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THE RELATIONSHIP BETWEEN THE ESG DISCLOSURE LEVELS AND THE FINANCIAL PERFORMANCE OF INDUSTRIAL ENTERPRISES IN POLAND

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Abstract:
The importance of environmental, social, and governance (ESG) factors has been steadily increasing, and their integration into corporate operations is now widely recognized as one of the key drivers of long-term value creation and competitive advantage. These issues are of particular relevance in the industrial sector, which is characterized by high capital intensity and considerable impacts on both the natural environment and the broader social context. The aim of this study was to assess the relationship between the level of ESG disclosures and selected financial performance indicators of the ORLEN Group. The study was conducted as a case study covering the period 2017-2023 and examined the evolution of the company's ESG disclosure practices prior to the mandatory application of the Corporate Sustainability Reporting Directive (CSRD) and the European Sustainability Reporting Standards (ESRS). While the analysed period largely predates the implementation of these regulatory frameworks, the study provides indirect insights into the reporting foundations that may have supported the company's subsequent adaptation to the new sustainability reporting requirements. The study employed an original methodology for assessing the level of ESG disclosures, based on an analysis of the extent of disclosures reported in accordance with the Global Reporting Initiative (GRI) Standards. This approach enabled the development of a synthetic ESG index, as well as its environmental, social, and governance sub-indices. The company's financial performance was evaluated using profitability ratios, margin indicators, and the cost of debt. The relationships between the level of ESG disclosure and financial performance were examined through comparative analysis and correlation coefficients. The results indicate a substantial increase in the level of ESG reporting within the ORLEN Group, reflected in the rise of the overall ESG index from 46.99% in 2017 to 90.10% in 2023. The strongest positive relationship between the ESG index and financial performance was observed for the EBITDA margin, whereas the associations with the remaining indicators were weaker and less conclusive. The findings indicate a systematic increase in the level of ESG disclosure intensity within the ORLEN Group over the analysed period. At the same time, the relationship between the level of ESG disclosures and corporate financial performance remains ambiguous and appears to be influenced by the specific characteristics of the fuel and energy sector.

Key words: sustainable development, ESG, financial performance, correlation analysis

INTRODUCTION

In recent years, the importance of environmental, social, and governance (ESG) factors in corporate operations has increased substantially. This trend is driven both by evolving regulatory requirements and by growing stakeholder expectations regarding organizational responsibility for the impacts of business activities. ESG standards are particularly important in the industrial sector, whose operations are

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characterized by intensive resource consumption, significant environmental impacts, and the need to manage complex operational and social risks.

Industrial enterprises belong to the group of entities that exert a considerable influence on the natural environment through the consumption of raw materials and energy, as well as through the generation of greenhouse gas emissions and waste. At the same time, the sector plays a crucial role in achieving the objectives of the European Green Deal and supporting the transition toward a more sustainable economic model [1]. The ESG disclosures in industrial enterprises encompasses, among other measures, efforts aimed at reducing negative environmental impacts, improving energy and resource efficiency, adopting innovative production technologies, strengthening corporate social responsibility, and enhancing governance practices.

The intensity of ESG disclosures may be associated with the financial performance of industrial enterprises. On the one hand, it involves additional investment expenditures and operational costs. On the other hand, it may contribute to enhanced corporate transparency, improved reputation, and reduced information asymmetry between the company and its stakeholders. However, the existing literature has not reached a clear consensus regarding the nature and strength of the relationship between the level of ESG disclosures and corporate financial performance, as set out in the following sections of this article. Furthermore, relatively few studies focus on companies operating in the fuel and energy sector and assess ESG disclosure levels based on the Global Reporting Initiative (GRI) Standards. Limited attention has also been devoted to large industrial companies operating in Poland, particularly those characterised by high capital intensity and substantial environmental and social impacts. Consequently, further research is needed to improve understanding of the relationship between ESG disclosure levels and the financial performance of such enterprises. Consequently, this issue represents an important area of research, contributing to a better understanding of the relationship between ESG reporting and corporate economic performance. Accordingly, the following research question was formulated: to what extent did the level of ESG disclosures co-vary with selected financial indicators of the examined company over the period 2017-2023?

In the context of the adopted research problem, the aim of this article is to investigate the relationship between ESG disclosure intensity and selected financial performance indicators, based on a case study of the ORLEN Group. The selection of the company was motivated by its prominent position within the Polish industrial and energy sectors, the scale of its operations, and its active involvement in the energy transition process. An additional argument supporting the choice of the ORLEN Group was the availability of data disclosed in annual reports, integrated reports, and consolidated financial statements, which enables a comprehensive analysis of the research problem.

EUROPEAN UNION REGULATORY FRAMEWORK AND ESG REPORTING STANDARDS

The growing importance of ESG factors in investment decision-making has been strongly supported by the actions of regulatory institutions. The European Union has initiated a comprehensive process of policy and legislative reforms under the framework of the European Green Deal. The overarching objective of this strategy is to transform the EU economy and achieve climate neutrality by 2050. The realization of these ambitions requires substantial investments and the active involvement of both the public and private sectors. Consequently, the European regulatory framework has expanded the scope of climate- and sustainability-related disclosures required from companies and financial institutions, thereby facilitating investors' assessment of the sustainability profile of investments and promoting capital allocation toward climate protection and sustainable development initiatives [2].

The introduction of mandatory non-financial reporting requirements in Europe began with Directive 2014/95/EU, commonly referred to as the Non-Financial Reporting Directive (NFRD), which entered into force in 2014. Under its provisions, non-financial reporting was required to cover environmental, social and employee-related matters, respect for human rights, and anti-corruption and anti-bribery issues [3]. In Poland, these requirements were transposed into national legislation through the 2016 amendment to the Accounting Act [4]. Large public-interest entities became obligated to disclose information concerning their business models, key non-financial performance indicators, policies implemented, due diligence

procedures, and significant risks associated with their operations. Despite its pioneering role, the NFRD framework allowed considerable flexibility regarding the selection of indicators and the presentation of information. As a result, non-financial reports often lacked comparability, while the disclosed information tended to be predominantly descriptive in nature. This limited their usefulness for investors and increased the risk of greenwashing practices [5].

To address these shortcomings, the European Parliament and the Council adopted Directive (EU) 2022/2464, known as the CSRD [6]. Its implementation marked a transition from relatively flexible sustainability reporting practices toward a more formalized, standardized, and verifiable ESG reporting framework. Environmental, social, and governance considerations became integral components of corporate strategy, risk management, and mandatory disclosure requirements. The CSRD introduced three fundamental changes. First, it significantly expanded the number of entities subject to sustainability reporting obligations. Second, ESG disclosures were incorporated into the management report and became subject to mandatory assurance. Third, the Directive introduced the principle of double materiality, according to which companies are required to report both the impact of their activities on society and the environment and the effects of ESG-related factors on their financial position, business performance, and development prospects [6, 7].

The practical implementation of the CSRD requirements is ensured through the ESRS. These standards establish a common framework for the disclosure of environmental, social, and governance information, thereby enhancing its transparency, consistency, and comparability [7]. The first set of ESRS comprises two cross-cutting standards (ESRS 1 and ESRS 2) as well as a series of topical standards covering specific ESG dimensions.

Within the environmental pillar, the ESRS address climate change, pollution, water and marine resources, biodiversity and ecosystems, and the circular economy. The social standards focus on a company's own workforce, workers in the value chain, affected communities, and consumers and end-users. At the same time, ESRS G1 addresses business conduct, corporate ethics, and anti-corruption measures. Importantly, the ESRS framework extends beyond the disclosure of quantitative indicators. Companies are also required to provide information regarding their business model, strategy, ESG policies, objectives, actions, and material impacts, risks, and opportunities. Particular attention is given to ESRS E1 *Climate Change*, which requires the disclosure of greenhouse gas emissions across Scopes 1, 2, and 3, covering direct emissions, emissions associated with purchased energy, and emissions generated throughout the value chain, respectively [6].

The introduction of the ESRS aims to enhance the consistency, comparability, and reliability of ESG-related information. For companies subject to these regulations, sustainability reporting has become an integral component of mandatory corporate disclosure, closely linked to business strategy, management systems, and risk assessment processes.

In subsequent years, the scope of the CSRD was partially revised. Directive (EU) 2026/470 limited the reporting obligation to the largest enterprises while preserving the principle of double materiality [8]. At the same time, the European Commission adopted revised ESRS standards designed to simplify reporting requirements and reduce administrative burdens. Despite these modifications, the fundamental objectives of the European sustainability reporting framework have remained unchanged, continuing to focus on the provision of comparable and reliable ESG information to market participants.

An important complement to the EU ESG regulatory framework is Regulation (EU) 2020/852, commonly referred to as the EU Taxonomy Regulation. This regulation establishes a common classification system for determining whether an economic activity can be considered environmentally sustainable. To qualify as Taxonomy-aligned, an activity must make a substantial contribution to at least one of the six environmental objectives, cause no significant harm to the remaining objectives, and comply with specified social and technical screening criteria [9]. Companies subject to disclosure requirements must report the proportion of their turnover, capital expenditures (CAPEX), and operating expenditures (OPEX) associated with Taxonomy-aligned activities. These disclosures provide investors and financial institutions with

valuable information for assessing the extent to which a company's operations are aligned with the European Union's environmental objectives and for evaluating ESG-related risks [10, 11].

In addition to European sustainability reporting regulations, GRI Standards constitute one of the most widely adopted frameworks for non-financial reporting worldwide. The GRI Standards provide an internationally recognized framework that enables organizations to disclose information regarding their economic, environmental, and social impacts. Initially, companies relied on successive generations of the GRI guidelines (G1-G4), with particular significance attributed to the G4 version released in 2013. This framework introduced a stronger emphasis on the principle of materiality, according to which organizations should focus their reporting on those environmental, social, and economic issues that are most relevant to their operations and stakeholders. This approach marked a shift away from maximizing the number of disclosures towards reporting information of the greatest relevance and decision-making value [12]. In 2016, the GRI Guidelines were replaced by the modular GRI Standards framework. The current system comprises three categories of standards: Universal Standards, Topic Standards, and Sector Standards [13]. The Universal Standards establish the fundamental principles of sustainability reporting and provide guidance on identifying material topics. The Topic Standards contain detailed disclosure requirements relating to specific ESG issues, while the Sector Standards address the particular characteristics of individual industries and are intended to enhance the comparability of disclosures among companies operating in similar economic environments [13, 14]. Of particular relevance to the present study are the Topic Standards, which encompass detailed environmental, social, and governance-related disclosures [13].

The literature further emphasizes that the GRI Standards constitute one of the most important reference frameworks in the development of contemporary sustainability reporting regulations [15]. The most recent revision, published in 2021, was designed, among other objectives, to strengthen the alignment of GRI reporting with emerging regulatory requirements, including those arising from the CSRD and ESRS. Consequently, the GRI framework is widely regarded as a key tool supporting organizations in adapting their sustainability reporting practices to the evolving European regulatory landscape [16].

Despite the differing objectives and characteristics of the two frameworks, a high degree of alignment exists between the GRI Standards and the ESRS. This compatibility enables companies to leverage the experience gained through GRI-based reporting when adapting to the requirements imposed by EU sustainability regulations. To facilitate their complementary application, GRI and the European Financial Reporting Advisory Group (EFRAG) jointly developed an interoperability index that identifies the relationships between corresponding disclosure requirements under both frameworks [6, 7, 17].

THE IMPACT OF ESG FACTORS ON CORPORATE FINANCIAL PERFORMANCE AND THE COST OF CAPITAL

The impact of ESG factors on corporate financial performance may be both direct and indirect. The individual ESG pillars influence business operations through different mechanisms. The environmental pillar primarily affects operating costs and exposure to regulatory risks, the social pillar influences employee productivity, corporate reputation, and stakeholder relations, while the governance pillar affects the quality of management and the level of organizational risk. Each of these dimensions may generate both benefits and costs; therefore, the impact of ESG on financial performance is neither universal nor unequivocal [18].

Research examining the relationship between ESG practices and corporate financial performance has, for many years, pointed to predominantly positive effects associated with the implementation of sustainability principles. One of the most influential contributions in this field is the meta-analysis conducted by Friede, Busch, and Bassen, covering approximately 2,200 empirical studies. The authors demonstrated that nearly 90% of the studies reported a non-negative relationship between ESG transparency and corporate financial outcomes, with the majority indicating a positive effect of ESG practices on financial performance [19]. This relationship is further supported by a report published by the NYU Stern Center for Sustainable Business, which reviewed more than 1,000 studies published between 2015 and 2020. The authors found that 58% of the studies examining corporate performance reported a positive impact of ESG factors on financial indicators such as return on assets (ROA), return on equity (ROE), and firm market

value [20]. More recent studies have likewise confirmed the positive influence of ESG practices on corporate efficiency and financial outcomes [21, 22, 23, 24, 25], providing further evidence of the economic rationale for implementing ESG practices.

At the same time, some studies have reported either a negative relationship or no statistically significant association between ESG practices and financial results [26, 27, 28, 29]. These findings suggest that the outcomes of ESG implementation depend on industry characteristics, regional context, and firm-specific attributes [18, 19]. Consequently, the relationship between the degree of ESG implementation and profitability may take the form of a U-shaped curve, whereby initial implementation costs are gradually offset by subsequent economic benefits [30]. As a result, the positive effects of ESG practices on corporate profitability are often observable only in the medium to long term [31].

The indirect impact of ESG factors on corporate financial performance primarily stems from their influence on access to capital, investor relations, credit ratings, and the overall risk profile of a company. Strong ESG transparency may contribute to lower financing costs, greater stability of cash flows, and reduced regulatory and reputational risks. At the same time, growing investor interest in ESG criteria may increase the cost of financing for firms with poor environmental performance. Furthermore, effective climate risk management can have a positive effect on both credit ratings and the cost of debt financing [32]. Particular importance is attributed to the governance pillar, which, through enhanced transparency, effective oversight mechanisms, and the prevention of managerial misconduct, can strengthen investor confidence and improve financial performance [18, 32]. Empirical evidence suggests that companies demonstrating strong environmental responsibility often achieve more stable financial results, with a lower cost of capital being one of the key factors explaining this relationship [32, 33, 34]. An MSCI study covering companies from both developed and emerging markets found that firms with high ESG ratings generally exhibited a lower cost of equity and a lower cost of debt compared with companies receiving poor ESG ratings. Moreover, improvements in ESG ratings were associated with reductions in financing costs [35]. Similar conclusions were reached by Yan, Cheng, and Ong (2024) in their analysis of Chinese enterprises. The authors observed that higher ESG practices contributed to a lower cost of debt capital, with this relationship being partially explained by a reduction in corporate default risk [36]. In contrast, Ernst and Woithe (2024), in their study of companies included in the S&P 500 Index, found that although the results suggested certain associations between ESG factors and corporate financing costs, no statistically significant relationship was identified between ESG practices and the weighted average cost of capital (WACC). These findings indicate that the relationship between ESG factors and financing costs may be more complex than previously assumed and potentially contingent upon firm-specific and market-related characteristics [37].

Research on the relationship between ESG and corporate financial performance in Central and Eastern European countries remains relatively limited compared to the extensive body of evidence available for Western Europe and the United States. Within the Central and Eastern European context, particular attention should be given to the study conducted by Siwiec and Karkowska (2024), which examined companies operating in the region over the period 2017-2021. The authors identified a positive relationship between ESG reporting and return on assets (ROA), while also highlighting significant differences across sectors of the economy. These findings suggest that the impact of ESG practices on financial performance may be strongly influenced by industry-specific characteristics [38].

A similar research stream has also been developing in Poland. Existing studies have examined both broad samples of listed companies [39, 40, 41] and specific sectors of the economy, including the energy sector [42], industrial enterprises [43] the banking sector [44, 45, 46], and investment funds [47]. Despite the diversity of methodological approaches, most studies have focused on examining the relationship between aggregated ESG measures and corporate financial performance. However, the findings remain inconclusive. While some studies point to a positive effect of sustainability-related activities on corporate performance, others suggest that both the direction and strength of this relationship depend on the ESG measurement approach adopted, industry-specific characteristics, and the broader institutional environment.

Despite the growing number of publications, relatively little attention has been paid to the development of ESG disclosures based directly on reported GRI indicators within large industrial enterprises. This research gap is particularly evident in the fuel, energy, and petrochemical sectors. Companies operating in these industries face substantial regulatory and societal pressure associated with environmental protection, the energy transition, and increasing stakeholder expectations regarding transparency and accountability. At the same time, these sectors are highly capital-intensive, which may affect the relationship between the development of ESG practices and financial performance. Despite the economic significance of these industries, there remains a lack of in-depth case-study research focusing on large industrial enterprises operating in Poland and other Central and Eastern European countries. Such studies could provide valuable insights into how ESG disclosure practices evolve over time and how they relate to corporate financial outcomes in sectors characterized by substantial environmental impact and investment intensity. The inconclusive nature of the relationship between ESG practices and corporate financial outcomes underscores the need to employ a diverse set of indicators when assessing business performance. ESG initiatives may influence various dimensions of corporate performance, including the efficiency of asset and equity utilization, sales profitability, and access to financing. Consequently, different financial metrics may capture distinct channels through which ESG practices affect firm performance.

For this reason, the empirical analysis presented in this study employs return on assets (ROA), return on equity (ROE), net profit margin, EBITDA margin, and the cost of debt. Together, these indicators enable a multidimensional assessment of the impact of ESG standards implementation on the financial performance of enterprises. While ROA and ROE reflect the efficiency with which a company utilizes its assets and shareholders' capital, profit margins provide insight into operational profitability. The cost of debt, in turn, serves as an indicator of the company's financing conditions and perceived risk from the perspective of creditors. The combined use of these measures allows for a comprehensive evaluation of the financial implications associated with ESG disclosures.

RESEARCH METHODOLOGY

The study was conducted using the case study method, with the ORLEN Group serving as a representative of the fuel and energy sector. The selection of the company was motivated by its prominent position within the industry, as well as the availability of data enabling an analysis of changes in the level of ESG disclosures and their potential relationship with financial performance.

The empirical analysis was based on annual reports, integrated reports, and consolidated financial statements published by the ORLEN Group. The assessment of the level of ESG disclosure was conducted through an examination of disclosures reported in accordance with the GRI Standards. It was assumed that the scope of disclosed information reflects the degree of formalization of corporate activities undertaken within the environmental, social, and governance dimensions.

For the purposes of this study, an original ESG index was developed. Its construction was based on an analysis of selected disclosure requirements specified in the GRI Standards. For each analyzed disclosure item, it was determined whether the relevant information had been reported by the company. A value of 1 was assigned when a disclosure was present and a value of 0 when it was absent. Subsequently, separate sub-indices were calculated for each ESG pillar: the Environmental (E), Social (S), and Governance (G) indices. Each sub-index was expressed as the proportion of disclosed items relative to the total number of disclosure requirements analyzed within the respective area. The overall ESG index was then calculated as the arithmetic mean of the E, S, and G indices, with equal weights assigned to each pillar. This approach was based on the assumption that environmental, social, and governance dimensions constitute complementary and interdependent components of the ESG framework. Assigning equal weights to each pillar avoided the arbitrary prioritization of any single dimension and enhanced the transparency and interpretability of the composite index. To enhance the reliability of the coding procedure, uniform criteria for classifying individual ESG disclosures were developed prior to the commencement of the analysis. Each indicator was subject to a binary assessment, whereby a value of 1 was assigned only when information corresponding to a given disclosure was identified in the company's report, while a value of 0 indicated

the absence of such information. To ensure consistency, the same coding rules were applied across all years and reports included in the study. Furthermore, for indicators whose nomenclature changed following the transition from the GRI G4 Guidelines to the GRI Standards, their substantive equivalents were identified and incorporated into the analysis, thereby ensuring the comparability of results throughout the entire study period.

The analysis covered the period 2017-2023, corresponding to the years preceding the ORLEN Group's mandatory compliance with the CSRD. The selected research horizon enabled an assessment of the evolution of the company's approach to ESG issues prior to the introduction of the new sustainability reporting requirements. The choice of this period was further justified by the intention to determine whether the development of sustainability-related practices had been proactive in nature and constituted a foundation for meeting the CSRD requirements, which became applicable to the ORLEN Group for the 2024 financial year.

The company's financial position was assessed using data contained in the consolidated financial statements for the years 2015-2024. The analysis employed indicators of return on assets (ROA), return on equity (ROE), net profit margin, EBITDA margin, and the cost of debt servicing. These indicators were selected due to their widespread use in evaluating corporate performance and a firm's ability to generate financial returns.

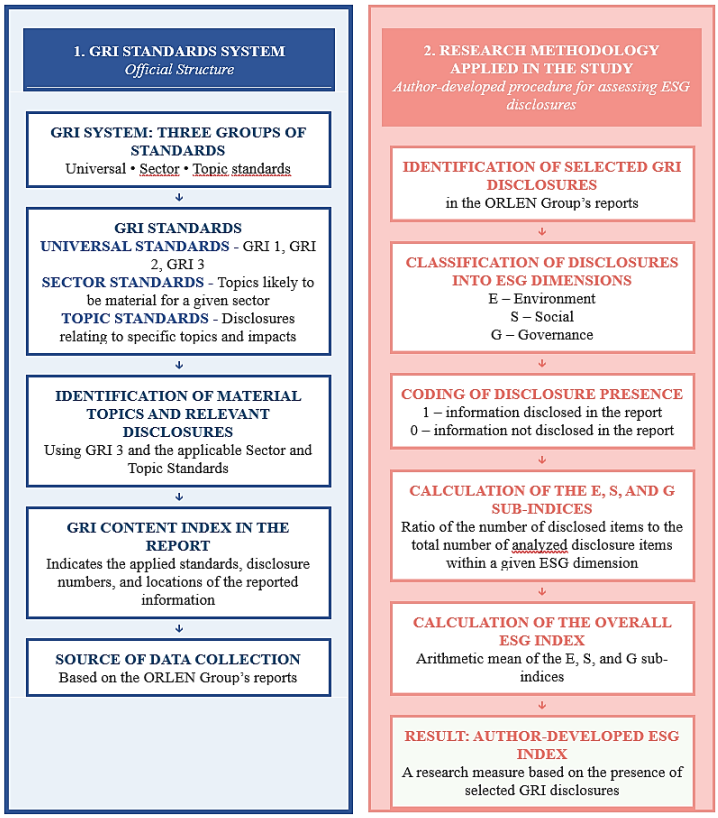


Fig. 1 Structure of the GRI Standards and their application in the empirical analysis

Alt-text: *fig. 1 presents a two-stage research methodology based on GRI Standards. First, Universal, Sector, and Topic Standards were used to identify material topics and disclosures in the ORLEN Group's reports. Next, an author-developed ESG assessment procedure was applied, including the classification of disclosures into Environmental (E), Social (S), and Governance (G) dimensions, coding their presence in reports, and calculating sub-indices and the overall ESG index. The result is an author-developed ESG indicator based on the extent of GRI-related disclosures.*

Source: authors' own elaboration based on [12, 13, 48].

The relationship between the level of ESG disclosures and financial performance was examined by comparing changes in the overall ESG Index with changes in the selected financial indicators over time. To

complement the analysis, Pearson's and Spearman's correlation coefficients were calculated using observations covering the period 2017-2023. The application of both measures enabled the assessment of the direction and strength of the relationship between the level of ESG disclosures and the analyzed indicators of financial performance. The correlation results were subsequently used to evaluate the co-movement of the examined variables and to identify those areas in which ESG disclosure intensity appeared to be most closely associated with the company's financial condition. The structure of the GRI Standards framework and its application within the empirical analysis are presented in Figure 1.

RESULTS AND DISCUSSION

ANALYSIS OF THE IMPACT OF ESG DISCLOSURES ON FINANCIAL PERFORMANCE - THE EVIDENCE FROM THE ORLEN GROUP

Assessment of ESG Disclosure Intensity

Analysis of environmental performance indicators

First, an analysis of disclosures relating to the environmental dimension was conducted. The detailed results are presented in Table 1.

Table 1

Disclosure of Environmental GRI Indicators by the ORLEN Group in 2017-2023

Indicator		Description	Year						
Previous Standard (until 2018)	**Revised Standard (from 2018 onwards)**		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
G4-EN1	301-1	Materials used by weight or volume	0	1	1	1	1	0	0
G4-EN3	302-1	Energy consumption within the organization	1	1	1	1	1	1	1
G4-EN5	302-3	Energy intensity	0	0	0	0	1	1	1
G4-EN6	302-4	Reduction of energy consumption	1	1	1	0	0	0	1
G4-EN8	303-1	Water and effluents management	1	1	1	1	1	1	1
G4-EN9	303-2	Management of water discharge-related impacts	0	0	0	0	0	1	1
G4-EN10	303-3	Water withdrawal	0	1	1	1	1	1	1
-	303-4	Water discharge	0	0	0	1	1	1	1
-	303-5	Water consumption	0	0	0	0	1	1	1
G4-EN11	304-1	Operational sites owned, leased, managed in, or adjacent to protected areas and areas of high biodiversity value outside protected areas	0	0	0	1	1	1	1
G4-EN12	304-2	Significant impacts of activities, products, and services on biodiversity	0	0	0	1	0	1	1
G4-EN13	304-3	Habitats protected or restored	0	0	0	1	1	1	1
G4-EN14	304-4	IUCN Red List species and national conservation list species with habitats in areas affected by operations, by level of extinction risk	1	1	1	1	1	1	1
G4-EN15	305-1	Direct (Scope 1) GHG emissions	1	1	1	1	1	1	1
G4-EN16	305-2	Energy indirect (Scope 2) GHG emissions	0	0	0	0	1	1	1
-	305-6	Emissions of ozone-depleting substances (ODS)	0	1	1	1	1	0	0
G4-EN21	305-7	NOx, SOx, and other significant air emissions	1	1	1	1	1	1	1

G4-EN22	306-1	Waste generation and significant waste-related impacts	1	1	1	1	1	1	1
G4-EN23	306-2	Management of significant waste-related impacts	1	1	1	1	1	1	1
G4-EN24	306-3	Waste generated	0	1	1	1	1	1	1
-	306-4	Waste diverted from disposal	0	1	1	1	1	1	1
-	306-5	Waste directed to disposal	0	0	0	0	1	1	1
G4-EN29	307-1	Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations	1	1	1	1	1	0	0
G4-EN32	308-1	New suppliers that were screened using environmental criteria	0	1	1	1	1	0	0

The selection of indicators was based on two main considerations. First, indicators considered relevant to the characteristics of the analysed sector were included. Second, the analysis was limited to indicators that were consistently reported or consistently not reported throughout the entire study period, which ensured the comparability of results over time.

The analysis covered 24 environmental indicators. These indicators related, among others, to material use, energy consumption and efficiency, water management, biodiversity, greenhouse gas emissions, other air pollutant emissions, waste management, and the environmental assessment of suppliers. The environmental dimension comprised the largest number of indicators among the three ESG pillars analyzed. This resulted from both the scope of the selected GRI Standards and the specific nature of the ORLEN Group's operations. Refining, petrochemical, upstream, and energy-related activities are inherently associated with the use of raw materials, energy consumption, emissions, water management, and waste generation. These factors may significantly affect a company's operating costs, capital expenditures, and regulatory risk exposure. However, the larger number of environmental indicators did not imply that the environmental pillar was assigned a greater weight in the calculation of the overall ESG index. Each of the three ESG pillars was given equal importance. The environmental index was calculated using the following formula:

$$E_t\ Index\ \frac{Number\ of\ environmental\ indicators\ disclosed\ in\ year\ t}{24}\ x\ 100\%, \quad (1)$$

where:

t denotes the year under analysis, corresponding to one of the years within the 2017-2023 period.

The social and governance indices were calculated in an analogous manner, using the corresponding disclosure data for each respective area. The results of the calculations are presented in Table 2.

Table 2

Environmental Index Results for the ORLEN Group

Environmental Dimension (E)	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Number of Indicators	24	24	24	24	24	24	24
Indicators Disclosed	9	15	15	18	21	19	20
Score – Environmental Index (E)	37.50%	62.50%	62.50%	75.00%	87.50%	79.17%	83.33%

In 2017, a total of 9 out of 24 analyzed environmental indicators were identified in the report, corresponding to an Environmental Index (E) value of 37.50%. In 2018, the number of disclosed indicators increased to 15, resulting in an index value of 62.50%. In 2019, the Environmental Index remained at the same level. In 2020, 18 out of 24 indicators were disclosed, yielding an index value of 75.00%. In 2021, the number of disclosed indicators increased further to 21, and the Environmental Index reached its highest value during the analyzed period, amounting to 87.50%. The expansion of disclosures included,

among other areas, water management, biodiversity, indirect emissions, and waste management. In 2022, the number of disclosed indicators decreased to 19, resulting in an index value of 79.17%. In 2023, the number of disclosures increased to 20, corresponding to an index value of 83.33%. The absence of certain disclosures should not be interpreted as an indication of deteriorating environmental performance within the ORLEN Group; rather, it reflects changes in the scope of information reported according to the adopted disclosure checklist. Overall, the period 2017-2023 was characterized by a substantial expansion of environmental reporting practices. The value of the Environmental Index (E) increased by 45.83 percentage points, indicating a significant improvement in the scope and comprehensiveness of environmental disclosures over the analyzed period.

Analysis of social performance indicators

The next stage involved the analysis of disclosures related to the social dimension. The detailed results are presented in Table 3. Consistent with the principle of materiality, the analysis focused on indicators deemed relevant to the company's business activities and stakeholder expectations.

Table 3

Disclosure of Social GRI Indicators by the ORLEN Group in 2017-2023

Indicator		**Description**	**Year**						
Previous Standard (until 2018)	**Revised Standard (from 2018 onwards)**		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
G4-LA1	401-1	Total number and rate of new employee hires and employee turnover	0	1	1	1	1	1	1
G4-LA2	401-2	Benefits provided to full-time employees that are not provided to temporary or part-time employees	1	1	1	1	1	1	1
G4-LA5	403-1	Occupational health and safety management system	0	0	0	1	1	1	1
G4-LA6	403-2	Hazard identification, risk assessment, and incident investigation	1	1	1	1	1	1	1
-	403-3	Occupational health services	0	1	1	1	1	1	1
G4-LA8	403-4	Worker participation, consultation, and communication on occupational health and safety	1	1	1	1	1	1	1
-	403-5	Occupational health and safety training	0	0	0	1	1	1	1
-	403-6	Worker health promotion	0	0	0	1	1	1	1
-	403-7	Prevention and mitigation of occupational health and safety impacts directly linked by business relationships	0	0	0	1	1	1	1
-	403-8	Workers covered by an occupational health and safety management system	0	0	0	1	1	1	1
-	403-9	Work-related injuries	0	0	0	1	1	1	1
G4-LA7	403-10	Work-related ill health	1	0	0	1	1	1	1
G4-LA9	404-1	Average hours of training per year per employee	1	1	1	1	1	1	1
G4-LA10	404-2	Skills enhancement programs and transition assistance programs	1	1	1	1	1	1	1
G4-LA12	405-1	Diversity of governance bodies and employees	1	1	1	1	1	1	1

-	405-2	Ratio of basic salary and remuneration of women to men	0	0	0	0	0	1	1
-	406-1	Incidents of discrimination and corrective actions taken	0	0	0	0	0	1	1
G4-SO1	413-1	Operations with local community engagement, impact assessments, and development programs	0	0	0	0	0	1	1
G4-SO2	413-2	Operations with significant actual and potential negative impacts on local communities	0	0	0	0	0	1	1
G4-SO6	415-1	Total monetary value of political contributions by country and recipient/beneficiary	0	0	0	1	1	1	1
G4-PR2	416-2	Incidents of non-compliance concerning the health and safety impacts of products and services	1	1	1	1	1	1	0
G4-PR3	417-1	Requirements for product and service information and labelling	1	1	1	1	1	1	0
G4-PR8	418-1	Substantiated complaints concerning breaches of customer privacy and losses of customer data	1	1	1	1	1	1	0

The analysis covered 23 social indicators. These indicators related, among other areas, to employment, employee benefits, occupational health and safety, workplace accidents, occupational diseases, training and employee development, diversity, anti-discrimination measures, impacts on local communities, product safety, and customer data protection. Using the data on disclosed indicators, a Social Index (S) was calculated in accordance with the methodology adopted in this study. The results of the calculations are presented in Table 4.

Table 4

Social Index Results for the ORLEN Group

Social Dimension (S)	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Number of Indicators	23	23	23	23	23	23	23
Indicators Disclosed	10	11	11	19	19	23	20
Score – Social Index (S)	43.48%	47.83%	47.83%	82.61%	82.61%	100.00%	86.96%

In 2017, 10 out of the 23 analyzed social indicators were disclosed, corresponding to a Social Index value of 43.48%. In 2018, the number of disclosed indicators increased to 11, resulting in an index value of 47.83%. The same level was maintained in 2019. A substantially greater expansion of social reporting occurred in 2020, when the number of disclosed indicators increased to 19, raising the Social Index to 82.61%. An identical result was recorded in 2021. The expansion of disclosures particularly concerned information related to the occupational health and safety (OHS) management system, hazard identification procedures, health and safety training, health promotion initiatives, and workplace accidents. In 2022, all 23 analyzed disclosure items were reported, enabling the Social Index to reach 100.00%. In 2023, however, 20 out of 23 indicators were disclosed, resulting in a decline of the index to 86.96%. This decrease was attributable to the absence of three disclosures concerning the impacts of products and services on health and safety, product and service labeling, and customer privacy breaches and data losses. Compared with 2017, the value of the Social Index increased by 43.48 percentage points. Overall, the results indicate a significant expansion in the scope of social disclosures over the analyzed period, although the changes did not follow a consistently upward trend in every consecutive year.

Analysis of corporate governance indicators

Within this dimension, the analysis covered 15 indicators assigned to the governance pillar (Table 5). As in the previous two dimensions, the selection of indicators was based on their relevance to the

company's operations and the availability of comparable disclosures throughout the entire period under analysis.

Table 5

Disclosure of Corporate Governance GRI Indicators by the ORLEN Group in 2017-2023

Indicator		Description	Year						
Previous Standard (until 2018)	**Revised Standard (from 2018 onwards)**		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
G4-7	102-5	Ownership and legal form	1	1	1	1	1	1	1
G4-56	102-16	The organization's values, principles, standards, and norms of behaviour, such as codes of conduct and codes of ethics	1	1	1	1	1	1	1
G4-57	102-17	Internal and external mechanisms for seeking advice on ethical and lawful behaviour, and matters related to organizational integrity	1	1	1	1	1	1	1
G4-34	102-18	Governance structure of the organization, including committees of the highest governance body responsible for economic, environmental, and social decision-making	1	1	1	1	1	1	1
G4-38	102-22	Composition of the highest governance body and its committees by gender and other diversity indicators	0	1	1	1	1	1	1
-	102-35	Remuneration policies	0	1	1	1	1	1	1
G4-24	102-40	List of stakeholder groups engaged by the organization	1	1	1	1	1	1	1
G4-11	102-41	Employees covered by collective bargaining agreements	1	1	1	1	1	1	1
G4-25	102-42	Basis for identification and selection of stakeholders with whom to engage	1	1	1	1	1	1	1
G4-26	102-43	Approaches to stakeholder engagement, including frequency of engagement by type and stakeholder group	1	1	1	1	1	1	1
G4-27	102-44	Key topics and concerns raised through stakeholder engagement	1	1	1	1	1	1	1
G4-SO3	205-1	Total number and percentage of operations assessed for risks related to corruption and the significant risks identified	0	1	1	1	1	1	1
G4-SO4	205-2	Communication and training on anti-corruption policies and procedures	0	1	1	1	1	1	1
G4-SO5	205-3	Confirmed incidents of corruption and actions taken	0	0	0	0	1	1	1
G4-LA12	405-1	Employees by employee category according to gender, age group, minority group membership, and other indicators of diversity	0	0	0	1	0	1	1

These indicators included, among others, ownership structure, the code of ethics, whistleblowing mechanisms, the composition of supervisory bodies, remuneration policies, stakeholder engagement practices, anti-corruption measures, and diversity-related issues. Based on the relevant data concerning

disclosed corporate governance indicators, the Governance Index (G) was calculated. The results of the analysis are presented in Table 6.

Table 6

Governance Index Results for the ORLEN Group

Governance Dimension (G)	2017	2018	2019	2020	2021	2022	2023
Number of Indicators	15	15	15	15	15	15	15
Indicators Disclosed	9	13	13	14	14	15	15
Score – Governance Index (G)	60.00%	86.67%	86.67%	93.33%	93.33%	100.00%	100.00%

The governance dimension exhibited the highest level of disclosures among the three ESG pillars analyzed. In 2017, the company disclosed 9 out of 15 governance indicators, corresponding to a Governance Index value of 60.00%. In 2018, the number of disclosed indicators increased to 13, resulting in an index value of 86.67%, which was maintained in 2019. In 2020, disclosures covered 14 out of the 15 indicators, yielding a Governance Index value of 93.33%. The same level was recorded in 2021. In both 2022 and 2023, all items included in the adopted disclosure framework were reported, enabling the Governance Index to reach 100.00%. The expansion of governance-related disclosures included, among others, information on remuneration policies, corruption risk assessments, anti-corruption training programs, confirmed incidents of corruption, and workforce and management diversity. The consistently high level of governance disclosures may be attributed to the reporting obligations associated with publicly listed companies, as well as to the extensive management and oversight structures characteristic of a large corporate group such as the ORLEN Group.

Construction of the overall ESG reporting index

Following the calculation of the E, S, and G sub-indices, a composite index measuring the overall level of ESG disclosures was developed. The underlying component results are presented in Table 7.

Table 7

Number of disclosed indicators within the ESG dimensions

Year	Dimension E		Dimension S		Dimension G	
	Number of disclosed indicators	E Index	Number of disclosed indicators	S Index	Number of disclosed indicators	G Index
2017	9 out of 24	37.50%	10 out of 23	43.48%	9 out of 15	60.00%
2018	15 out of 24	62.50%	11 out of 23	47.83%	13 out of 15	86.67%
2019	15 out of 24	62.50%	11 out of 23	47.83%	13 out of 15	86.67%
2020	18 out of 24	75.00%	19 out of 23	82.61%	14 out of 15	93.33%
2021	21 out of 24	87.50%	19 out of 23	82.61%	14 out of 15	93.33%
2022	19 out of 24	79.17%	23 out of 23	100.00%	15 out of 15	100.00%
2023	20 out of 24	83.33%	20 out of 23	86.96%	15 out of 15	100.00%

Given the varying number of indicators across the individual pillars, the overall score was not calculated by simply adding up all the values of 1. Such an approach would have meant that the environmental dimension, comprising 24 items, would have had a greater impact on the final score than the corporate governance dimension, comprising 15 items. Each dimension was assigned equal weighting. The overall ESG Index was calculated as the arithmetic mean of the E, S and G indices:

$$ESG_t\ Index = \frac{E_t\ Index + S_t\ Index + G_t\ Index}{3} \tag{2}$$

The overall ESG Index values for each year are shown in Table 8.

Table 8

Overall ESG Index values for the ORLEN Group

Year	E Index	S Index	G Index	ESG Index
2017	37.50%	43.48%	60.00%	46.99%
2018	62.50%	47.83%	86.67%	65.66%
2019	62.50%	47.83%	86.67%	65.66%
2020	75.00%	82.61%	93.33%	83.65%
2021	87.50%	82.61%	93.33%	87.81%
2022	79.17%	100.00%	100.00%	93.06%
2023	83.33%	86.96%	100.00%	90.10%

The overall ESG Index increased from 46.99% in 2017 to 90.10% in 2023. The total increase over the analyzed period amounted to 43.11 percentage points, indicating a substantial expansion in the scope of ESG-related disclosures. The largest year-on-year increase occurred between 2017 and 2018, when the index rose from 46.99% to 65.66%, representing an increase of 18.67 percentage points. In 2019, the index remained unchanged at 65.66%, while in 2020 it increased to 83.65%. In the following years, the index reached 87.81% in 2021 and 93.06% in 2022, the highest value recorded during the entire study period. In 2023, the overall ESG Index declined slightly to 90.10%. During that year, the governance pillar achieved the highest score, reaching 100.00%. The Environmental Index increased from 79.17% in 2022 to 83.33% in 2023, whereas the Social Index decreased from 100.00% to 86.96%. Despite the slight decline in the final year of the analysis, the overall level of ESG disclosures remained substantially higher than at the beginning of the study period. The values of the overall ESG Index are also presented graphically in Figure 2.

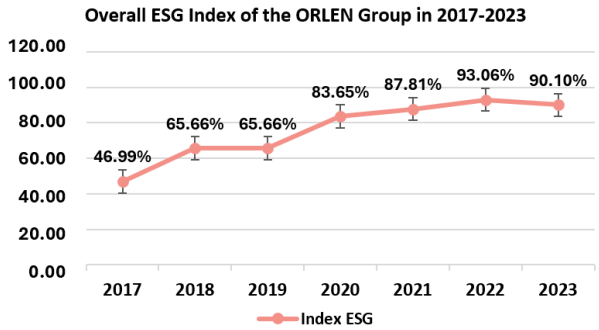


Fig. 2 Overall ESG Index of the ORLEN Group in 2017-2023

Alt-text: *Fig. 2 presents the Overall ESG Index of the ORLEN Group between 2017 and 2023. The index increased from 46.99% in 2017 to a peak of 93.06% in 2022, with the largest growth recorded between 2019 and 2020. In 2023, the index declined slightly to 90.10%, but remained significantly higher than at the beginning of the analyzed period.*

The graphical presentation confirms that the most significant expansion in disclosure coverage took place during the initial phase of the study period. Following 2020, the overall ESG Index stabilized at a relatively high level. The changes observed in the later years were primarily driven by differences in the scope of environmental and social disclosures.

Analysis of the Financial Performance of the ORLEN Group

Following the assessment of the level of ESG discosures, an analysis of the ORLEN Group's financial performance was conducted. The calculations were based on data obtained from the company's consolidated financial statements, including net profit, total assets, shareholders' equity, sales revenue, and EBITDA. Using these data, the indicators return on assets (ROA), return on equity (ROE), net profit margin, and EBITDA margin were calculated. In addition, the cost of debt servicing was estimated using

information on interest expenses incurred and the average level of interest-bearing debt. The results of the calculations are presented in Table 9.

Table 9

Selected Financial Performance Indicators of the ORLEN Group, 2015-2024 (%)

Year	ROA	ROE	Net profit margin	EBITDA margin	Cost of debt servicing
2015	6.72%	13.34%	3.66%	7.06%	2.60%
2016	10.33%	19.60%	7.22%	12.12%	2.54%
2017	11.82%	20.37%	7.52%	11.62%	3.03%
2018	8.74%	15.68%	5.11%	9.01%	2.75%
2019	6.04%	11.13%	3.87%	7.97%	2.37%
2020	3.37%	6.67%	3.28%	9.80%	2.59%
2021	10.48%	21.28%	8.52%	14.63%	2.15%
2022	12.35%	24.55%	12.12%	17.30%	3.80%
2023	7.85%	13.53%	5.56%	11.34%	3.94%
2024	0.54%	0.94%	0.47%	7.45%	2.98%

In 2016, compared with the previous year, all analyzed profitability indicators improved. ROA increased from 6.72% to 10.33%, ROE from 13.34% to 19.60%, net profit margin from 3.66% to 7.22%, and EBITDA margin from 7.06% to 12.12%. In 2017, further growth was observed in ROA, ROE, and net profit margin, which reached 11.82%, 20.37%, and 7.52%, respectively. The EBITDA margin declined slightly to 11.62%, although it remained above the level recorded in 2015. Between 2018 and 2020, the values of ROA, ROE, and net profit margin gradually decreased. In 2020, ROA amounted to 3.37%, ROE to 6.67%, and net profit margin to 3.28%. The EBITDA margin declined to 7.97% in 2019, before increasing to 9.80% in 2020. This indicates that the deterioration in net profitability in 2020 was more pronounced than the decline in earnings measured at the EBITDA level. A significant improvement in all analyzed profitability indicators was observed during 2021-2022. Their highest values were recorded in 2022, when ROA reached 12.35%, ROE 24.55%, net profit margin 12.12%, and EBITDA margin 17.30%. In 2023, all profitability indicators declined, and this downward trend continued in 2024. In that year, ROA amounted to 0.54%, ROE to 0.94%, net profit margin to 0.47%, and EBITDA margin to 7.45%. The EBITDA margin remained substantially higher than the net profit margin, indicating that the company's bottom-line financial performance was more heavily affected than earnings before interest, taxes, depreciation, and amortization. The cost of debt servicing of the ORLEN Group during the period 2015-2024 ranged between 2.15% and 3.94%. In 2015 and 2016, it remained relatively stable at 2.60% and 2.54%, respectively. In 2017, it increased to 3.03%, before declining to 2.75% in 2018 and 2.37% in 2019. In 2020, the cost of debt rose to 2.59%, while its lowest value was recorded in 2021, at 2.15%. During 2022-2023, the cost of debt increased substantially, reaching 3.80% and 3.94%, respectively. In 2024, the indicator declined to 2.98%. The results indicate that the cost of debt did not follow a uniform trend over the analyzed period, with its highest values occurring in 2022 and 2023. Changes in profitability ratios, profit margins, and the cost of debt are additionally illustrated in Figures 3, 4, and 5.

The similar trajectories of ROA and ROE (Fig. 3) indicate that both measures responded in a comparable manner to changes in the ORLEN Group's financial performance. However, ROE exhibited greater volatility, reflecting the fact that net profit was measured relative to shareholders' equity rather than total assets. Consequently, fluctuations in profitability had a more pronounced effect on ROE than on ROA, resulting in larger variations in the indicator over the analyzed period.

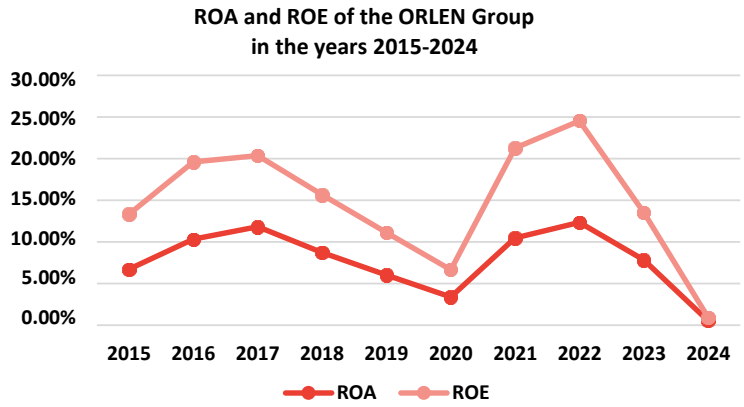


Fig. 3 ROA and ROE of the ORLEN Group in 2015-2024

Alt-text: *Fig. 3 presents the values of the ROA and ROE indicators of the ORLEN Group between 2015 and 2024. Both indicators followed a similar trend, reaching their highest levels in 2022 (ROA approximately 12.4% and ROE approximately 24.6%), after a decline in 2020 and a strong recovery in 2021-2022. In 2023, profitability decreased, and in 2024 both ROA and ROE fell to levels close to zero.*

The trajectory of the cost of debt servicing (Fig. 4) differed from the changes observed in profitability indicators. This suggests that financing conditions were influenced not only by the ORLEN Group's current financial performance but also by factors such as interest rate levels, the structure of debt financing, and broader market conditions. Consequently, fluctuations in the cost of debt reflected both company-specific determinants and external financial and economic factors.

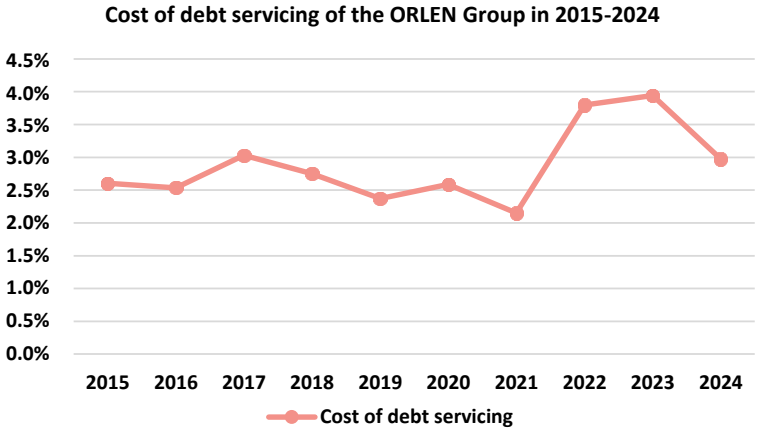


Fig. 4 Cost of debt servicing of the ORLEN Group in 2015-2024

Alt-text: *Fig. 4 presents the cost of debt servicing of the ORLEN Group in the years 2015-2024. Throughout the analyzed period, the indicator remained relatively stable until 2021, fluctuating between approximately 2.2% and 3.0%, with the lowest value recorded in 2021. In 2022-2023, the cost of debt servicing increased significantly to nearly 4.0%, before declining to approximately 3.0% in 2024*

A comparison of the net profit margin and EBITDA (Fig. 5), margin indicates that the EBITDA margin was generally higher and less sensitive to factors affecting net income.

Consequently, it was included in the subsequent analysis as a separate measure of operating performance, providing a clearer assessment of the company's core operational efficiency independent of financing costs, taxation, and depreciation or amortization expenses.

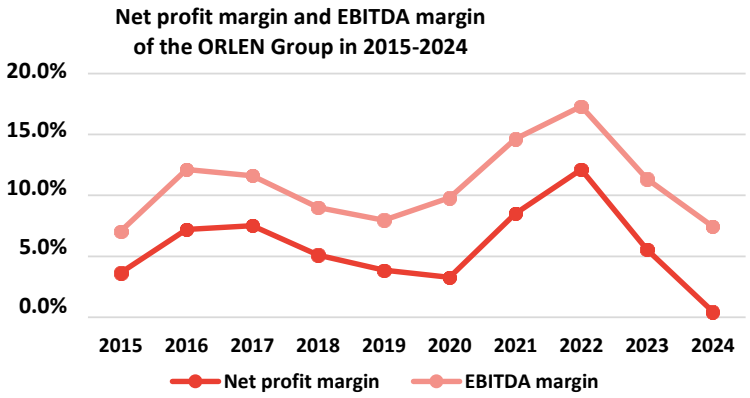


Fig. 5 Net profit margin and EBITDA margin of the ORLEN Group in 2015-2024

Alt-text: *Fig. 5 presents the net profit margin and EBITDA margin of the ORLEN Group between 2015 and 2024. Throughout the analyzed period, the EBITDA margin remained higher than the net profit margin, with both indicators reaching their highest values in 2022 (approximately 17.3% and 12.2%, respectively). Following a marked increase in 2021-2022, profitability declined in subsequent years, and by 2024 the net profit margin had fallen to a level close to zero, while the EBITDA margin stood at approximately 7.5%.*

Comparison of the ESG Index and Financial Performance Indicators

To examine the relationship between the level of ESG disclosures and financial performance, the values of the ESG Index were compared with the financial indicators recorded in the corresponding years (Table 10).

Table 10

ESG Index and Financial Performance of the ORLEN Group during the analysis period

Year	ESG Index	ROA	ROE	Net profit margin	EBITDA margin	Cost of debt servicing
2017	46.99%	11.82%	20.37%	7.52%	11.62%	3.03%
2018	65.66%	8.74%	15.68%	5.11%	9.01%	2.75%
2019	65.66%	6.04%	11.13%	3.87%	7.97%	2.37%
2020	83.65%	3.37%	6.67%	3.28%	9.80%	2.59%
2021	87.81%	10.48%	21.28%	8.52%	14.63%	2.15%
2022	93.06%	12.35%	24.55%	12.12%	17.30%	3.80%
2023	90.10%	7.85%	13.53%	5.56%	11.34%	3.94%

Between 2017 and 2018, the ESG Index increased from 46.99% to 65.66%, representing a rise of 18.67 percentage points. At the same time, all analysed profitability indicators declined. ROA decreased from 11.82% to 8.74%, ROE from 20.37% to 15.68%, net profit margin from 7.52% to 5.11%, and EBITDA margin from 11.62% to 9.01%. The cost of debt decreased from 3.03% to 2.75%. In 2019, the ESG Index remained unchanged at 65.66%, while profitability indicators deteriorated further, and the cost of debt decreased to 2.37%. In 2020, the ESG Index increased to 83.65%. During the same period, ROA, ROE, and net profit margin declined, whereas the EBITDA margin increased from 7.97% to 9.80%. The cost of debt increased to 2.59%. In 2021 and 2022, the growth of the ESG Index was accompanied by improvements in all analysed profitability measures. In 2022, the ESG Index reached 93.06%, while ROA, ROE, net profit margin, and EBITDA margin attained their highest values over the study period, amounting to 12.35%, 24.55%, 12.12%, and 17.30%, respectively. However, the cost of debt increased to 3.80%. In 2023, the ESG Index declined to 90.10%, and all profitability indicators deteriorated. At the same time, the cost of debt increased further to 3.94%. Therefore, a year-by-year comparison does not indicate a consistent relationship between changes in financial performance and changes in the ESG Index. The most pronounced simultaneous improvement in both the extent of ESG disclosures and profitability was observed during the period 2020-2022.

A more detailed year-by-year analysis indicates that the relationship between ESG disclosure levels and the financial performance of the ORLEN Group varied over time. During the initial period of the study (2017-2020), increases in the ESG Index were not accompanied by improvements in most of the financial indicators examined. This may suggest that the expansion of ESG disclosures did not translate directly into short-term improvements in corporate profitability, or that such effects were overshadowed by other factors affecting financial performance. A different pattern was observed in the period 2020-2022, when the increase in the ESG Index from 83.65% to 93.06% coincided with improvements across all analysed profitability indicators. The convergence of these trends may indicate the presence of a positive co-variation between ESG disclosure levels and corporate performance, particularly with regard to operational results. At the same time, the absence of similar patterns throughout the entire study period, together with the deterioration in financial performance observed in 2023 despite the maintenance of a high ESG Index level, suggests that the financial performance of the ORLEN Group was also influenced by a range of other factors, including market, regulatory, and macroeconomic conditions. The findings therefore suggest that the relationship between ESG disclosure levels and financial performance may be multidimensional in nature, and that its development is likely to be influenced by market, regulatory, and macroeconomic factors as well.

Correlation analysis

To investigate whether changes in the ESG Index were accompanied by changes in selected financial indicators of the ORLEN Group, a correlation analysis was conducted. Pearson's and Spearman's correlation coefficients were calculated. The Pearson correlation coefficient was used to assess the direction and strength of the linear relationship between variables, whereas the Spearman rank correlation coefficient was employed to determine whether an increase in one variable was associated with a systematic increase or decrease in another variable. The analysis was based on data from seven observation points covering the consecutive years of the 2017-2023 period. Given the limited sample size, the reported correlation coefficients should be interpreted as exploratory indicators of potential associations rather than as evidence of statistically validated relationships. Due to the very small number of observations, emphasis was placed on the direction and magnitude of the observed co-variation, while significance testing and confidence interval estimation were not considered informative for inferential purposes. Furthermore, both ESG disclosure levels and financial performance indicators may be subject to the influence of temporal trends, firm-specific events, and broader macroeconomic developments. In the case of the ORLEN Group, factors such as corporate consolidation processes, regulatory changes, volatility in energy commodity markets, and macroeconomic conditions may have contributed to the observed patterns and associations. The obtained results serve as a complement to the previous comparative analysis. They enable the assessment of the co-variation between the ESG Index and selected financial indicators, while their interpretation focuses primarily on the direction and strength of the observed relationships. The results are presented in Table 11.

Table 11

Relationship between the ESG Index and selected financial indicators: correlation analysis

Financial indicator	Pearson's *r*	Spearman's *ρ*
ROA	-0.100	0.180
ROE	0.045	0.324
Net profit margin	0.298	0.450
EBITDA margin	0.533	0.559
Cost of debt servicing	0.311	0.324

Pearson's correlation coefficient between the ESG index and ROA was -0.100, indicating a very weak negative linear relationship. In contrast, Spearman's correlation coefficient reached 0.180, suggesting a very weak positive monotonic relationship. For ROE, the Pearson coefficient was 0.045, while the

Spearman coefficient amounted to 0.324. These results indicate the absence of a clear linear relationship and the presence of a weak positive monotonic association. For the net profit margin, the obtained coefficients were 0.298 for Pearson's correlation and 0.450 for Spearman's correlation, indicating weak to moderate positive co-variation. The highest correlation values were observed for the EBITDA margin. Pearson's correlation coefficient amounted to 0.533, while Spearman's coefficient reached 0.559. The results point to a moderate positive association between the ESG Index and the EBITDA margin; however, the small sample size precludes drawing robust conclusions and warrants a cautious interpretation of this finding. The correlation between the ESG Index and the cost of debt was 0.311 according to Pearson's coefficient and 0.324 according to Spearman's coefficient, indicating a weak positive relationship. Therefore, the results do not support the conclusion that an increase in the ESG Index was systematically accompanied by a reduction in financing costs throughout the analysed period. The correlation analysis did not provide a basis for identifying unambiguous and persistent relationships across the full set of financial indicators. Nevertheless, the results should be interpreted as exploratory in nature and warrant further validation in studies employing larger samples and more sophisticated statistical techniques. The most pronounced positive co-variation was observed for the EBITDA margin, a measure of operating performance. The correlation results are also presented graphically in Figure 6.

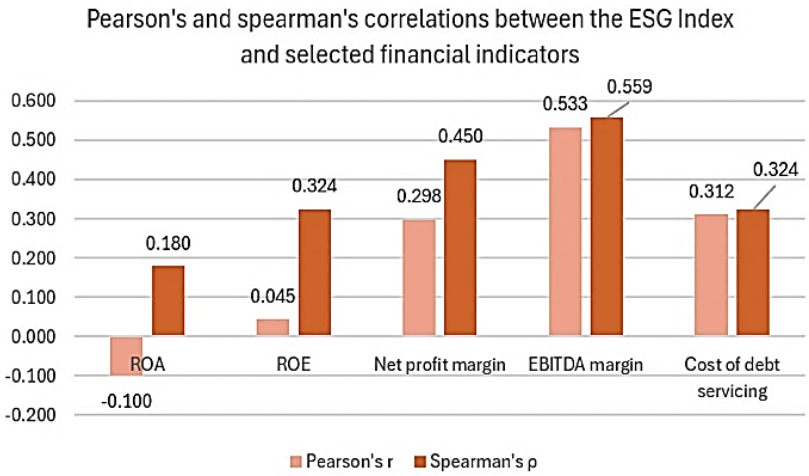


Fig. 6 Correlation Analysis of the ESG Index and Financial Indicators Using Pearson's and Spearman's Coefficients

Alt-text: *Fig. 6 presents the values of Pearson's (r) and Spearman's (ρ) correlation coefficients between the ESG Index and selected financial indicators of the ORLEN Group. The highest positive values of both coefficients were observed for the EBITDA margin (r = 0.533; ρ = 0.559), indicating the relatively strongest association with the ESG Index among the analyzed indicators. Positive relationships were also identified for net profit margin, cost of debt servicing, and ROE, whereas for ROA the Pearson coefficient was slightly negative (r = -0.100), while the Spearman coefficient indicated a weak positive correlation (ρ = 0.180).*

The graphical representation provides a clearer comparison of the direction and strength of the analysed relationships. The strongest and most consistent positive association was observed for the EBITDA margin, while the coefficients obtained for the other financial indicators were lower and did not indicate a consistent relationship with the ESG Index.

DISCUSSION

The study revealed that the strongest positive co-variation between the level of ESG disclosures and the financial performance of the ORLEN Group was observed for the EBITDA margin. This finding is partly consistent with previous research suggesting that greater transparency regarding ESG-related issues may be associated with improved corporate economic performance [19]. At the same time, the observed relationships were only moderate in strength, while the associations identified for the remaining profitability indicators were noticeably weaker. This observation is in line with a stream of empirical

studies that emphasize the inconclusive nature of the relationship between ESG and financial performance. For example, Brogi and Lagasio (2019) argue that both the strength and direction of the ESG-financial performance relationship may vary depending on the industry sector and the financial performance measures applied [49].

Another noteworthy finding is the absence of the expected negative relationship between the level of ESG disclosures and the cost of debt. The literature frequently suggests that greater transparency and broader ESG disclosures can reduce information asymmetry and improve lenders' assessment of corporate risk, thereby contributing to lower financing costs [32, 33, 34, 35, 36]. This effect appears particularly evident in European Union countries characterized by a stakeholder-oriented governance model, where ESG disclosure may influence financing costs to a degree comparable to that of actual ESG performance [50]. However, the results obtained for the ORLEN Group did not confirm the existence of such a relationship. This observation is not inconsistent with the broader body of empirical evidence, as previous studies have also reported mixed and inconclusive findings [37]. For instance, Andersson and Schwartz (2024) emphasize that the relationship between ESG disclosures and the cost of debt is sensitive to the research methodology employed, sample characteristics, and the period under investigation, with some models failing to identify statistically significant associations [51].

When interpreting these findings, it is also necessary to consider the specific characteristics of the oil and energy sector. Companies operating in this industry face particularly strong regulatory pressure resulting from the ongoing energy transition and increasing stakeholder expectations regarding environmental reporting. At the same time, their financial performance remains strongly influenced by external factors, including oil and natural gas prices, refining margins, geopolitical developments, and regulatory changes. Consequently, the relationship between ESG disclosure intensity and financial performance may be less pronounced than suggested by studies based on heterogeneous cross-industry samples. Therefore, the results may be viewed as a refinement of previous findings by highlighting the importance of industry-specific factors in shaping the ESG-finance relationship.

It should also be emphasized that the ESG Index applied in this study reflected the level of ESG disclosures in accordance with the GRI Standards rather than the actual implementation of ESG practices or ESG performance outcomes. As a result, the findings should be interpreted as relating to the relationship between the intensity of ESG disclosures and the company's financial performance. Accordingly, the study does not so much confirm or challenge prior evidence regarding the effects of ESG implementation on financial outcomes as it provides additional insights into the association between the scope of ESG reporting and selected measures of financial performance in a company operating within the oil and energy sector.

CONCLUSION

The aim of this study was to analyse the relationship between the level of ESG disclosures and selected financial performance indicators of the ORLEN Group. The conducted analysis demonstrated a substantial increase in the scope of reporting and the formalization of activities related to environmental, social, and governance issues between 2017 and 2023. The value of the proprietary ESG index developed for the purposes of this study increased from 46.99% to 90.10%, indicating a systematic expansion of disclosed information and the growing importance of sustainability-related issues within the Group's operations. Particularly significant progress was observed in the governance dimension, which achieved the highest level of disclosure completeness by the end of the analysed period.

Given that the ORLEN Group belongs to the entities covered by the first wave of implementation of the CSRD, the obligation to report in accordance with its requirements applies from the 2024 financial year onward. The trends observed during the 2017-2023 period indicate that the company had already been systematically increasing the scope and completeness of its ESG disclosures prior to the introduction of the new regulations. This may have facilitated the process of adapting to the reporting requirements introduced under the CSRD. It can therefore be assumed that previous experience in reporting on

sustainability issues may have facilitated the process of adapting to the new reporting requirements. At the same time, based on the analysis carried out, it is not possible to unequivocally assess the extent to which the company is prepared to meet all the requirements of the ESRS standards, nor the level of maturity of its ESG reporting processes.

The analysis of financial performance revealed greater variability in the examined indicators than in the ESG Index. Throughout the study period, both improvements and declines in corporate profitability were observed, suggesting that the relationship between the ESG transparency and financial performance was not unequivocal. An increase level of ESG disclosure was not always accompanied by improvements in financial indicators, just as declines in profitability were not necessarily associated with a reduction in ESG-related activities. The most pronounced relationship between the ESG index and the company's financial condition was observed for the EBITDA margin. Both the analysis of changes in indicator values over time and the correlation results indicate a moderate positive association between the extent of ESG disclosures and operational efficiency. Weaker relationships were identified for return on assets, return on equity, and net profit margin. In contrast, no stable and unambiguous relationship was found between the ESG Index and the cost of debt. Addressing the research question, the findings indicate that the level of ESG disclosures was associated with selected financial indicators of the ORLEN Group. Nevertheless, the observed relationships varied in both strength and direction across the financial measures examined.

The obtained results should be interpreted in light of the specific characteristics of the fuel and energy sector. The financial performance of the ORLEN Group was simultaneously influenced by numerous external and internal factors, including fluctuations in energy commodity prices, refining and petrochemical margins, exchange rates, and interest rates, as well as regulatory changes and consolidation processes associated with the acquisitions of the LOTOS Group and PGNiG. These factors jointly shaped the company's financial results, limiting the possibility of unequivocally attributing the observed changes solely to the changes relating to ESG disclosures.

The study indicates that the development of ESG reporting within the ORLEN Group was primarily associated with an increasing degree of formalization in the management of environmental, social, and governance issues. At the same time, the findings suggest that the potential contribution of ESG practices to the company's economic performance may be most evident at the level of operational activities. Nevertheless, the findings should be interpreted as exploratory, as the adopted research design does not provide a basis for establishing causal relationships between the variables under investigation. As the study is based on a single case study, the findings reflect the experience of the ORLEN Group and should be interpreted primarily in the context of the examined company. The findings highlight the need for further studies based on a broader sample of firms and more advanced statistical approaches, which would allow for a more robust assessment of the relationship between ESG disclosure levels and the financial performance of industrial companies.

Future research could usefully extend the scope of analysis to encompass the period following the full implementation of the CSRD and the ESRS. Such an approach would enable an assessment of the extent to which the new reporting requirements influence the scope and quality of ESG disclosures and their relationship with corporate financial performance. In addition, future studies based on a broader sample of companies and a longer time horizon may contribute to a more robust assessment of the economic effects of ESG reporting.

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