

Sustainability and Environmental Governance in Listed Companies: Comparative Insights into Climate and Resource Management

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Abstract: This study presents a comparative analysis of the environmental performance of selected listed companies across diverse sectors, focusing on their greenhouse gas (GHG) emissions reduction, resource consumption, waste management, and sustainability reporting practices. By examining key environmental performance indicators and corporate commitments, the analysis highlights progress toward decarbonization, operational efficiency, and circular economy integration. The findings reveal sector-specific strengths and challenges, emphasizing the importance of comprehensive metrics and governance in driving sustainable business practices. The study underscores the need for ongoing innovation and digital integration to enhance environmental outcomes and corporate transparency.

Keywords: Environmental performance, greenhouse gas emissions, corporate sustainability, resource efficiency, waste management, renewable energy, circular economy, sustainability reporting, listed companies, climate commitments.

1. Introduction

Environmental sustainability has become a critical imperative for corporations worldwide (Salvati, 2025), driven by increasing regulatory pressures, stakeholder expectations, and the urgent need to address climate change (Vardopoulos and Passas, 2025). Listed companies, in particular, face heightened scrutiny to demonstrate responsible environmental management and transparent reporting of their impacts. This study explores the environmental performance of selected firms across multiple sectors, emphasizing their strategies and achievements in reducing greenhouse gas emissions, optimizing resource consumption, managing waste, and adopting sustainability frameworks.

The focus on GHG emissions aligns with global climate commitments (Ribeiro Hoffmann *et al.*, 2024), including the Paris Agreement targets, which necessitate ambitious decarbonization pathways. Simultaneously, efficient resource use (particularly energy and water) and circular economy principles are increasingly recognized as essential components of (corporate) sustainability (Sateriano *et al.*, 2024). Effective integration of environmental indicators within sustainability reporting frameworks further enhances accountability and informs investor decision-making (Vardopoulos *et al.*, 2024).

By comparing diverse corporate practices, this analysis seeks to identify best practices, sectoral differences, and ongoing challenges, thereby contributing to the broader discourse on sustainable corporate governance and environmental stewardship.

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The study is structured as follows. Section 2 reviews the relevant literature on corporate environmental performance and sustainability reporting. Section 3 outlines the methodology and data sources used for the analysis. Section 4 presents an overview of the Athens Stock Exchange's performance from 2020 to 2022. Sections 5 and 6 analyze macroeconomic and firm-specific factors influencing stock market dynamics during the period. Section 7 offers a comparative assessment of the environmental performance of selected listed companies. Finally, Section 8 concludes with key findings and recommendations for future research.

2. Environmental, Social, and Governance Issues in Greece and in the Athens Exchange

2.1. Environmental, Social, and Governance Issues in Greece

As environmental, social, and governance (ESG) issues rapidly gain prominence, institutional interest in these areas has intensified. In response, the European Union has introduced significant regulatory frameworks, notably the Corporate Sustainability Reporting Directive (CSRD). Announced in draft form in April 2021, the CSRD substantially revises the previous 2014 Non-Financial Reporting Directive by imposing more detailed reporting obligations. These mandates require companies, regardless of listing status, to disclose comprehensive sustainability information, encompassing environmental responsibility (E), human rights and labor practices (S), and corporate governance frameworks (G).

The CSRD's scope extends to all large companies, with reporting obligations commencing from 1 January 2024, for entities already under the directive's purview, and expanding to all large companies by 1 January 2025. In Greece, this regulatory shift is complemented by the National Climate Law (Law 4936/2022), which sets ambitious targets for reducing greenhouse gas emissions and achieving climate neutrality by 2050. Consequently, Greek firms will be required to comply with the CSRD's enhanced disclosure standards by 2024.

A recent study conducted by EY, titled "Long-Term Value and Corporate Governance Survey Greece 2023," underscores the critical role of effective corporate governance in advancing sustainable development within Greek enterprises. Based on insights from 100 executives and board members, the study highlights urgent needs for transitioning to renewable energy, improving energy efficiency, reducing greenhouse gas emissions, and minimizing waste generation.

Within this context, Forbes Greece and EY developed the ESG Transparency Index to measure the disclosure levels of Greek companies regarding ESG matters. Key findings from this index include:

- 41% of companies published a sustainability/ESG report for 2022.
- 41% disclosed non-financial information aligned with recognized standards.
- 43% reported direct (Scope 1) and indirect (Scope 2) greenhouse gas emissions.
- Only 25% disclosed indirect emissions (Scope 3).
- 29% set quantifiable greenhouse gas reduction targets with defined timelines.
- 21% assessed physical climate-related risks.
- 26% incorporated external independent assurance of non-financial disclosures.
- 20% disclosed targets related to zero workplace accidents.

Among the ESG pillars, governance disclosures recorded the highest percentage (40%), with the sector leading at 58%. This increasing transparency is pivotal in enhancing investor confidence and contributes to the sustainable competitiveness of Greek businesses.

ESG considerations are no longer limited to publicly traded companies but are permeating the wider market landscape. The Hellenic Development Bank (HDB) has pioneered efforts to extend ESG integration to small and medium-sized enterprises (SMEs) through the establishment of the first National ESG Observatory for SMEs. The launch of the ESG Tracker by HDB highlights the expanding relevance of ESG across all sectors, signaling a new paradigm that encompasses the broader market and society.

2.2. Environmental, Social, and Governance Issues in the Athens Exchange

The General Index of the Athens Stock Exchange (ASE) serves as the principal benchmark for the Greek capital market, reflecting the overall performance of companies listed on the Athens Stock Exchange (ATHEX). This price-weighted index incorporates both market capitalization and the trading volume of its constituents.

The global rise in the importance of ESG criteria has influenced the Greek stock market significantly. ESG indices assess corporate performance through environmental sustainability, social responsibility, and governance practices, attracting institutional investors focused on sustainable investment opportunities.

Within the Athens Stock Exchange, the integration of ESG principles has bolstered transparency and enhanced investor trust. Companies adopting robust ESG practices benefit from improved access to capital markets and enhanced reputations internationally. Moreover, ESG indices function as vital benchmarks for investors seeking to evaluate corporate performance beyond traditional financial metrics.

The alignment of Athens-listed companies with international ESG standards reveals a trend towards increased resilience against long-term crises and heightened appeal to long-term investors. This movement is expected to accelerate with EU legislation mandating non-financial disclosures, thereby incentivizing companies to enhance their ESG commitments.

The development of ESG indices in the Greek capital market offers numerous advantages, including increased market credibility, attraction of foreign investment, and promotion of sustainable economic growth. Nevertheless, challenges such as insufficient data availability and the need for broader ESG education among Greek companies persist, representing areas for future improvement.

3. Data

3.1. Sample

This study examines the relationship between ESG scores (environmental, social, and corporate governance) and the stock market performance of ten selected companies listed on the Athens Stock Exchange (ATHEX). The ESG data is sourced from the rating agency MSCI, which provides comprehensive analyses of corporate sustainability and responsibility practices, taking into account environmental, social, and governance factors. Meanwhile, the stock returns of the companies are obtained from the financial newspaper Naftemporiki (www.naftemporiki.gr), which offers reliable and up-to-date financial data.

For the current analysis, ESG scores are compared with the corresponding stock returns of the companies listed on the ATHEX in order to explore whether there is a positive, negative, or neutral correlation between the two parameters. Additionally, the study investigates whether investors consider ESG criteria in their decision-making, as well as the extent to which companies with higher ESG ratings demonstrate more stable or increased stock market performance.

Through this study, the aim is to draw useful conclusions regarding the role of sustainability in investment strategy and the value it may add to publicly listed companies.

3.2. Brief Induction to Companies Researched

- Titan Group operates in the field of building materials and cement.
- Alpha Services and Holdings is the parent company of the Alpha Bank Group.
- Coca-Cola HBC AG produces, sells, and distributes non-alcoholic ready-to-drink beverages.
- PPC (Public Power Corporation) is a Greek company involved in electricity generation and supply, as well as natural gas trading. It is one of the largest in Greece.
- National Bank of Greece (NBG) is the largest and oldest operating bank in Greece.
- Eurobank Holdings is a holding company that owns 100% of the shares of Eurobank S.A.
- Motor Oil is a petroleum company active in the energy sector, natural gas, and the refining and trading of crude oil.
- Mytilineos S.A., founded in 1990, operates in the fields of metallurgy, energy, and construction.
- OPAP is the leading gaming company in Greece and one of the most established in its sector globally.
- Cosmote is the unified commercial brand for all OTE Group products and services, covering fixed and mobile telephony, pay TV, and integrated information and communication technology solutions.

3.3. Descriptive Analysis

3.3.1. Descriptive analysis of closing price returns

Table 1 presents the descriptive statistics of the daily closing price returns for the ten selected companies listed on the Athens Stock Exchange. The results highlight notable variation in both the central tendency and dispersion of returns across the sample.

Among the firms, Mytilineos (MYTIL) exhibited the highest average return at 0.13%, followed by Public Power Corporation (PPC) with 0.11%, suggesting stronger relative stock performance and potentially greater investor confidence in these firms. Conversely, Titan and Alpha Bank reported negative average returns of -0.03% and -0.01% , respectively, indicating marginal underperformance over the observed period.

In terms of volatility, as measured by the standard deviation, Alpha Bank recorded the highest value (3.88%), reflecting substantial price fluctuations and elevated risk. Eurobank and PPC also demonstrated relatively high volatility levels (3.57% and 3.15%, respectively). In contrast, the lowest volatility was observed for the National Bank of Greece (NBG) with a standard deviation of 1.36%, indicating more stable price movements.

Regarding extreme values, Alpha Bank displayed both the maximum (28.57%) and minimum (-27.42%) daily returns in the sample, underscoring its susceptibility to pronounced price swings. PPC followed closely, with a maximum return of 28.41% and a minimum of -24.24% , reflecting exposure to market shocks, possibly due to the dynamic nature of the energy sector.

The median returns for most firms were 0%, indicating a distribution centered around no daily change in price. However, Mytilineos and OTE were the only firms with positive medians (0.16% and 0.07%, respectively), suggesting relatively more consistent daily gains.

Overall, the analysis reveals a heterogeneous risk-return profile among the firms. While certain companies demonstrate both positive returns and moderate volatility, others exhibit significant variability and downside risk. These findings may have implications for investors, particularly those incorporating ESG considerations, as they emphasize the importance of balancing return potential with financial stability.

3.3.2. Descriptive analysis of ESG scores

Table 2 provides descriptive statistics for the ESG (environmental, social, and governance) scores of the ten selected firms listed on the Athens Stock Exchange. The ESG scores, ranging from 0 (lowest) to 10 (highest), are derived from MSCI assessments and reflect the extent to which each firm adheres to sustainability and corporate responsibility standards.

The data reveal a generally favorable ESG profile across the sample, with average scores ranging from 5.00 to 9.29. Coca-Cola HBC (EEE) exhibited the highest ESG score, with both its average and median at 9.29, and a standard deviation of 0.00, indicating consistent strong performance across all observations. Similarly, Motor Oil (MOH) and Public Power Corporation

Table 1. Descriptive analysis of closing price returns

Company	Average	Median	Std dev	Minimum	Maximum
Alpha	-0.01%	0%	3.88%	-27.42%	28.57%
EEE	-0.01%	-0.02%	2.36%	-16.93%	18.27%
Eurobank	0.08%	0%	3.57%	-16.67%	25.81%
MOH	0.04%	-0.05%	2.49%	-16.14%	19.92%
MYTIL	0.13%	0.16%	2.14%	-17.15%	11.76%
NBG	0.03%	0%	1.36%	-8.12%	8.38%
OPAP	0.05%	0%	2.31%	-22.71%	10.10%
OTE	0.02%	0.07%	1.93%	-10.72%	13.55%
PPC	0.11%	0%	3.15%	-24.24%	28.41%
Titan	-0.03%	0%	2.20%	-19.72%	16.14%

Table 2. Descriptive analysis of ESG scores

Company	Average	Median	Std dev	Minimum	Maximum
Alpha	7.14	7.14	0.82	6.43	7.86
EEE	9.29	9.29	0.00	9.29	9.29
Eurobank	5.00	5.00	1.17	3.57	6.43
MOH	6.43	6.43	0.00	6.43	6.43
MYTIL	7.14	7.14	1.01	6.43	7.86
NBG	5.36	5.00	0.71	5.00	6.43
OPAP	7.50	7.86	0.71	6.43	7.86
OTE	5.71	5.71	0.82	5.00	6.43
PPC	5.00	5.00	0.00	5.00	5.00
Titan	7.50	7.86	0.71	6.43	7.86

(PPC) also showed no variability in their ESG scores, although at lower levels (6.43 and 5.00, respectively), suggesting stable but differing sustainability performance.

Among the more variable firms, Eurobank recorded the lowest average ESG score (5.00) and the highest standard deviation (1.17), signaling both weaker and more volatile ESG performance. Mytilineos (MYTIL) also showed notable variability (standard deviation = 1.01), despite having a relatively high average ESG score (7.14), suggesting recent improvements or fluctuations in reporting or performance.

Median values were largely consistent with the means, reinforcing the normality of the distributions. Firms such as OPAP and Titan reported relatively high ESG scores (both with a median of 7.86), indicating robust sustainability practices. In contrast, National Bank of Greece (NBG) and OTE had modest median scores (5.00 and 5.71, respectively), reflecting more average alignment with ESG criteria.

Overall, the descriptive analysis of ESG scores reveals significant heterogeneity in sustainability practices among Greek listed firms. While some companies exhibit strong and stable ESG performance, others display either weaker or more volatile ESG behavior. This variation provides a critical basis for further investigation into the relationship between ESG performance and financial outcomes, as addressed in subsequent sections of this study.

3.3.3. Descriptive analysis of ESG scores

Table 3 presents considerable variation in the ESG ratings among the companies in the sample. EEE stands out with the highest average ESG score (9.29), while companies such as Eurobank and PPC record scores of 5.00. This variation highlights the differing practices and performance of Greek businesses in ESG matters. It is noteworthy that certain companies, such as MOH and PPC, exhibit zero standard deviation, indicating stability in their ESG ratings but also a lack of change over time.

Table 3 also presents the stock returns of these companies. Small fluctuations are observed in the average returns, with MYTIL recording the highest positive change (0.13%) and Alpha Bank the largest negative (−0.01%). However, the high standard deviation in returns, particularly for companies like Alpha Bank and DEI, suggests significant volatility and potential risk. We observe that some companies, such as OPAP and Mytilineos, have high average ESG scores (7.5 and 7.14) along with relatively high average stock returns (0.05% and 0.13%). Conversely, there are companies like DEI that have a low ESG score (5) but a high average annual return (0.11%). Notably, in recent years DEI has shifted toward alternative energy sources, which is expected to contribute to an increase in its ESG score in the future.

Overall, it appears that companies' ESG scores tend to improve over time, and it is anticipated that in the future the correlation between returns and improvements in ESG scores will become more evident, as such effects require sufficient time to be reflected in the average annual stock returns. Even with the limited available data, there seems to be a positive correlation between average stock returns and ESG scores, as illustrated by certain individual examples in Table 3.

Table 3. Returns in relation to ESG scores

Company	Returns			ESG scores		
	2020	2021	2022	2020	2021	2022
Alpha	−0.14%	0.10%	0.01%	7.86	7.86	6.43
EEE	0.00%	0.07%	−0.10%	9.29	9.29	9.29
Eurobank	−0.05%	0.19%	0.11%	3.57	5.00	5.00
MOH	−0.13%	0.08%	0.24%	–	6.43	6.43
MYTIL	0.14%	0.11%	0.10%	–	–	6.43
NBG	0.04%	0.04%	0.01%	5.00	5.00	5.00
OPAP	0.03%	0.07%	0.06%	6.43	7.86	7.86
OTE	0.00%	0.09%	−0.03%	5.00	5.00	6.43
PPC	0.34%	0.11%	−0.12%	–	–	5.00
Titan	−0.07%	0.01%	−0.01%	6.43	7.86	7.86

From Table 3, we observe that only in the case of OPAP is there a statistically significant correlation between annual returns and ESG scores. However, many companies have stable ESG scores over the years, which limits the correlation coefficient's ability to produce useful and statistically significant conclusions.

4. Literature Review

The concept of environmental, social, and corporate governance (ESG) encompasses a set of criteria that influence a company's capacity to generate sustainable value. ESG synthesizes three core dimensions: environmental (E), social (S), and governance (G). The environmental dimension addresses concerns such as climate change mitigation (Vardopoulos and Passas, 2025), pollution control (Vardopoulos et al., 2021), resource efficiency (Vardopoulos et al., 2024), waste management (Vardopoulos, 2025), biodiversity conservation (Doukas et al., 2024), and sustainable use of natural resources (Escrivà Saneugenio et al., 2024). The social dimension pertains to human rights (Nickayin et al., 2023), labor standards (Ciaschini and Salvati, 2024), workplace diversity (López-Gay et al., 2020), health and safety (Kavouras et al., 2022), community relations (Vicini and Salvati, 2022), and social responsibility initiatives (Vortelinos et al., 2024). The governance dimension focuses on corporate ethics (Passas et al., 2022), board diversity and structure (Zopounidis et al., 2020), executive compensation (Yiannoulis et al., 2025), transparency (Cheliatsidou et al., 2023), anti-corruption measures (Zafeiriou et al., 2023), regulatory compliance (Angelaki et al., 2025), and shareholder rights (Passas, 2024).

Although traditionally categorized as non-financial indicators, ESG factors have demonstrated tangible linkages to corporate financial performance and risk profiles. Disclosure of ESG information enables investors, regulators, consumers, and other stakeholders to evaluate firms' sustainability performance comprehensively. ESG scoring systems, provided by agencies such as MSCI, Sustainalytics, and Bloomberg, translate these qualitative disclosures into quantitative metrics, though variation exists due to differing methodologies and frameworks like GRI, SASB, and regional standards.

The scholarly literature on ESG has burgeoned, investigating its multifaceted relationship with corporate financial outcomes, valuation, and risk. Seminal meta-analyses by Friede et al. (2015) and Whelan et al. (2021) synthesize thousands of studies to confirm a generally positive association between ESG performance and financial returns, while acknowledging variability across sectors, regions, and measurement approaches. Giese et al. (2019) further demonstrate that firms with superior ESG ratings tend to benefit from lower cost of capital and enhanced risk-adjusted returns, underscoring ESG's role in corporate risk management. Complementing these findings, Hübel, and Scholz (2020) link ESG scores to narrower corporate credit spreads, while Wang and Xu (2024) document ESG's stabilizing effect on stock price volatility.

Disclosure practices and their determinants have also received significant attention. Bayoud et al. (2012) reveal that CSR disclosure varies according to firm characteristics and institutional settings, with transparency serving as a vital mechanism for achieving sustainability outcomes, as corroborated by Chytis et al. (2024). Furthermore, governance factors such as

family ownership and audit committee effectiveness modulate ESG's impact on firm value and performance, as shown in studies by DasGupta (2022) and Julianto *et al.* (2025). Hu *et al.* (2023) add that ESG information increasingly influences stock price synchronicity, reflecting growing market recognition of ESG materiality.

In emerging markets, ESG dynamics present unique patterns. Diab and Eissa (2024) link enhanced ESG performance to higher audit quality and favorable audit opinions, while Wang *et al.* (2024) highlight the interconnectedness of ESG with credit risk ratings, governance, and capital structure in Chinese firms, emphasizing institutional context. Ownership and investor perspectives are critical in shaping ESG engagement; Sun *et al.* (2023) identify family ownership as a key driver of ESG practices in family firms, whereas Kräusl *et al.* (2024) expose heterogeneity in investor beliefs and call for greater ESG standardization.

The integration of ESG into financial decision-making extends to both equity and debt markets. Asimakopoulos *et al.* (2024) demonstrate ESG's influence on corporate debt structure, while Li *et al.* (2024) connects higher ESG scores with improved stock liquidity and shareholder returns. Life cycle and contextual approaches also enrich ESG research: Qu and Zhang (2023) show that the timing and maturity of ESG initiatives affect firm performance in China, and Zhang *et al.* (2025) emphasize the significance of institutional ownership heterogeneity for ESG outcomes.

Collectively, this growing body of research affirms the pivotal role of ESG factors in shaping financial performance, corporate governance, and market behavior. Nonetheless, the complex and context-dependent nature of ESG effects calls for continued investigation into the underlying mechanisms, regulatory influences, and evolving investor expectations shaping ESG's integration into global capital markets.

5. Factors that Influenced the Course of the Athens Exchange

5.1. 2020

The year 2020 can be divided into four distinct periods. In first period, at the start of the year, the general index (G.I.) moved upward, reaching its highest performance on 24 January at 948.64 points. Despite geopolitical tensions (such as US–Iran conflicts and Turkey's interventions in Libya) the markets remained largely unaffected.

In second period, from February to May, the G.I. exhibited a pronounced V-shaped movement due to the COVID-19 pandemic's escalation. Market panic ensued amid widespread lockdowns that halted economic activity. Oil prices plummeted by 31% daily and briefly turned negative because of storage capacity saturation and halted transport. On 16 March, the G.I. hit a yearly low of 484.40 points. Central banks (including the Federal Reserve, ECB, BoJ, and BoE) cut rates to near zero or negative and injected massive liquidity, with the ECB launching its €1.35 trillion Pandemic Emergency Purchasing Programme (PEPP), including Greek bond purchases. Governments responded with unprecedented fiscal stimuli (e.g., US\$2 trillion direct payments, EU's €540 billion emergency package and €750 billion Recovery Fund). These coordinated efforts stabilized markets, allowing the G.I. to recover to 652.58 points by late May. However, the MSCI index restructuring removed the three major Greek banks from the MSCI Standard Greece index, reflecting their market value erosion.

In third period, from June to October, the Greek stock market moved asymmetrically, with limited growth and continued foreign investor outflows, particularly from the bank-centric market affected by recession and geopolitical tensions in the Eastern Mediterranean (e.g., Turkish NAVTEX notices). Tourism collapsed, and pandemic restrictions persisted, resulting in low trading volumes. By the end of October, the G.I. stood at 669.50 points.

In fourth period, during November and December, despite new lockdowns investor sentiment shifted dramatically due to three major developments: the US election of Joe Biden, Greece's credit rating upgrade by Moody's (2021), and vaccine announcements by Pfizer and Moderna. The Greek market outperformed globally, with a +29.4% return in November and a historic 14-session winning streak for the G.I., signaling optimism for economic recovery despite a projected –10% GDP contraction for 2020.

5.2. 2021

The year can be divided into two main phases. In the first period (January–April), after an early January dip to 743.5 points driven by renewed lockdown fears, the G.I. rebounded towards 900 points amid improving global conditions. The Greek Government Debt Management Agency (ODDIH) successfully raised €3.5 billion through 10-year bonds at 0.807%. Corporate

bond issuances included Alpha Bank (€500 million, 5.5%), Public Power Corporation (DEI, €650 million, 3.875%), and Motor Oil (€200 million, 1.90%). In April, Piraeus Bank raised €1.38 billion via capital increase, reducing HFSF's stake and bringing in new investors. Standard & Poor's upgraded Greece's credit rating to BB.

In terms of the second period (May–December), the market consolidated between 830 and 930 points, hitting a yearly high of 929.3 on August 30 but failing to break higher. Inflation concerns mounted, with US inflation reaching 5% by June. ODDIH issued more bonds (€3 billion at 0.20% in May; €2.5 billion at 0.888% in June). Alpha Bank completed an €800 million capital increase and rejoined the MSCI Standard Greece index. DEI issued €500 million bonds and sold 49% of its HEDNO subsidiary to Macquarie (€2.1 billion). The Delta variant and a brief Mykonos lockdown caused market disruptions. The EU approved Greece's National Recovery Plan (€31 billion grants/loans). Devastating wildfires marred August's strong tourism. Bond issuances continued with favorable yields, and credit ratings improved via DBRS and Scope. By October, inflation, energy crises, geopolitical tensions, and pandemic challenges drove volatility. Greek 10-year bond yields rose to 1.31%, dampening sentiment. DEI raised €1.35 billion via private placement, with CVC acquiring significant shares. The Omicron variant appeared late November. December inflation surged, prompting the US Federal Reserve to announce 2022 interest rate hikes and the end of quantitative easing. The ECB ended the PEPP program in March 2022 but maintained low rates and APP purchases. Greek GDP grew 13.4% annualized by Q3, while November inflation hit 4.8%, a decade high.

5.3. 2022

The year began positively, aided by banking stocks and a 3-year Greek government bond issuance at 1.84%. A preliminary acquisition of Viva Wallet by J.P. Morgan also buoyed sentiment, with the G.I. peaking at 971.09 points on 11 February. However, Russia's invasion of Ukraine in late February induced sharp market declines in March. Energy prices surged, grain supply chains were disrupted, and Russia's decree requiring gas payments in rubles worsened uncertainty. The G.I. dropped to 879.45 points by March end. Despite persistent geopolitical tensions and Shanghai's COVID-19 lockdowns, April saw resilience: S&P upgraded Greece to BB+, a 7-year bond was issued at 2.40%, and the G.I. stabilized at 922.43 points, although inflation had reached 8.9% in March. May's inflation rose to 10.2%, reinforcing concerns about persistent inflation. National Bank of Greece and Mytilineos rejoined the MSCI Standard Greece index; Motor Oil announced a deal with Ellaktor. The G.I. closed May at 890.70 points. In June, the US Federal Reserve began aggressive rate hikes in response to inflation, which hit 11.3% in Greece for May. The G.I. fell to 810.42 points. July worsened with sabotage on Nord Stream 1, further increasing gas prices; US inflation reached 9.1%. Summer saw continued Fed hikes and ECB tightening. August's market declined amid hawkish Fed comments but was buoyed by strong Greek bank performance, with the G.I. closing at 856.36 points. September was the low point, with the energy crisis deepening after Nord Stream 1's shutdown. Despite 7.7% GDP growth, the G.I. hit a yearly low of 788.46 points on September 29, ending the month at 792.90. In Q4, easing natural gas prices and continued central bank tightening supported recovery. The G.I. gained +10.26% in October to 874.27 points and rose above 900 points by November (912.33). Meanwhile, US inflation eased to 7.7% in November, though the collapse of crypto exchange FTX caused sector turmoil.

6. Factors Affecting the Stock Market Performance of Selected Companies

This section provides an analysis of the key factors influencing the stock market performance of ten major companies listed on the Athens Stock Exchange and other relevant markets during the period 2020–2022. The discussion highlights the impact of macroeconomic events, geopolitical developments, and company-specific dynamics on stock price movements and investor sentiment.

6.1. TITAN Cement International (TCI)

At the close of 2022, TCI's stock price was €12.00 on Euronext and €12.06 on the Athens Stock Exchange, reflecting year-on-year declines of 9.5% and 9.9%, respectively. The stock's performance was predominantly shaped by adverse market conditions and the indirect repercussions of the Ukraine war, which led to escalating energy costs. Despite a broadly negative global equity environment—with indices such as the STOXX Europe 600 and BEL Midcap declining by 13% and 12%, respectively—TCI exhibited relative resilience within its sector. The company's market capitalization contracted from €1.05 billion in 2021 to €0.9 billion by the end of 2022.

6.2. Alpha Bank Holdings

Alpha Bank's stock commenced 2020 on a downward trajectory amid the initial shock of the COVID-19 pandemic but reversed course to close the year approximately 20% higher. This upward momentum persisted through 2021, fueled by easing pandemic restrictions, economic recovery, and the successful completion of the EUROBANK acquisition, resulting in a near doubling of its share price. In 2022, growth moderated to around 15%, as inflationary pressures, increased borrowing costs, and recession fears tempered investor enthusiasm.

6.3. Coca-Cola HBC (EEE)

The onset of the pandemic in 2020 caused market instability and a stock price decline in March. However, EEE swiftly rebounded, benefiting from shifts toward at-home consumption and e-commerce channels. This positive trend continued through 2021 with the reopening of economies, further bolstered by increasing investor interest in ESG (environmental, social, and governance) criteria. The conflict in Ukraine introduced uncertainty in early 2022, pressuring the stock through rising raw material and energy costs. Nonetheless, EEE reported a robust 12.6% increase in net sales revenue in Q1 2024, reinforcing investor confidence.

6.4. Public Power Corporation (PPC)

PPC's stock demonstrated notable volatility between 2020 and 2022. Following a decline to €0.70 in March 2020 amid the global recession triggered by COVID-19, the stock rebounded to €1.80 by year-end, supported by government infrastructure initiatives. In 2021, it reached a 52-week high of €2.50 in May but declined to close at €1.70. The following year saw further volatility with a low of €0.90 in February 2022, a subsequent recovery to €1.60 in August, and closure at €1.30.

6.5. National Bank of Greece (NBG)

NBG's stock began 2020 at €0.70, peaking at €1.02 in July due to optimistic economic recovery expectations. However, apprehensions regarding non-performing loans and potential lockdowns led to a decline to €0.58 in November, with a year-end close at €0.65. In 2021, NBG's stock rose to €1.25 in May amid restructuring efforts but slipped to €0.90 by October amid global slowdown fears, closing at €1.00. The year 2022 opened with gains to €1.35 in February, supported by strong financial results, but declined to €0.98 in June amid war-related economic concerns, ending the year at €1.10.

6.6. Eurobank Holdings

Eurobank's stock demonstrated strong growth from €0.29 in March 2020 to €0.83 in March 2022, representing a 186% increase. Initial pandemic-related declines gave way to recovery driven by economic stabilization, banking reforms, and improved financial performance. The stock peaked at €0.75 in August 2021 before inflationary and interest rate concerns dampened momentum. In 2022, the stock experienced volatility due to the Ukraine conflict but rebounded to close at €0.83, aided by rising energy prices, credit rating upgrades, and higher interest rates.

6.7. Motor Oil

Motor Oil's stock started 2020 with a decline to €10.50 in March but recovered to €14.80 by year-end, buoyed by oil price rebounds and easing restrictions. In 2021, it reached a high of €22.40 in June, reflecting rising oil prices and economic optimism, before retreating to €19.20 by December. The stock peaked again at €26.06 in April 2022 amid the Ukraine war's impact on energy prices, underwent a correction to €21.94 in July, and closed the year at €25.80.

6.8. Mytilineos

Mytilineos experienced an initial decline to €1.90 in March 2020, followed by recovery supported by renewable energy investments, closing the year at €2.70. The stock fluctuated in 2021, peaking at €3.50 in February before a mid-year dip linked to inflation concerns, and ended the year at €3.80. In 2022, after reaching €4.60 in May, the stock dropped to €3.20 amid market instability from the Ukraine war, then recovered to close at €4.20.

6.9. OPAP

OPAP's stock exhibited an overall upward trend despite volatility. The pandemic-induced closure of retail outlets led to declines in 2020, but easing restrictions facilitated recovery by year-end. In 2021, the stock rose by over 30%, supported by strong financial results and improved investor sentiment. Market uncertainties in 2022, including legislative changes in online gambling and inflationary pressures, introduced volatility. Technical analysis indicated sustained bullish momentum, with the stock trading predominantly above key moving averages and encountering defined resistance near €17 and support around €13.

6.10. COSMOTE

Amidst macroeconomic challenges from the pandemic and geopolitical tensions, COSMOTE maintained stable financial performance. The stock rose from €11.50 at the start of 2020 to €14.00 in October, driven by solid interim results and positive outlooks. In 2021, further growth was supported by strategic investments and acquisitions, with the stock reaching €16.50 in November. Despite the uncertainties in 2022 linked to the Ukraine conflict, COSMOTE's stock price ended the year marginally higher at €16.00, reflecting resilience and effective strategic management.

7. Environmental Performance of Listed Companies: A Comparative Analysis

This section examines the environmental performance of selected listed companies across diverse sectors, emphasizing their commitments and achievements in greenhouse gas (GHG) emissions reduction, resource management, and sustainability initiatives. The analysis focuses on key performance indicators such as emissions targets, energy and water consumption, waste management, and adoption of renewable energy, providing a comprehensive overview of corporate environmental responsibility practices.

7.1. Greenhouse Gas Emissions Reduction and Climate Commitments

Several companies have set explicit decarbonization goals aligned with global climate targets. For instance, TITAN has established clear reduction targets for both direct emissions from cement production and indirect emissions linked to fossil fuel sales, with benchmarks extending to 2030 and 2050. Similarly, Mytilineos has committed to achieving net-zero greenhouse gas emissions by 2050, reflecting strategic alignment with international climate agreements.

In the financial sector, Alpha Bank achieved a significant 27% reduction in GHG emissions between 2020 and 2022, driven by enhanced renewable energy use and energy efficiency measures. Public utilities such as the Public Power Corporation (PPC) (2022) demonstrated substantial emission cuts of 36%, alongside a nearly doubling of renewable energy capacity connected to the grid since 2020. The National Bank of Greece incorporates a broad emissions framework, addressing Scope 1, 2, and 3 emissions to manage climate-related risks and opportunities comprehensively.

7.2. Resource Consumption and Efficiency

Energy and water consumption metrics further elucidate corporate sustainability efforts. Companies like Coca-Cola HBC reported modest but meaningful reductions in energy use (2.9%) and water consumption (1.3%) in 2022, alongside initiatives to improve packaging recyclability. In contrast, OPAP achieved notable reductions in total energy consumption and GHG emissions over 2019–2021, although water consumption increased during the same period.

Mytilineos demonstrated a 10% reduction in energy use and a 5% decrease in water consumption since 2021, underscoring continuous improvement in operational resource efficiency. Conversely, Cosmote has made progress in reducing emissions and resource use but still faces challenges in waste reduction and biodiversity conservation.

7.3. Waste Management and Circular Economy Practices

Waste management practices vary considerably among companies, reflecting sector-specific challenges and opportunities. Motor Oil stands out for its circular economy initiatives, with 92% of solid waste recycled or repurposed and significant

investments (€964 million) in sustainable projects. Conversely, OPAP's waste recycling trends show mixed results, with hazardous waste recycling declining sharply, although non-hazardous waste recycling remains substantial.

TITAN emphasizes detailed tracking of waste treatment methods and hazardous waste destinations, reflecting a comprehensive approach to minimizing environmental impacts throughout the waste lifecycle.

7.4. Integration of Environmental Indicators and Sustainability Reporting

Financial institutions such as Eurobank employ a dual framework distinguishing between key performance indicators (KPIs), focusing on GHG emissions and energy consumption and advanced performance indicators (APIs) which include lifecycle assessments and Scope 3 emissions. This layered approach facilitates a holistic understanding of environmental impacts and supports transparent, data-driven sustainability strategies.

Companies such as Public Power Corporation (PPC) and Motor Oil utilize internationally recognized standards, including ISO 14001 certification and the EU taxonomy framework, to validate their environmental management systems and investment alignment with sustainability goals.

7.5. Summary and Implications

The surveyed companies illustrate diverse but convergent paths toward enhanced environmental performance, marked by ambitious emission reduction targets, improved resource efficiency, and evolving waste management practices. While progress is evident, particularly in renewable energy adoption and emissions mitigation, challenges remain in areas such as water use optimization, hazardous waste recycling, and biodiversity management.

This comparative analysis highlights the importance of sector-specific strategies, comprehensive performance metrics, and robust governance frameworks in driving sustainable corporate practices. Future research may focus on longitudinal assessment of environmental performance and the integration of digital technologies to further enhance sustainability outcomes.

8. Concluding Remarks

This comparative analysis of environmental performance across selected listed companies highlights a growing commitment to sustainability, evidenced by ambitious GHG emissions reduction targets and tangible progress in resource efficiency and waste management. Companies such as TITAN, Mytilineos, and PPC demonstrate leadership through clear decarbonization goals and increased renewable energy integration, while others show notable improvements in operational resource use.

However, challenges remain, particularly in optimizing water consumption, enhancing hazardous waste recycling, and addressing biodiversity impacts. The heterogeneity of sectoral approaches underscores the need for tailored strategies supported by robust governance frameworks and comprehensive performance metrics.

Moreover, the integration of advanced sustainability indicators and adherence to internationally recognized standards play a crucial role in enhancing transparency and driving continuous improvement. Future research should focus on longitudinal performance tracking and the role of digital innovations in augmenting sustainability outcomes.

Overall, this study reinforces the critical importance of multi-dimensional environmental strategies and stakeholder engagement in advancing corporate contributions to global sustainability objectives.

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