

# The impact of ESG factors on financial performance in the European Energy Sector

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**Abstract**—The European energy sector is crucial in promoting sustainable economic growth but faces increased pressure to adhere to environmental, social, and governance (ESG) standards. ESG adoption is no longer a matter of compliance only but a way of significantly influencing companies' financial performance and strategic positioning. Indeed, integrating ESG factors significantly impacts public perception and is increasingly recognized as a key determinant of financial performance. Therefore, this study investigates how ESG factors, individually and collectively, influence the financial performance of European energy companies and which specific ESG practices contribute most to financial resilience and profitability. Furthermore, it studies how varying regulatory frameworks and market conditions shape the relationship between ESG adoption and financial performance in compliance with Sustainable Development Goals (SDGs). The study concludes that adopting robust ESG practices enhances the financial resilience of European energy companies, demonstrating that sustainability efforts may not be aligned with profitability. Also, governance measures were revealed to have the most substantial effect on financial performance and leverage.

**Index Terms**—ESG factors, financial performance, energy sector, Europe.

## I. INTRODUCTION

With increased awareness surrounding climate change and stricter policies such as the European Green Deal and the Paris Agreement, energy companies must integrate ESG practices to maintain competitiveness and achieve sustainable development. This study aims to identify which of the ESG components are most strongly correlated with the financial performance of the energy firms, assess the short- and long-term financial impacts of ESG integration, and provide recommendations for energy sector stakeholders. To achieve these goals, it intends to answer the following research questions: i) how do environmental, social, and governance factors individually and collectively affect the financial performance of energy companies in Europe?; ii) what are the specific ESG practices that contribute most significantly to financial profitability?; and iii) how do differing regulatory environments and market conditions within Europe modulate

the relationship between ESG adoption and financial performance?

Covering the period from 2019 to 2023 and 9 companies from the energy sector, it employs a mixed-method approach, combining quantitative analysis with qualitative case studies to comprehensively understand ESG impacts. Therefore, using a combination of panel data analysis and case studies, the research examines how environmental, social, and governance practices contribute to financial outcomes, using accounting performance, liquidity, and leverage metrics, such as return on equity (ROE), Debt/Equity, and % Long Term Debt to Total Capital. The model incorporates fixed effects to control for firm-specific attributes and macroeconomic variables. Several indicators are tested for robustness checks, and different specifications are employed, like the Generalized Method of Moments, to control possible endogeneity issues.

By addressing these questions, this study aims to offer data-driven recommendations to help energy sector stakeholders to refine ESG strategies for enhanced financial and operational outcomes. The results highlight that companies with strong environmental initiatives, including investments in renewable energy and emission reduction strategies, correlate more with accounting financial measures. These findings are attributed to consumer demand and regulatory support, which are particularly effective in mitigating risks during periods of economic uncertainty. The analysis also points out that governance compliance influences the strength of the relationship between ESG integration and financial performance. Additionally, social practices related to employee welfare and governance measures emphasizing transparency and accountability are associated with long-term stability and reduced risk exposure. In conclusion, adopting robust ESG practices enhances the financial resilience of European energy companies, demonstrating that sustainability efforts are aligned with profitability. The set of Policymakers can support this trend by refining ESG regulations, offering investment incentives for renewable technology, and standardizing reporting standards to foster transparency and informed decision-making. These steps will promote the sector's transition to sustainable operations and ensure its long-term financial health and competitiveness.

## II. LITERATURE REVIEW

The energy sector is one of the main contributors to greenhouse gas (GHG) emissions, primarily due to the burning of fossil fuels (such as coal, oil, and natural gas) for energy production. Rising energy demand is closely associated with rising population and economic growth [1]. Being a leading source of direct GHG emissions, the energy sector is also crucial for reducing GHG emissions from other sectors. Energy use is the dominant source of carbon dioxide (CO<sub>2</sub>) emissions, accounting for 74% of global CO<sub>2</sub> emissions in 2018 [2]. Energy activities' global GHG emissions share from fossil fuel combustion is 51%, with large GHG emissions shares in the electricity and heat production industries and the residential and commercial sectors.

It is also important to note that this sector has been undermined due to the Russia-Ukraine conflict. According to the International Energy Agency (IEA), the war triggered an energy crisis that raised prices. European countries have put energy security at the top of their priorities, dramatically reducing fuel imports from Russia on which they had formerly relied. Furthermore, they have considerably raised their clean energy objectives to diversify energy mixes further while progressing towards climate targets [3]. The European energy sector is crucial in promoting sustainable economic growth but faces substantial pressure to adhere to environmental, social, and governance (ESG) standards. Increasing global awareness surrounding climate change and stricter policies such as the European Green Deal and the Paris Agreement have intensified the need for energy companies to adopt sustainable practices [1].

The importance of ESG factors has been continuously rising and is becoming one of the main priorities in every business strategy. According to the European Union, ESG ratings increasingly significantly impact investor trust in sustainable products, making sustainable finance an up-and-coming concept. "In the EU's policy context, sustainable finance is understood as finance to support economic growth while reducing environmental pressures" [4].

The importance of studying the impact of sustainable finance and ESG perspective strategies on the energy sector lies in the unique position of this industry as one of the most environmentally sensitive and economically critical sectors globally. The energy industry powers modern economies and contributes significantly to global GHG emissions, making it a focal point for achieving sustainability goals. By analyzing the relationship between ESG-focused strategies and financial performance, this study aims to uncover whether adopting environmentally and socially responsible practices can align with maintaining or enhancing profitability.

This analysis is particularly significant because it challenges the traditional view that sustainability and financial success are mutually exclusive, demonstrating that environmentally friendly initiatives can coexist with strong financial outcomes [5]. Furthermore, it seeks to provide evidence that one of the highest-emitting industries can lead the transition to a sustainable future while preserving its competitiveness and revenue streams. This dual focus on sustainability and financial performance underscores the urgency and relevance of exploring how ESG can transform the energy sector into a model of sustainable industrial practice.

Several studies have examined the relationship between ESG and financial performance. According to [6], ESG practices positively influenced ROA (Return on Assets), suggesting that firms with strong ESG scores utilized their assets more effectively to generate revenue. He also found a strong negative correlation between risk indicators, such as "debt," and ESG. However, these practices did not affect Tobin's Q, which measures a company's market value relative to the cost of replacing its assets. Xie et al. [6] discovered that most ESG-related activities positively correlate with corporate efficiency, ROA, and market value. Environmental activities and cost-cutting policies, such as green building initiatives, sustainable packaging, an environmentally friendly supply chain, or independent assessments, also relate positively to CFP (Corporate Financial Performance).

Fauzi et al. [7] employed slack resource theory, the idea that extra resources like cash or time allow organizations to invest in sustainability or social responsibility initiatives, and found no significant relationship between corporate social performance and financial performance. Modern and market-oriented metrics that emphasize sustainability's contribution to corporate performance, such as Tobin's Q, Price-to-Earnings ratio, enterprise value, and cash flow, tend to attract more attention because accounting measures are historically more focused [8].

Financial performance analysis based on ESG measures often employs stock return, ROA, and ROE as metrics. A meta-analysis of 51 studies by [9] identified 80 unique performance metrics, the most common being firm size, ROE, and ROA. Contrary to others, [10] noted that all market-based and accounting measures were considered, with ROA as the most crucial metric. Lo and Sheu [11] explored the impact of corporate sustainability on market value, and their findings supported the idea that sustainability enhances a company's overall value and, in turn, financial performance.

Folger-Laronde et al. [12] analyzed the relationship between ESG and financial returns during the COVID-19 financial crisis. Their study concluded that, during the pandemic, there was a negative relationship between ESG and economic returns, and ETFs with higher ESG ratings did not perform better or offer any protection against financial losses during sharp market downturns. This study argued that even companies with strong ESG performance were not better financially during the crisis, suggesting that, at least in this instance, ESG factors did not protect against the financial disruptions caused by the pandemic.

Gregory [13] argues that ROE, ROA, and Tobin's Q are insufficient measures of corporate financial performance concerning ESG criteria. Additionally, as sustainability practices can affect debt levels, other components like profit margins and equity multipliers may not accurately reflect the impacts of sustainability activities when using ROE and ROA. Consequently, Tobin's Q may be screened out, as sustainable companies might enjoy greater pricing power in their markets and face lower capital costs, making Tobin's Q seem less appealing for these firms. Financial performance measures relevant to ESG factors should primarily consider pre-tax cash

flows and cash flows tied to debt and equity to understand better these criteria' effects on a company [13].

### III. DATA ANALYSIS

All the data was collected from LSEG financials and the LSEG ESG database. Due to the complete data availability requirements, only data from 9 energy sector companies (Total; Engie; Iberdrola; Orsted; Neoen; ERG; E.ON; RWE; Vattenfall) were collected for several indicators, which are presented in Table I. The period corresponds to 2019-2023 and includes companies all traded at Euronext. This section comprises two steps. First, the data will be statistically analyzed. Afterward, the panel data model will be employed, and the results will be presented for each dependent variable (return on equity (ROE), Debt/Equity, and % Long Term Debt to Total Capital).

Besides the traditional data tests, simple panel data models are also estimated with fixed and random effects, along with the Hausman test. However, results are omitted considering space restrictions. Since endogeneity problems are very common in this model, the GMM methodology was employed. Three different sets of estimations are presented (Tables II, III, and IV), each considering the effects of Environmental (E), Social (S), and Governance (G) variables included in the analysis, respectively, to account for the different ESG effects over the dependent variable. The dimension of the company is also included as a control variable (the log of the number of employees), as is the asset turnover (ratio).

#### A. Statistical Analysis

Table I provides a descriptive statistical analysis of the data collected. It is essential to mention that it refers to large energy companies publicly traded in financial markets and has a demanded responsibility regarding sustainability reporting. From the analysis, we can infer a considerable disparity in total energy use, CO<sub>2</sub> emissions, and renewable energy supply. The mean value of employee satisfaction is high among all these nine firms. From the original data, it was also possible to observe that all firms comply with the GRI (Global Reporting Initiative) standards, and some information about the salary amount paid to CSR (Corporate Social Responsibility) direct employees was considerable. All these companies possess a corporate social responsibility committee and have been presenting the demanded sustainability reports even before these become mandatory, which only happened in 2023. During this period, the company with the highest number of board members has 22 members, of which, on average, only 26% are women. Indeed, from an average total of 48163 employees, board gender diversity is, on average, 38.8%, and the social responsibility in terms of employees with disabilities is very low (4.4%). Similarly, board cultural diversity is, on average, low (21.8%), as is the executive member's gender diversity (26.2%).

Figure 1 presents the number of firms that comply yearly with each SDG. In the most recent years of 2023 and 2022, all companies comply with SDG 5-Gender Equality and SDG 8-Decent Work and Economic Growth. SDGs 1, 2, 6, and 14 have fewer companies fulfilling these goals. Therefore, energy sector companies should raise awareness of SDG 1-No Poverty and SDG 2-Zero Hunger, focusing on energy poverty and becoming

active members of social causes, contributing to overall well-being.

TABLE I. DESCRIPTIVE STATISTICS

Variable	Mean	Std. dev.	Min	Max
ROE	0.081	0.115	-0.245	0.553
DE	1.415	1.183	0.200	6.670
LTD	0.395	0.148	0.147	0.722
INEE	9.641	2.087	5.361	12.059
AT	0.356	0.216	0.080	0.910
Environmental (E)	Mean	Std. dev.	Min	Max
TEU	2845.141	5097.222	87.620	19431.580
TRETEU	46100000	86300000	9735	282000000
TCO2E	813.961	1381.545	7.780	6553.330
LTEU	6.724	1.657	4.473	9.875
RES	0.244	0.187	0.026	0.630
LTRETEU	14.175	3.746	9.183	19.459
RCO2E	1.000	0.000	1.000	1.000
LTCO2E	5.662	1.559	2.052	8.788
NOxETR	0.702	0.750	0.020	3.430
SOxETR	0.340	0.598	0.010	2.210
TWMRR	35.961	69.279	0.430	347.810
WRTTW	0.640	0.226	0.193	0.980
THW	7.943	27.538	0.020	135.020
WRR	0.623	0.243	0.092	0.980
Social (S)	Mean	Std. dev.	Min	Max
EmployeeS	0.822	0.040	0.760	0.880
SalaryG	46.353	40.368	4.000	166.000
NEC	0.045	0.175	-0.438	0.823
GPGP	0.976	0.093	0.713	1.073
WomenE	0.266	0.064	0.128	0.369
NWE	0.315	0.076	0.209	0.421
WomenM	0.260	0.043	0.158	0.332
EWD	0.044	0.027	0.012	0.097
NEE	48163	50912	213	172703
Governance (G)	Mean	Std. dev.	Min	Max
NBMM	9.205	3.088	4.000	17.000
BMAA	0.980	0.020	0.925	1.000
CMAA	0.981	0.024	0.918	1.000
BoardS	13.976	4.108	7.000	22.000
BoardGGGEN-t	0.388	0.082	0.273	0.583
BoardSSSPE-t	0.313	0.201	0.036	0.714
ABTY	6.419	2.182	3.400	12.830
NEBM	0.907	0.087	0.750	1.000
IBM	0.613	0.194	0.375	1.000
BoardCCLTU-t	0.218	0.103	0.046	0.500
ExecutiveM-t	0.262	0.089	0.111	0.444

a. Return on Equity (ROE); Debt/Equity (DE); % LT Debt to Total Capital (LTD); log Number of Employees (INEE); Asset Turnover (AT); Total Energy Use / Million in Revenue \$ (TEU); Total Renewable Energy To Energy Use in million (TRETEU); Total CO<sub>2</sub> Emissions / Million in Revenue \$ (TCO2E); log TEU (LTEU); Renewable Energy Supply (RES); log TRETEU (LTRETEU); CO<sub>2</sub> Equivalent Emissions Total / Estimated CO<sub>2</sub> Equivalent Emission Total (RCO2E); log LTCO2E (LTCO2E); NOx Emissions To Revenues USD in million (NOxETR); SOx Emissions To Revenues USD in million (SOxETR); Total Waste / Million in Revenue \$ (TWMRR); Waste Recycled To Total Waste (WRTTW); Total Hazardous Waste / Million in Revenue \$ (THW); Waste Recycling Ratio (WRR); Employee Satisfaction (EmployeeS); Salary Gap (SalaryG); Net Employment Creation (NEC); Gender Pay Gap Percentage (GPGP); Women Employees (WomenE); New Women Employees (NEW); Women Managers (WomenM); Employees With Disabilities (EWD); Number of Employees (NEE); Number of Board Meetings (NBMM); Board Meeting Attendance Average (BMAA); Committee Meetings Attendance Average (CMAA); Board Size (BoardS); Board Gender Diversity, Percent (BoardGGGEN-t); Board Specific Skills, Percent (BoardSSSPE-t); Average Board Tenure (Years) (ABTY); Non-Executive Board Members (NEBM); Independent Board Members (IBM); Board Cultural Diversity, Percent (BoardCCLTU-t); Executive Members Gender Diversity, Percent (ExecutiveM-t).

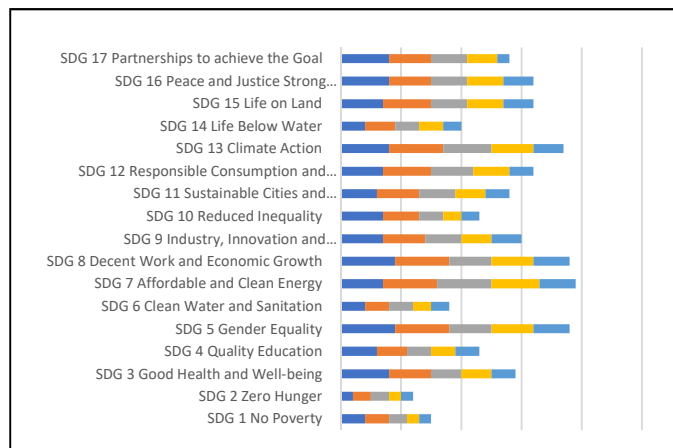


Figure 1. Number of firms by year complying with each of the SDGs.

Indeed, among all the ESG factors, the S (Social) component was revealed to be the one with the fewest results (Table I), with the E (Environmental) component being the one with the highest number of pointed guidelines followed, though, presenting several limitations in terms of data availability. The G (Governance) component presented the most robust results, which is essential considering that none of the other E and S components could be achieved without good governance. Still, despite the number of reduced data points, interesting conclusions within the energy sector might be drawn.

### B. Estimation Results

We first gathered all the environmental, social, and governance information into unique indexes for the empirical results. We have resorted to principal component analysis, creating an index for each ESG component. Then, a correlation matrix was presented among dependent and independent variables (Table II). After considering data endogeneity and performing the usual initial specification tests, a panel GMM methodology was followed, and results were presented for each dependent variable and ESG-created index. We have followed an instrumental variables approach, using a two-step procedure and robust standard errors.

TABLE II. CORRELATION MATRIX

	ROE	DE	LTD	INEE	AT	pec	pes	peg
ROE	1.0000							
DE	0.0784	1.0000						
LTD	-0.0909	0.8142***	1.0000					
INEE	0.1885	-0.1602	-0.4156***	1.0000				
AT	0.4037***	0.0819	-0.1132	0.6961***	1.0000			
pec	-0.4440	-0.7163*	-0.8236**	-0.7389*	-0.9253***	1.0000		
pes	-0.4077	0.8317	0.8802	0.9964*	0.9963*		1.0000	
peg	-0.1125	-0.2384	0.0282	-0.0056	0.0596	0.9103**	0.9265	1.0000

a. \*, \*\*, \*\*\* significant at 10%, 5%, 1%. Variables acronyms in Table I

Table II shows that the debt/equity (DE) ratio and the percentage of long-term debt to total capital are highly correlated. Nevertheless, since these are independent variables, no multicollinearity issues will be derived from them. High collinearity between the three ESG components index; therefore, to eliminate any possible multicollinearity in estimations, these were used in separate estimations presented in Table III. It is essential to notice the negative and significant correlation between the E component and the leverage (DE and LTD) dependent variables. Indeed, the E component reveals a negative correlation sign with all other dependent and control variables (these include INEE and AT). Thus, environmental sustainability concerns exert pressure on costs, probably due to the high investments that need to be realized. The same is true for the social and governance components, although internal rearrangements may be sufficient to comply with some GRI standards in this area. Opposition reveals the hugest positive correlation value between the S component and the dependent representatives of indebtedness (overall debt and considering solely long-term debt). The ESG component presenting the lowest correlation values with all the others is the G one. Moreover, noticing the significant negative correlation between company size and long-term debt is interesting. Asset turnover (AT) positively correlates with ROE and company size (as represented by the log of the total number of employees). It also correlates positively with the S and G components, albeit not significantly in the latter, but it presents a negative and strong

correlation with the E component. Considering that it measures the efficiency with which a company uses its assets to produce sales, the presented values might indicate that efficiency decreases with environmental concerns while increases with social awareness. This also strengthens the observations previously made regarding the SDGs.

Table III presents the GMM estimation results. In the case of the S component of ESG, and considering that our sample is very small, estimation results could not be presented. Furthermore, due to collinearity, with the number of instruments larger relative to the number of observations, pcs were dropped, and the two-step estimated covariance matrix of moments is singular. Thus, the E and G results are presented solely for each dependent variable.

TABLE III. ESTIMATION RESULTS (GMM)

	ROE	ROE	DE	DE	LTD	LTD
INEE	0.076*	-0.029	0.515*	0.082	0.062***	0.089
AT	-1.328	-0.150	-4.443	0.899	-0.306	0.012
pec	-0.699		2.376		-0.003	
peg		-0.022		-0.042		0.016
AR(1)-p	0.312	0.662	0.296	0.414	0.302	0.852
AR(2)-p	0.608	0.767	1.000	0.538	0.480	0.451
Sargan-p	0.345	0.787	0.470	0.022	0.358	0.000

a. Return on Equity (ROE); Debt/Equity (DE); % LT Debt to Total Capital (LTD); log Number of Employees (INEE); Asset Turnover (AT); \*, \*\*, \*\*\* significant at 10%, 5%, 1%. After performing two-step GMM, you need to check the following: (1) AR(1) p-value <0.05 = is significant (by construction, there must be first-order serial correlation). (2) AR(2) p-value >0.05 = insignificant (no second-order serial correlation). (3) Hansen test >0.05 = insignificant overidentification restrictions of the excluded instruments, which means the adequacy and validity of the included instruments. If we applied one step, we should check the Sargen test instead. Two-step is used when there is a heteroscedasticity problem. (4) no. Instruments are less or equal to the number of sections = no proliferation problem of instruments that weakens Hansen/Sargen tests. Sargan p-value >0.05 should be insignificant. The lagged values of dependent variables were collapsed.

As Table III shows, size positively and significantly impacts each dependent variable. These results do not confirm the previous correlation data analysis. The results are because the sample dimension is too small to produce robust results. For the same motive, it is not easy to correctly interpret results, being one of the main limitations of the present study. However, if significant, the E component demonstrates a negative impact on both accounting performance, measured by ROE and long-term debt, which, as stated previously, might be due to the high imposed costs of corporate social responsibility in terms of ESG compliance. The G component also presented a negative coefficient over ROE and DE but a positive coefficient sign in the case of long-term debt. These findings do not allow for profound conclusions, but jointly, all the results in this work raise awareness about the effort needed by energy sector companies to comply with sustainability. At the same time, they need to follow the path imposed by the ESG and SDGs, where results evidence the long effort that is still needed.

### IV. CONCLUSION

As awareness of climate change grows and policies like the European Green Deal and the Paris Agreement become more stringent, energy companies must adopt ESG practices to stay competitive and ensure sustainable development. In this regard, this study analyzes the impact of ESG factors on the financial performance of European energy companies, identifying key ESG practices that drive resilience and

profitability while considering the influence of regulatory frameworks and market conditions.

Companies prioritizing environmental initiatives, fostering socially responsible practices, and maintaining high governance standards should be better positioned to achieve financial growth and resilience. Faced with transformations in the energy sector, companies well positioned in ESG guidelines can capture opportunities, mitigate threats, and generate additional value for all stakeholders, including their shareholders. Therefore, this study can contribute crucial insights for policymakers to promote adopting robust ESG practices for the sector's transition to sustainable financial and competitiveness success. For instance, they can improve ESG regulations to incentivize companies to adopt comprehensive and impactful ESG strategies. Moreover, they can provide financial incentives for investments in renewable technologies and social programs to accelerate the transition toward sustainability while enhancing company profitability. Additionally, they can standardize ESG reporting requirements to improve transparency, making it easier for investors to assess long-term risk and value and fostering informed decision-making. Therefore, this research underscores the multifaceted benefits of ESG integration in the European energy sector, providing a roadmap for companies to align their operational strategies with sustainability goals while strengthening financial performance.

It is also noticeable that policymakers should promote ESG education and training, implementing programs to educate corporate leaders and investors about the benefits of ESG practices and their impact on financial performance. Moreover, they should encourage stakeholder engagement, implementing policies that promote corporate engagement with various stakeholders, including employees, communities, and supply chain partners, to enhance social responsibility efforts.

The study could benefit in the future by considering a larger sample of companies and a more extended period (not possible presently since ESG data was limited to 2019 onwards). Including other energy companies in the analysis besides those publicly traded would allow for overcoming the main study limitation. The small sample size restricts the generalizability of the findings. Moreover, issues with collinearity among the ESG indices, especially affecting the analysis of the social component, compromise the robustness of the results. Also, it can be concluded that adopting ESG practices enhances financial resilience, but with the small sample, we cannot connect with the energy crisis during COVID-19. Thus, expanding the sample size and extending the study period would strengthen the reliability and depth of the analysis, providing a more comprehensive picture of ESG impacts across the sector. With this larger sample and period, refining the policy recommendations with more context-specific strategies would fill the gap between academic insights and actionable industry practices, further increasing the study's practical value. These recommendations aim to create a

supportive environment for ESG implementation, ultimately leading to improved financial performance and sustainable business practices across industries.

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