA in Tarnów, CIECH SA and PCC Rokita SA are the parent companies of the capital groups.

Table 3. Synthetic characteristics of the activities of the surveyed entities and their pro-environmental projects

Name of the company	Characteristics
Azoty Capital Group, including 2 entity companies	<p>One of the key capital groups of the fertiliser and chemical industry in Europe. It consists of 50 companies located in Poland and around the world. After the consolidation of the largest Polish chemical plants from Tarnów, Puławy, Police and Kędzierzyn, a common brand, Grupa Azoty, was created. It ranks second in the EU in the production of nitrogen and compound fertilisers. It has a strong position on the markets of melanin, polyamides, OXE alcohols, plasticizers and titanium white. It is the leader of the Polish fertiliser market.</p> <p>In 2021, it employed approximately 15,000 people, sales revenues amounted to EUR 3.46 billion and assets amounted to EUR 5.15 billion. In 2018, the subsidiary COMPO EXPERT GmbH based in Westphalia, a producer of high-quality specialist fertilisers for professional customers, joined the Group. Grupa Azoty has included activities in the area of sustainable development in its ESG Strategy. A particular emphasis was placed on non-emission and renewable energy sources and reducing CO₂ emissions. The strategy complements the Strategic Corporate Project "Zielone Azoty" relating to three pillars: green products, technologies and organisation. Since 2020, the Group has been a signatory of the Partnership for the Implementation of the UN Sustainable Development Goals. In 2022, it received the International Sustainability & Carbon Certification Plus (ISCC+) certificate, confirming that certified products have a lower carbon footprint and were made using bio-based raw materials. It has developed a set of corporate governance principles consistent with the "Good Practices of WSE Listed Companies 2021". The group's companies have implemented an environmental management system compliant with ISO 14001:2015.</p> <p>Grupa Azoty SA in Tarnów has been listed on the Warsaw Stock Exchange since 2008. It is included in the WIG ESG index (formerly Respect Index). In 2021, the company employed over 2,000 employees, revenues amounted to EUR 562 million and assets amounted to EUR 2.54 billion. It has an environmental policy focused on clean production, reducing the consumption of natural resources and pollutant emissions, effective waste management, and conducting industrial processes in such a way as to effectively prevent failures. It implements the strategic "Zielone Azoty" project, which includes, among others: decarbonizing operations and improving energy efficiency in chemical installations by implementing ecological solutions, including the use of green hydrogen. It was recognized in the Decarbonization Initiatives ranking. It registered its products in accordance with the REACH regulation and prepared a chemical safety report. Grupa Azoty Zakłady Chemiczne Police SA has been the largest producer of compound fertilisers, nitrogen fertilisers and titanium white in the country for over 50 years, and has been listed on the Warsaw Stock Exchange since 2005. In 2021, it employed over 2.5 thousand employees, revenues amounted to EUR 696 million and assets amounted to EUR 921 million. Since 2011, it has been part of the Azoty Group. It is certified by the World Environment Center, "Green Laurel" and the title of "Environmentally Friendly Company".</p>
CIECH Capital Group	<p>An international chemical holding created by 17 subsidiaries from Poland, Germany, Romania and Spain, including 8 production plants operating in the following areas: soda ash (calcined and purified), salt, resins, silicates, packaging and foams. The largest supplier of sodium silicates in Europe, the second largest producer of caustic and baking soda in the EU, the largest producer of evaporated salt and plant protection products in Poland, and a leading producer of polyurethane foams.</p> <p>Since 2005, CIECH SA has been listed on the Warsaw Stock Exchange, and since 2016 on Börse Frankfurt. It creates the WIG ESG index. In 2021, the parent company employed approximately 200 employees, revenue amounted to EUR 353 million and assets exceeded EUR billion. At that time, the Group employed over 3,000 people, revenues amounted to EUR 755 million and assets amounted to EUR 1.55 billion.</p> <p>The company conducts activities that are highly energy-intensive, which results in CO₂ emissions. Since 2020, it has been a member of the Nations Global Compact, and since 2021 it has been implementing the ESG Strategy – "Chemistry for a Better World". It was the first among large industrial companies in Poland to join the Science Based Targets initiative, which helps companies adapt more quickly to the standards of a low-emission economy.</p> <p>The Group's companies, moving towards a circular economy, reduce water consumption in production processes and the amount of waste and secondary raw materials. They implement the ISO 14001:2015 environmental management system. The products are entered in the REACH register. In 2021, the Group identified operational risks in accordance with the TCFD, taking into account their financial impact on the business. In 2021, CIECH SA won the Diamond Award in the first edition of the "ESG Leaders 2021" competition (co-organized by the Warsaw Stock Exchange) in the "ESG Strategy" category. The company was awarded for its "ESG strategy, conducting an effective information and promotional campaign in the area of sustainable development, and innovative products that have a positive impact on the environment" (NN Investment Partners TFI et al., 2023).</p>
PCC Rokita Capital Group	<p>The parent company of the capital group formed by several companies from the chemical and service industries is PCC Rokita SA. The industry investor is the German company PCC SE operating on international markets of chemical and energy raw materials. PCC Rokita SA is the largest supplier of chlorine for water supply installations in Poland and the second largest producer of chlorobenzene in Europe. It produces sodium hydroxide and hydrochloric acid, polyols, prepolymers, phosphorus-derivatives and naphthalene-derivatives. The company remains the operator of the Gas and Energy Distribution System until 2030. In 2021, it employed over 700 people, its revenues amounted to EUR 481 million and assets amounted to EUR 512 million. The company's strategy assumes expanding the product range and investing in new technological solutions supporting environmental protection. The company has developed an environmental policy. Its activities are consistent with the CSR and sustainable development strategy of the PCC Group and the sustainable purchasing policy. It has the "Silver EcoVadis 2023/Sustainability Rating" certificate and a 2021 certificate confirming compliance of the Responsible Care Framework Management System with the guidelines of the European Chemical Industry Council and the Polish Chamber of Chemical Industry. Until 2018, it created the Respect Index. It has introduced an environmental management system compliant with ISO 14001:2015. The company has started implementing the "Assumptions of the decarbonization strategy for 2022-2050", including modernization of its own sources of electricity and heat, enabling them to be powered by hydrogen and natural gas. It builds photovoltaic and wind farms, increasing energy efficiency.</p>

Name of the company	Characteristics
POLWAX SA	<p>The company is the largest in Poland and one of the European leaders in the paraffin market, a producer and distributor of waxes and industrial paraffin products, among others, wood processing, production of varnishes and paints, precision casting, production of building materials.</p> <p>The company's installations and production processes impact the environment in accordance with standards, and the products are of high quality and safe for recipients. The company has implemented an integrated management system, including the ISO 14001:2015 environmental management system.</p> <p>In 2021, it employed approximately 250 people, revenues amounted to EUR 59 million and assets amounted to EUR 30.8 million.</p> <p>In 2023, the company started working on preparing an ESG strategy. The principles of waste management and sewage disposal are regulated in contracts with recipients. Conducts activities to optimise the use of resources and energy consumption.</p>

Source: authors' work based on Grupa Azoty (2023a), CIECH (2023), PCC Rokita (2023), Polwax (2023a).

The pro-ecological projects undertaken by the surveyed entities are consistent with the European strategy of climate neutrality and consist mainly of installing new low-emission energy sources or renewable energy sources in order to reduce greenhouse gas emissions and lower energy consumption in production processes, more efficient use of raw materials, reducing the use of fossil fuels, and limiting water consumption in technological processes and the amount of sewage discharged. The surveyed entities have implemented an integrated environmental management system that is aimed at minimising environmental losses and hazard risks. Moreover, they incurred high costs related to adapting to the guidelines and obtaining environmental permits, but these were not shown in the non-financial reports in connection with the described environmental initiatives.

Analysis of the level of environmental reporting in the surveyed entities

At this stage, 24 reports from 6 entities have been analysed. In 3 entities, they appeared as reports on non-financial information, in 2 entities as management board reports and in 1 as non-financial reports. All of them have a separate section on the environment. Despite common criteria resulting from the regulations, the reports were prepared differently, both in terms of scope and level of detail, which makes it difficult to collect information and compare it not only between entities but also over time. The first trial of ESG reports for 2017, prepared by some of the respondents, was of a very general nature, without data on pollutant emissions. Therefore, the study began in 2018. Table 4 presents the results of the analysis of the level of environmental reporting of the surveyed entities in 2018-2022. The reports for 2018 included basic information on the use of the environment and emitted pollutants, which was related to Directive 2014/95 and the publication of non-binding reporting guidelines for enterprises (2017). Greater detail appeared in the 2019 reports as a result of the inclusion of additional guidelines on reporting climate-related information (2019). A fairly wide scope of disclosures in the environment section was already included in the reports for 2021-2022, which indicates adaptation to Regulation (EU) 575/2013, SFRD 2019/2088 and the Taxonomy Regulation. Namely, the environmental part was developed, linking it to climate and energy goals and providing the amounts of investment expenditure, and parts about the sustainable development strategy, activities in terms of taxonomy, risk management, and product quality and safety were introduced. Visible efforts to meet ESG reporting requirements (expanding them, making them more detailed and taking into account the methodology and criteria indicated in EU regulations) are reflected in the increase in the average value of the assessment of compliance with criteria in the environmental area. In the following years, the surveyed entities had an increasingly higher level of environmental reporting. The highest level of reporting was recorded by the PCC Rokita Capital Group (B+), followed by entities from the Azoty Group (from B to B+) and the CIECH Capital Group (from C+ to B+). POLWAX SA had the lowest level of reporting (from C to C+). Knowing what changes have occurred in environmental reporting, it remains to check whether there is any convergence between the reporting of environmental information and changes in environmental pressure. This similarity is partly indicated by the scope of disclosures. A higher level means that entities have something to report, i.e. they have taken appropriate actions and achieved results. More precise confirmation was provided by the analysis carried out in the next stage of the research.

Table 4. Results of the analysis of the level of environmental reporting of the surveyed entities in 2018-2022

Criterion name	Azoty Capital Group			Grupa Azoty SA w Tamowie			Grupa Azoty Zakłady Chemiczne Police SA					
	2018	2020	2021	2022	2018	2020	2021	2022	2018	2020	2021	2022
	Value in points (0-3)											
Organization and environmental management	2	3	3	3	2	3	3	3	2	3	3	3
Environmental requirements in the supply chain	0	1	2	2	0	1	2	2	0	1	2	2
Energy consumption	3	2	3	3	3	2	3	3	3	2	2	2
Water consumption	2	2	2	2	2	2	2	2	2	2	2	2
Greenhouse gas emissions	2	2	2	2	2	2	2	2	2	2	2	2
Non-greenhouse gas emissions	2	2	2	2	2	2	2	2	2	2	2	2
Hazardous waste	2	2	2	2	2	2	2	2	2	2	2	2
Non-hazardous waste	2	2	2	2	2	2	2	2	2	2	2	2
Environmental protection and restoration activities	2	2	2	2	2	2	2	2	2	2	2	2
Integrating environmental considerations into insurance, credit and investment policies	0	1	1	2	0	1	0	1	0	1	0	1
Products meeting environmental criteria	3	3	3	3	3	3	3	3	3	3	3	3
Business travel	0	0	0	0	0	0	0	0	0	0	0	0
Transport	1	2	2	2	1	2	2	2	1	2	2	2
Risk management	2	2	3	3	2	2	3	3	2	2	3	3
Total value	23	26	29	30	23	26	28	29	23	26	27	28
Average value	1.64	1.86	2.07	2.14	1.64	1.86	2	2.07	1.64	1.86	1.92	2
Evaluation	b	b+	b+	b+	b	b+	b+	b+	b	b+	b+	b+

Criterion name	CIECH Capital Group			PCC Rokita Capital Group/ PCC Rokita SA			POLWAX SA					
	2018	2020	2021	2022	2018	2020	2021	2022	2018	2020	2021	2022
	Value in points (0-3)											
Organization and environmental management	1	2.5	3	3	3	3	3	3	1	1	1	2
Environmental requirements in the supply chain	0	0	0	0	2	0	0	0	1	1	1	1
Energy consumption	1	2.5	3	3	3	3	3	3	0	0	0	0
Water consumption	1	1.5	2	2.5	2	1.5	1.5	1.5	0	0	0	0
Greenhouse gas emissions	1	2	3	3	3	3	3	3	0	0	0	0
Non-greenhouse gas emissions	1	1.5	2.5	3	1	1	1	1	0	0	0	0
Hazardous waste	0	1	1.5	2	2	2	1.5	1.5	0	0	0	0
Non-hazardous waste	0	1	1.5	2	2	2	1	1	0	0	0	0
Environmental protection and restoration activities	1	1	1.5	2	3	3	3	3	0.5	0.5	0.5	0.5
Integrating environmental considerations into insurance, credit and investment policies	1	1.5	2	3	1	2	3	2	0	0	0.5	0
Products meeting environmental criteria	0	0	0	1	3	3	3	3	1	1	1	1
Business travel	0	0	0	0	0	0	0	0	0	0	0	0
Transport	0	0	0	0.5	1	1	1	1	0	0	0	0
Risk management	0.5	0.5	3	2.5	2	2	3	3	0	0	0	1
Total value	7.5	14	23	27.5	27	26.5	27	26	3.5	3.5	4	4.5
Average value	0.54	1	1.64	1.96	1.93	1.89	1.93	1.86	0.25	0.25	0.29	0.32
Evaluation	c+	b-	b	b+	b+	b+	b+	b+	c	c	c	c+
Level	relatively low	medium	medium	relatively high	relatively high	relatively high	relatively high	relatively high	low	low	low	relatively low

Source: authors' work based on Grupa Azoty (2023a), Ciech (2023), PCC Rokita (2023), Polwax (2023a).

Analysis of changes in pressure on the environment of the surveyed entities

The activities of chemical companies are burdened with high environmental risk and burdensome to the natural environment. Hence, it is important to identify sources of pollution and their types and levels. The analysis of ESG reports showed that the surveyed entities disclosed primarily data on the amount of greenhouse gases, dust and waste generated (Table 5). Other types of environmental burdens were sometimes mentioned as being present but without details. Before 2018, when there was no obligation to report non-financially, they only prepared a marketing description of the impact of their activities on the environment without providing the amount of pollutant emissions. Information on investment expenditure related to environmental protection appears in some reports from 2021, which are related to adaptation to the SFRD 2019/2088 regulation and the taxonomy regulation. Among the surveyed entities, only one company did not prepare ESG reports (POLWAX SA). There is no information on emitted pollutants in the financial reports. Its business strategy does not describe the impact on sustainable development and climate risks.

Table 5. Sales revenues, pollutant emissions, and investment outlays on environmental protection in the surveyed entities (2018-2022)

Year	Sales revenue [in billion PLN]	Greenhouse gas emissions ¹ [in thousand tonnes]	Dust emissions [in tonnes]	Waste generated [in thousand tonnes]	Sewage dis- charged [in thousand m ³]	Outlays on fixed assets in environmental protection [in million PLN]
Azoty Capital Group						
2018	9.9	4969	1548	4409	NA	NA
2020	10.5	7218	1822	4423	NA	NA
2021	15.9	7288	998	4514	NA	1528
2022	24.6	6069	1197	4516	NA	1970
<u>2021</u> 2018 [%]	160	147	64	102	NA	-
<u>2022</u> 2018 [%]	248	122	77	102	NA	-
Grupa Azoty SA w Tarnowie						
2018	1.8	1011	168	60	NA	NA
2020	1.6	915	249	41	NA	NA
2021	2.6	875	197	48	NA	132
2022	3.9	879	305	49	NA	38
<u>2021</u> 2018 [%]	140	87	117	80	NA	-
<u>2022</u> 2018 [%]	216	87	181	82	NA	-
Grupa Azoty Zakłady Chemiczne Police SA						
2018	2.4	1172	459	4130	NA	NA
2020	2.4	1701	903	4192	NA	NA
2021	3.2	1523	271	4250	NA	56
2022	5.4	1121	275	4297	NA	66
<u>2021</u> 2018 [%]	133	130	59	103	NA	-
<u>2022</u> 2018 [%]	223	96	60	104	NA	-

1 Greenhouse gas emissions include CO₂ and N₂O emissions in terms of CO₂ equivalent.

Year	Sales revenue [in billion PLN]	Greenhouse gas emissions ¹ [in thousand tonnes]	Dust emissions [in tonnes]	Waste generated [in thousand tonnes]	Sewage dis- charged [in thousand m ³]	Outlays on fixed assets in environmental protection [in million PLN]
CIECH Capital Group						
2018	3.7	3027	297	297	NA	56
2020	2.9	2795	223	513	35	NA
2021	3.5	2825	179	524	36	NA
2022	3.0	2823	381	528	36	141
<u>2021</u> 2018 [%]	94	93	60	176	-	-
<u>2022</u> 2018 [%]	82	93	128	178	-	251
PCC Rokita Capital Group/PCC Rokita SA						
2018	1.5	225	NA	NA	NA	NA
2020	1.5	345	NA	NA	NA	NA
2021	2.2	266	NA	NA	NA	NA
2022	3.1	245	NA	NA	NA	97,6
<u>2021</u> 2018 [%]	149	118	NA	NA	NA	NA
<u>2022</u> 2018 [%]	212	109	NA	NA	NA	NA
POLWAX SA –Entity does not prepare non-financial reports						

Source: authors' work based on non-financial reports of the surveyed companies and financial statements.

Data on the environmental pressure of entities is incomplete, especially regarding industrial sewage discharge and investment expenditure on environmental protection. More information can be found on capital groups than on the companies that constitute them, and yet the environmental burden of individual enterprises forming the group varies, depending on the type and scope of activity. Shortcomings in reporting were caused, among others, by the shortcomings of Directive 2014/95 EU, which did not specify the reporting standard and left the choice between preparing a report or presenting a statement on its preparation (Regulation, 2016; Act, 2016). Sometimes, it is the unwillingness to accept another obligation to fulfil and the lack of appropriate information and actions.

In the years 2018-2022, in Capital Groups (except the CIECH Group), the increase in sales revenues was accompanied by an increase in emissions of greenhouse gases, dust and generated waste. However, the growth rate of revenues was higher than the growth rate of production emissions (similarly to the entire division 20, Table 2), which indicates progress in reducing them. Among the respondents, Grupa Azoty SA in Tarnów stands out, where greenhouse gas emissions tend to decline despite an increase in production. In turn, in the CIECH Group, the decline in sales revenues was accompanied by a faster decline in dust emissions. Since 2018, entities have been describing the modernisation and pro-environmental activities undertaken in their reports, and their effects are visible in increasing production and energy efficiency, which leads to the reduction in air pollutant emissions, including greenhouse gases, a reduction in the amount of sewage discharged, rational water and waste management while improving the quality of manufactured products. This may be related not only to the pursuit of the applicable climate and energy policy goals but also to the emergence of non-binding guidelines on reporting for enterprises (European Commission, 2017) and additional guidelines on reporting climate-related information (European Commission, 2019).

Thus, summing up, both positive changes in the scope of disclosed environmental information and reduced pollution indirectly indicate adaptation to EU regulations related to ESG reporting.

Discussion

Directive 2014/95/EU initiated the obligation for companies to report non-financial information. The rationale behind its introduction was to provide stakeholders with comparable, reliable, high-quality data on the sustainable development of economic entities, including the reduction of environmental pressure. Companies' attention to environmental protection, social responsibility and corporate governance have become a necessity. In this situation, ESG reporting is an additional tool that allows you to exert greater influence on the output of business entities in specific areas and disciplines you to take action to protect the environment. It allows you to measure and quantify the degree of environmental problems and environmental initiatives undertaken. For the entities themselves, the reports are an opportunity to show that they take actions to reduce pollutant emissions and rational use of resources. At least, that's what the aforementioned Directive assumed. However, in practice, not all units perceive it this way. This is confirmed by publications in which the authors pointed out shortcomings in ESG reporting in terms of reliability, thoroughness, uniformity, understandability and comparability of data (Breijer & Orij, 2022; Dhandhanian & O'Higgins, 2022). On the one hand, they were related to, among others, the shortcomings of the EU Directive 2014/95, which did not specify the reporting standard and left the choice between preparing a report and presenting a statement on its preparation (Mućko et al., 2021a; Krasodomska et al., 2020; Piłacik, 2017), on the other hand, with the reluctance of individuals to report (Ruiz-Lozano et al., 2022; Chelli et al., 2018; La Torre et al., 2018). The unsatisfactory effects of reporting determined the introduction of further regulations by the EU, which broadened the reporting obligation thematically and subjectively. The scope of the guidelines is wide and difficult to meet in the initial phase. It imposes an obligation on enterprises to exercise due diligence based on identifying, preventing, eliminating and accounting for adverse environmental impacts within their own operations, the operations of subsidiaries and their value chains – direct and indirect business partners. A “snowball” effect is expected because reporting entities will require information on environmental issues from business partners on whom the reporting obligation has not yet been imposed (Sapere, 2022).

Challenges related to ESG reporting also face the chemical sector, which, due to the specific nature of its activities, must demonstrate particular commitment to implementing EU regulations in order to monitor and mitigate the adverse impact on the environment. Due to the fact that the research carried out has a slightly different purpose and scope than existing publications on a similar topic, it is possible to compare the results of other authors only in terms of the quality of reporting and in other sectors of the economy. There have been no other scientific studies with results strictly related to chemical enterprises that could constitute the basis for direct comparisons with those obtained in this paper.

The study showed that most of the surveyed entities have taken up this challenge with varying degrees of success, as evidenced by the different rates of increase in the level of environmental information reporting. This is in line with the results of consultations conducted by the Stock Exchange, which show that most global asset managers strive to fully incorporate ESG criteria in the investment process (Sapere, 2022). This is also becoming an increasingly important aspect for individual investors. This conclusion applies to all examined entities as listed on the stock exchange. Similar results, but with reference to Italian-listed companies, were obtained by Agostini et al. (2022) and Aguardo-Correa et al. (2023) for the Spanish banking sector. They showed that Directive 2014/95 has influenced the number of entities involved in ESG reporting and the amount of information provided, but its quality is low. This suggests an unsatisfactory level of ESG reporting. The low level of reporting but of non-listed entities was pointed out, among others, by Mio et al. (2021), and Ottenstein et al. (2022). It should be emphasised that the results in the above publications were usually static and concerned all reporting areas of various types of enterprises. They did not present a quantitative evaluation of the assessment as done in this paper.

Moreover, the study shows that the need to disclose information on the level of pollutant emissions and identify ecological risk forced the adoption of more systematic actions to protect the environment, the preparation of sustainable development strategies, and the introduction of monitoring and measurement of the adverse impact of chemical production on the environment. The effect was not only an increase in the level of reporting but also a reduction in the environmental pressure of the surveyed entities. A similar conclusion, but only to increase the number of climate disclosures, was

presented by, among others, Jastrzębska (2023) and Krasodomska et al. (2023). Analysis of the quality of reporting of climate-related aspects for 2022, and in particular disclosure of the impact of climate risks on the activities of 133 largest Polish listed companies from various industries (finance, fuels and energy, chemicals and raw materials, industrial production and construction and assembly, consumer goods, trade and services, health care and technologies) was also conducted by Deloitte (2023). It showed that 14% of companies did not include issues related to climate risk in their annual report. However, the best prepared reports were those of companies from the chemicals and raw materials and fuels and energy sectors. The level of maturity of disclosures was assessed in relation to the regulatory requirements of the EU Taxonomy and the NDRD guidelines (Nonfinancial Disclosure Reporting Directive), the new CSRD (Corporate Sustainability Reporting Directive), the related ESRS 1 standard (European Sustainability Reporting Standards, Environment 1: Climate change) as well as the priorities of ESMA (European Securities and Markets Authority) regarding reports and the standard recommended by TCFD (Task Force on Climate-Related Financial Disclosures). Deloitte's results confirm the authors' conclusion that chemical entities are quite well adjusted to ESG reporting regulations. However, none of the above analysed it in relation to environmental pressure.

To sum up, the results obtained indicate, on the one hand, how much chemical entities have done to properly report environmental information and reduce pressure on the environment, and on the other – how much work still awaits them in this area. Their experiences can help promote compliance with ESG reporting regulations.

Conclusions

The conducted research confirms that selected chemical companies of division 20 in Poland have adapted to Directive 2014/95/ quite well and similarly to subsequent EU guidelines on ESG reporting in the environmental dimension, but in a different way and at a different pace. The reporting obligation helps reduce environmental burdens. Similar, but much slower, changes are taking place in the production of chemicals and chemical products division, to which the surveyed entities belong. This was indirectly indicated by changes in its environmental pressure. Regardless of the management dimension, this is an indication that the regulations introduced regarding ESG reporting are effective and efficient and should not be abandoned. Based on the results obtained, it can be concluded that the aim of the article was achieved, which was to examine how selected companies from the chemical sector in Poland adapt to the EU guidelines on ESG reporting in the environmental dimension and whether this had an impact on reducing their pressure on the environment. Moreover, an attempt was made to answer the questions posed in the introduction.

Answer to question 1. There have been positive changes in the level of environmental information reporting for the surveyed entities. Although the reports have different structures, information values and levels of detail, the level of environmental reporting has increased in subsequent years. The highest reporting level was recorded by the PCC Rokita Capital Group (B+), followed by the Azoty Capital Group (from B to B+), and the CIECH Capital Group (from C+ to B+). POLWAX SA had the lowest level of reporting (from C to C+). This indicates that large capital groups are better prepared for reporting than individual entities. Moreover, the analysis showed that the new regulations introduced subsequently are complementary and improve the implementation of reporting obligations initiated by Directive 2014/95/EU. This is expressed by broadening and deepening the information, as well as changing the structure and methodology of its presentation. The analysis of reports showed that each year, non-financial reports contained more information about enterprises' environmental impact and actions taken to reduce it. Since 2021, in accordance with the NFDR Directive and delegated acts, companies have been preparing non-financial reports in part relating to environmental issues, taking into account taxonomy guidelines. For 2021, the reports were prepared in a simplified version, and the disclosed data was accompanied by contextual information. Reports for 2022 were more detailed, especially in capital groups that had already started preparing for the EU taxonomy guidelines.

Answer to question 2. There is a convergence between the reporting of environmental information and changes in environmental pressures. On the one hand, this is indicated by the degree of disclosure of information, which increased as we adjusted to subsequent regulations in this area. The

higher it is, the more the entities have something to report, i.e. they have taken actions to reduce environmental pressure. On the other hand, this is evidenced by reduced pollutant emissions, the structure of which is consistent with the priority goals of the current climate and energy/zero emission policy.

Answer to question 3. Regulations on non-financial reporting are one of the factors motivating enterprises to take pro-environmental activities. This is evidenced by the information presented on activities undertaken and planned in this area, the investment outlays incurred, and their effects, which are more and more precise and relativised in relation to the applicable climate and energy goals, as well as the reduction of environmental pressure. However, the heterogeneity and incompleteness of the data make it difficult to precisely determine the extent to which regulations were a motivator for pro-protection activities.

The research results not only reflect a positive relationship between reporting environmental information and reducing the environmental pressure of enterprises in the context of adapting to Directive 204/95/EU and subsequent regulations in this area but also indicate that fulfilling this obligation does not worsen their economic situation. As the reduction in environmental pressure was accompanied by an increase in the sold production. This, therefore, refutes opponents' argument for implementing further recommendations in the field of environmental reporting regarding the unprofitability of this process. Therefore, the presented results may contribute to its dissemination.

The analyses carried out do not satisfy the span of the issue discussed. It could be interesting to examine the connection between the level of adaptation of entities to the new ESG reporting requirements resulting from the new CSRD Directive and the level of achievement of climate and energy goals, not only in the chemical sector but also in other sectors of the economy.

The contribution of the authors

Conception, B.K. and M.K.; literature review, B.K.; acquisition of data, M.K.; analysis and interpretation of data, B.K. and M.K.

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Barbara KRYK • Małgorzata KOŻUCH

UREGULOWANIA UE W ZAKRESIE RAPORTOWANIA ROZWOJU ZRÓWNOWAŻONEGO JAKO DETERMINANTA OGRANICZANIA PRESJI ŚRODOWISKOWEJ PRZEDSIĘBIORSTW CHEMICZNYCH W POLSCE

STRESZCZENIE: Kończy się okres obowiązywania Dyrektywy 2014/95/UE, która nałożyła na przedsiębiorstwa obowiązek prezentowania informacji niefinansowych w odrębnych raportach niefinansowych, tzw. ESG. Postanowiono sprawdzić jakie są jej efekty i przepisów do niej komplementarnych oraz realnych działań w obszarze środowiskowym. Są prace, w których analizowano różne aspekty raportowania niefinansowego w kontekście Dyrektywy, w tym kilka o raportowaniu ESG w relacji do emisji zanieczyszczeń powietrza. Nie badano jednak czy istnieje związek pomiędzy poziomem raportowania a efektami działań prośrodowiskowych w kontekście oddziaływania nań uregulowań. Stwierdzono lukę badawczą w tym zakresie. Stąd celem artykułu jest zbadanie, jak wybrane przedsiębiorstwa chemiczne w Polsce dostosowują się do wytycznych unijnych o raportowaniu ESG w wymiarze środowiskowym i czy miało to wpływ na ograniczenie ich presji na środowisko. Okres badawczy to lata 2010-2022. W trzyetapowym badaniu zastosowano podejście metodologiczne ilościowo-jakościowe. W etapie pierwszym i trzecim wykorzystano metody statystyki opisowej i analizy szeregów czasowych. W drugim zaś metody: analizy treści, analizy przypadków, GES Risk Rating, eksperckiej. Przeprowadzone analizy umożliwiły konkluzję o wpływie uregulowań raportowania niefinansowego na presję środowiskową.

SŁOWA KLUCZOWE: raportowanie ESG, Dyrektywa 2014/95/UE, sektor chemiczny, działania prośrodowiskowe, efekty środowiskowe